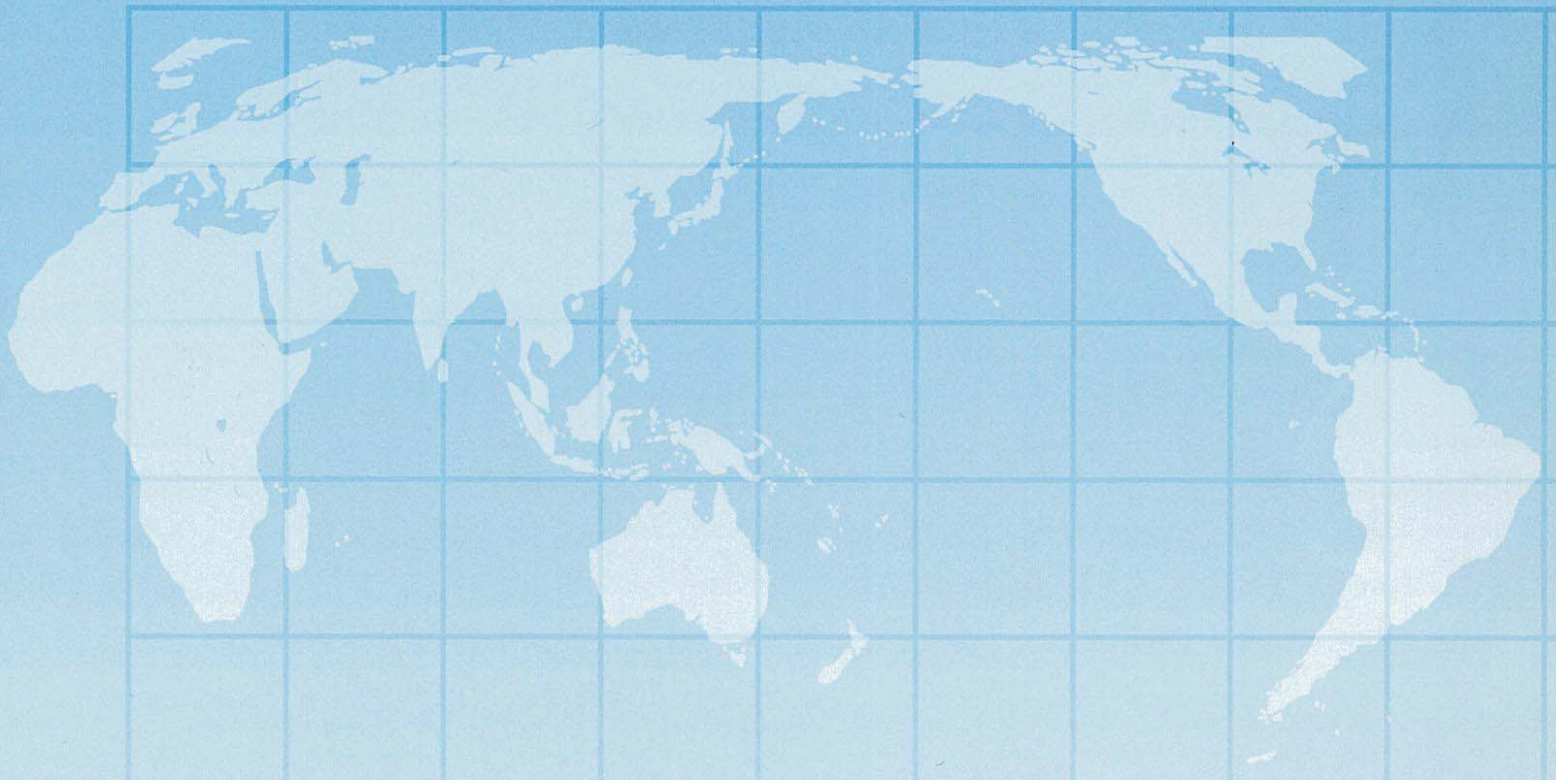
The Third World Conference on Production and Operations Management

POM TOKYO 2008

Tokyo,Japan August 5-8,2008



学習院大学
Gakushuin University

The Third World Conference on Production and Operations Management

Manufacturing Fundamentals: Necessity and Sufficiency

PROGRAM BULLETIN
POM TOKYO 2008

Gakushuin University, Tokyo, Japan
August 5 – 8, 2008

Japanese Operations Management and Strategy Association
European Operations Management Association
Production and Operations Management Society

Edited by
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Yoshiki Matsui,
Hirofumi Matsuo
and
Michiya Morita

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The Japanese Chapter of the System Dynamics Society
Reliability Engineering Association of Japan
The Japanese Society for Quality Control
International Manufacturing Leaders Forum

The Number of Participants by Country Declared

as of 2008/7/21

Country	Registration	Country	Registration
Argentina	3	Macau	1
Australia	6	Mexico	4
Austria	5	Nepal	2
Belgium	5	Netherlands	11
Brazil	6	New Zealand	3
Canada	5	Nigeria	1
China	7	Norway	8
Colombia	2	Portugal	3
Denmark	4	Republic of Korea	3
Fiji	1	Singapore	3
Finland	13	Slovenia	1
France	4	South Africa	4
Germany	11	Spain	56
Greece	3	Sweden	6
Honduras	1	Swiss	3
Hong Kong	24	Taiwan	14
Hungary	1	Thailand	16
India	4	Turkey	8
Iran	7	UAE	2
Ireland	1	UK	39
Israel	1	USA	43
Italy	4		
Japan	65	Total	414

JOMSA Welcome Message from JOMSA

As representatives of the hosting organization, we are pleased to welcome you to the 3rd World Conference on Production and Operations Management in Tokyo, Japan. Under the main theme of "Manufacturing Fundamentals: Necessity and Sufficiency," constructive ideas and thoughts should be exchanged to reexamine the basic construct of manufacturing management and to explore new research directions for better managing manufacturing firms and their global supply chains. Thanks to productive collaboration with European Operations Management Association (EurOMA) and Production and Operations Management Society (POMS), 414 scholars from 43 countries have pre-registered the conference, which consists of 3 tutorials, 1 panel discussion and 412 research presentations. The CD-ROM conference proceedings include 217 full papers accepted and revised after a peer refereeing process. In addition, we are honored to have three distinguished speakers at the afternoon plenary sessions: Mr. Yukihisa Hirano, Chairman of Central Japan International Airport Co., Ltd., Prof. Hau Lee at Stanford University, a former president of POMS, and Prof. Chris Voss at London Business School, a former president of EurOMA.

We are very much blessed to have the wonderful and devoted co-chairs of the conference representing the two academic organizations: Prof. Jose A. D. Machuca at University of Seville from EurOMA and Prof. Barbara B. Flynn at Kelly School of Business, Indiana University from POMS. We also greatly appreciate the current and past presidents of EurOMA and POMS for their continuous supports and helpful advices and the program committee members and paper reviewers for their hard work and commitment to the advancement of out discipline. We believe that we have developed a cohesive and attractive plan for this conference and worked out its management as a team. We hope this conference to be a worthwhile and memorable international event in the field of POM in Asia.

This conference represents the first academic achievement of a new academic society, Japanese Operations Management and Strategy Association (JOMSA). Most of the members have contributed to the conference as committee members, and they are going to present papers and serve as session chairs. This experience and achievement should form a foundation of the advancement of our discipline, production and operations management in Japan.

Finally, we would like to thank sponsors, exhibitors, and advertisers for their financial support. Special thanks should be given to the colleagues, staff and students at the conference venue, Gakushuin University.

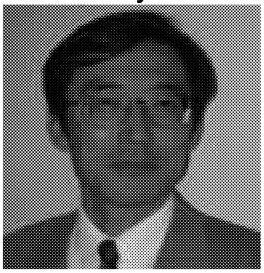
We are looking forward to interacting with you in Tokyo.

Best wishes,

Executive Committee members of JOMSA

Michiya Morita, Professor of Gakushuin University
Kakuro Amasaka, Professor of Aoyama Gakuin University
Hirofumi Matsuo, Professor of Kobe University
Yoshiki Matsui, Professor of Yokohama National University






Greetings

European Operations Management Association (EurOMA)

It is my pleasure as President of EurOMA to invite you to attend the 3rd World Conference on Production and Operations Management to be held in Japan in August 2008. After the successful previous World conferences in Seville (Spain) in 2000 and Cancun (México) in 2004, the Japan conference will provide an excellent opportunity for POM professionals from around the world to meet and discuss our current research work, teaching challenges and practical applications of our field.

Japan has been for many years a source of innovations, from the JIT production philosophies to the current applications of similar principles to product development. The contents of a POM course is very different now from what it was in the 70's and Japanese Management techniques deserve a big credit for it. It is not very common for Western scholars to have the opportunity to attend a world conference in Japan and to network with our Japanese colleagues, and this is definitely an occasion not to miss.

These World Conferences are jointly organized by JOMSA, POMS and EurOMA, the leading production/operation management societies in Japan, USA and Europe, respectively. Once every four years one of the associations takes the lead in the organization of this world event. Our fellow EurOMA Board member, Prof. J. A. D. Machuca is the representative of Euroma to the conference organization committee. From EurOMA we thank our colleagues from JSPM for the efforts they are making in the preparation of the 2008 Conference, we are convinced this will be one of the best POM conferences the world have ever seen, and I encourage everybody interested in the field to attend it. See you in Japan!!

Best wishes.

Prof. Jaume Ribera
IESE Business School, Spain
CEIBS, P. R. China
President, EurOMA
(2004-2007)

Greetings

European Operations Management Association (EurOMA)

It is my pleasure to invite you to the 3rd World Conference on Production and Operations Management, which will be held at Gakushuin University in Tokyo, Japan, in August 2008.

This conference is the third of its kind. In 2000, POMS organised its first world conference in Seville, in Spain. In 2004, the second conference was organized in Cancun, in Mexico. Now, four years later, the conference travels to Asia. It is a co-organisation of JOMSA, POMS and EurOMA, the leading operations management societies in Japan, the USA and Europe.

I'm convinced that all of us, in our Operations Management courses, talk about the impact that the Japanese concepts and practices have had and are still having on our field. This conference offers a unique opportunity for Western scholars to experience these practices and to discuss the future of Operations Management with both academics and practitioners, in this stimulating environment.
The conference programme looks very promising: it offers a mix of keynote speeches and paper sessions; it combines insights from academics and from executives; it provides the opportunity to join on a few factory visits; and after the hard work, there is also some time for sightseeing in the magnificent city of Tokyo.

This conference offers a unique setting: a global network of participants, in a region famous for its operations management theories and philosophy.

I look forward to meeting you in Tokyo next August !

Best wishes.

Prof. Ann Vereecke
Vlerick Leuven Gent Management School and Ghent University, Belgium
President, EurOMA (2007-2010)

Greetings from Co-Chair

European Operations Management Association (EurOMA)

In 1998 POMS proposed that I should organize their International Conference in 2000. I thought that the transition from one millennium to the next and unstoppable globalization implied a need to share different points of view, provided by different geographical and historical settings. This is why I proposed the organization of the First World Conference on Production and Operations Management, which would provide an incomparable opportunity for joint reflection and cooperation efforts in our field.

This initiative received the active support of valued colleagues in North America, Europe, Asia and Latin America and of the leading OM Associations. In this way a seed was sown with the intention that it should grow and bear fruit, facilitating and catalyzing worldwide cooperation for the benefit of the OM discipline, a point of departure for a possible series of OM World Conferences.

The seed has indeed borne fruit thanks to the support and effort from international OM organizations which agreed to hold these joint Conferences every four years, alternating between Europe, America and Asia. The first was held in Seville (POM Seville 2000) and the second in Cancun (POM Cancun 2004); both enjoyed remarkable success. The third, which will bring the first twelve-year cycle to a close, will be held in Tokyo in 2008 and there is no doubt that it, too, will be the perfect example of a complete success.

Thanks, as always, to the effort and expectations of the organizing teams and the collaboration of a vast number of colleagues from a wide range of countries. EurOMA (UE), POMS (USA) and JOMSA (Japan) are working hard and closely together to achieve this success and, I have no doubt, they'll manage it. I feel certain that a great number of OM researchers, professors and managers from all over the world will meet up once more, this time in Asia, not only to share their ideas and facilitate the scientific advance of our discipline, but also to benefit from this incomparable opportunity for networking with colleagues from all five continents. This networking will be aided by social activities planned before and during the Conference.

Prof. Jose A. D. Machuca
University of Seville, Spain
Co-Chair, the 3rd World Conference on Production and Operations Management

I look forward to seeing you in Tokyo!!!

P O M S

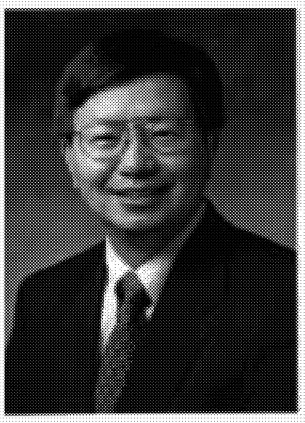
Greetings

Production and Operations Management Society (POMS)

On behalf of the Production and Operations Management Society, I want to congratulate the organizers of the Third World Conference on POM, Tokyo, 2008, for developing a very exciting plan for this important event. I also want to invite you to participate, as this conference promises to be a productive and enjoyable one.

With the globalization of the world's economy where production and operation activities are increasingly distributed all over the globe, it is very fitting that the 2008 World Conference on POM be held in Tokyo, one of the world's most cosmopolitan cities. Asia, in general, is also a major emerging geography in the global operations network. Industries now can have product design, supply sourcing, manufacturing, distribution, retailing and after-sales service located in different corners of the world. Coordinating such activities, exchanging information, and developing the necessary infrastructure, are all key issues that we in the POM community should explore and contribute. In his well known best-seller, Thomas Friedman described how "The World is Flat," as a result of globalization, advances in information technology, and the emergence of developing economies. How can companies perform well in this "flattened world?"

The World Conference in 2008 is a combined effort of multiple international societies, headed by our host in Japan. This is a great opportunity for us to share research findings, exchange ideas, share lessons, and most importantly, renew our existing professional friendships and build new ones. Collectively, we in the POM community can make a big impact to industry on how to manage the global operations network in a "flattened world."



Best wishes.

Prof. Hau Lee
Stanford University, USA
President, POMS
(2006-2007)

P O M S

Greetings

Production and Operations Management Society (POMS)

On behalf of the Production and Operations Management Society, it is with great pride, excitement and honor that I invite you to participate in the 3rd World Conference on Production and Operations Management to be held at Gakushuin University, Tokyo in Japan in August 2008. After two successful World Conferences, the first in Seville, Spain in 2000 and second in Cancun, Mexico in 2004, it is appropriate to move to the Eastern Hemisphere and organize a conference for POM academicians and professionals around the world to gather together and discuss the current and emerging issues, challenges and contributions in solving world's problems and making it a better place to live and enhance the quality if life.

Our profession and discipline of Production and Operations Management is more important today than it ever has been. The widespread use of internet and resulting telecommunications in organizations and the speed with which we can traverse through the world has created a global village. Therefore, there is an urgent and increased need for operations management, logistics, and supply chains in a global context to solve new and emerging problems. With most emerging global economies being in Asia at this time makes the selection of Japan as the venue of the 3rd World Conference on POM really timely and appropriate. The collaboration of the three prominent societies, Production and Operations Management Society (POMS), European Operations Management Society (EurOMA) and Japanese Operations Management and Strategy Association (JOMSA) to organize this world conference is a testimony to the harmonizing nature of the world affairs and business functions on one hand and the need to coordinate and cooperate on the other. This conference will feature speakers that will enable participants to learn the state-of-art developments in POM and also to exchange information on topics of vital importance and interest.

Professor Barbara Flynn of Kelly School of Business at Indiana University is POMS' representative to serve as the General Co-chair of this conference. She and her other two co-chairs, Professor Jose Machuca of University of Seville, Spain, and Professor Michiya Morita of Gakushuin University are hard at work to organize excellent program for us to learn and enjoy. I am thankful to them for undertaking this important task and invite you to take advantage of it by participating in this conference by way of attending the conference, presenting a paper, or serving as a session and/or track chair. I look forward to welcoming and seeing you at the 3rd World Conference at Gakushuin University, Tokyo in Japan in August 2008. I know it will be fun!!!

Prof.
University of Alabama, USA
President, POMS
(2007-2008)

Best wishes.

POMS Greetings from Co-Chair

Production and Operations Management Society (POMS)

It is very exciting to be serving as Co-Chair of the Third World Conference on POM 2008. This conference represents a unique collaboration between the best POM scholars from around the world. In addition to sharing our research findings, this venue will allow ample opportunity for networking and developing relationships with global POM scholars that will form the foundation for future POM research opportunities.

What better place to be located than in Tokyo, home to many of the advanced POM techniques that we study? We will be able to observe Japanese manufacturing first-hand through tours of cutting edge manufacturing facilities, as well as enjoy the surroundings in one of the world's largest and most dynamic cities.

At the heart of the Third World Conference on POM 2008 is collaboration. EurOMA and POMS will be joining hands with Japanese partners in the Japanese Operations Management and Strategy Association (JOMSA). Previous World Conferences on POM have been held in Seville, Spain and Cancun, Mexico. For the Third World Conference on POM, we are happy to be part of the inauguration of the new Japanese Operations Management and Strategy Association.

Please join us in Tokyo at beautiful Gakushuin University in August, 2008 for the Third World Conference on POM 2008.

I am looking forward to seeing you in Tokyo!

Prof. Barbara Flynn
Indiana University, USA
Co-Chair, the 3rd World Conference on Production and Operations Management

POM TOKYO 2008 Time Table

Time	Event	Location
Monday, August 4th, 2008		
15:00-17:00	Registration	W2-entrance lobby
Tuesday, August 5th, 2008		
8:00-17:00	Registration	W2-entrance lobby
8:30-9:45	Parallel Sessions	See program schedule
9:45-10:05	Coffee Break	Cafeteria at Hojin Kaikan
10:00-17:00	Exhibits Open	W2-304 and 306
10:05-1120	Parallel Sessions	See program schedule
11:20-12:40	Lunch	Cafeteria at Hojin Kaikan
12:40-13:30	Plenary Session	W2-201
13:40-14:55	Tutorial Session	W2-402
13:40-14:55	Parallel Sessions	See program schedule
15:00-16:30	Welcome Reception	Cafeteria at Hojin Kaikan
Wednesday, August 6th, 2008		
8:00-17:00	Registration	W2-entrance lobby
8:30-17:00	Exhibits Open	W2-304 and 306
8:30-9:45	Parallel Sessions	See program schedule
9:45-10:05	Coffee Break	Cafeteria at Hojin Kaikan
10:05-1120	Parallel Sessions	See program schedule
11:20-12:40	Lunch	Cafeteria at Hojin Kaikan
12:40-13:30	Plenary Session	W2-201
13:40-14:55	Tutorial Session	W2-401
13:40-14:55	Parallel Sessions	See program schedule
14:55-15:15	Coffee Break	Cafeteria at Hojin Kaikan
15:15-16:30	Parallel Sessions	See program schedule
Thursday, August 7th, 2008		
8:00-17:00	Registration	W2-entrance lobby
8:30-15:15	Exhibits Open	W2-304 and 306
8:30-9:45	Parallel Sessions	See program schedule
9:45-10:05	Coffee Break	Cafeteria at Hojin Kaikan
10:05-1120	Parallel Sessions	See program schedule
11:20-12:40	Lunch	Cafeteria at Hojin Kaikan
12:40-13:30	Plenary Session	W2-201
13:40-14:55	Tutorial Session	W2-301
13:40-14:55	Parallel Sessions	See program schedule
14:55-15:15	Coffee Break	Cafeteria at Hojin Kaikan
15:15-16:30	Parallel Sessions	See program schedule
18:30-20:30	Banquet*	Chinzan-so
Friday, August 8th, 2008		
7:00-14:00	Honda Motor Co. Factory Tour	Rendezvous point: Main gate
9:00-17:00	Yokogawa Electric Factory Tour	Rendezvous point: Main gate
9:30-16:00	Mori Seiki Co. Factory Tour	Rendezvous point: Main gate
10:00-16:00	JFE Steel Co. Factory Tour	Rendezvous point: Main gate
10:30-15:00	NTT Laboratory Tour	Rendezvous point: Main gate

* Complimentary bus service will be available at the main gate of Gakushuin University at 17:00.

POM Tokyo 2008 SESSION SCHEDULE

West-2 Building, Gakushuin University

Plenary Sessions (Building West 2 Room 201)

TP201 Tuesday 12:40-13:30 Architecting the Supply Chain for Value Creation by Hau L. Lee
WP201 Wednesday 12:40-13:30 Research in Service Operations – Challenges and Directions by Chris Voss
RP201 Thursday 12:40-13:30 Always Aiming Higher by Yukihisa Hirano

Room	TA Tuesday 8:30-9:45	TB Tuesday 10:05-11:20	TC Tuesday 13:40-14:55
W2-202	New product development 1	New product development 2	New product development 3
W2-301	Product-service systems 1	Product-service systems 2	Health care management 1
W2-302	invited-High Performance Manufacturing 1	invited-High Performance Manufacturing 2	invited-High Performance Manufacturing 3
W2-303	Empirical research on marketing interface	Marketing and operations interface	invited-Global transfer in East Asia
W2-305		Empirical research on HRM	HRM systems
W2-401	Empirical research on mfg strategy 1	e-operations 1	e-operations 2
W2-402	Empirical research on SCM 1	Empirical research on SCM 2	Tutorial: 7/11Japan: SCM and product innovation
W2-403	m-Sustainability	invited, m-Production & inventory management	m-Distribution systems design
W2-405		m-Jobshop scheduling	m-JIT
W2-501	S-Lean production	S-Quality management	S-Service OM
W2-503	m-Vehicle routing problem 1	m-SQC 1	m-SQC 2

Room	WA Wednesday 8:30-9:45	WB Wednesday 10:05-11:20	WC Wednesday 13:40-14:55	WD Wednesday 15:15-16:30
W2-202	Lean concept	Lean perspectives	Empirical research on quality management 1	Empirical research on quality management 2
W2-301	Health care management 2	invited-Service OM 1	invited-Service OM 2	invited-Service OM 3
W2-302	Case research on mfg strategy 1	Case research on mfg strategy 2	Manufacturing strategy framework	International OM 1
W2-303	Sustainability and social responsibility	Environment and suppliers	Green operations	Remanufacturing and recycling
W2-305	Cost management 1	Cost management 2	Performance measurement	Evaluating sourcing
W2-401	e-commerce 1	e-commerce 2	Tutorial: Using secondary data in OM research	Information systems 1
W2-402	Empirical research on SCM 3	SCM framework	Case research on SCM 1	Case research on SCM 2
W2-403	m-Sharing risk and return in SCM 1	m-Sharing risk and return in SCM 2	m-Evaluation of port/terminal operations	invited, m-SCM
W2-405	m-New scheduling model 1	m-New scheduling model 2	m-Scheduling algorithms	m-Capacity and inventory management
W2-501	S-Manufacturing technology	S-SCM 1	S-SCM 2	S-Purchasing management and strategy
W2-503	m-New approaches to QM & maintenance 1	m-New approaches to QM & maintenance 2	m-Vehicle routing problem 2	SCM practices

Room	RA Thursday 8:30-9:45	RB Thursday 10:05-11:20	RC Thursday 13:40-14:55	RD Thursday 15:15-16:30
W2-202	Perspectives on quality management 1	Perspectives on quality management 2	Lean production 1	Lean production 2
W2-301	Mass customization	invited-Finance and operations interface	Tutorial: Science TQM – Toyota's new strategy	
W2-302	International OM 2	International OM 3	Empirical research on mfg strategy 2	
W2-303	invited-Panel: RFID	RFID 1	RFID 2	
W2-305	Manufacturing technology and ergonomics	Teaching innovation in POM 1	Teaching innovation in POM 2	Teaching innovation in POM 3
W2-401	Information systems 2	Knowledge management 1	Knowledge management 2	Knowledge management 3
W2-402	invited-Disaster management	Case research on SCM 3		invited-Supply chain risk management
W2-403	m-Simulating SCM	m-SCM optimization 1	m-SCM optimization 2	m-SCM optimization 3
W2-405	m-Inventory policies	m-New formulations for inventory management	m-Production and inventory management	m-Batch sizing & inventory management
W2-501	S-Teaching innovation in POM	S-New product development & knowledge mgmt	S-Information systems and e-operations	S-Knowledge and technology management
W2-503	m-Project management	m-Forecasting	m-Pricing	m-Marketing and operations interface

m-: Sessions on mathematical modeling, S-: Sessions in Spanish, invited-: Sessions invited to organize,
Tutorial: Tutorial sessions, Panel: Panel discussion session, All others are contributed sessions.

Announcement on Technology

1. Session rooms:

Every session room has a computer and a projector. Please bring a USB memory device including your presentation file to the room. If you need to use your own computer, you will have to in advance check it in your session room by yourself. Because there are many speakers and the session schedule is tight, we strongly recommend you to bring your USB memory device instead of PC for your convenience. If you would like to use a Mac, you will also have to bring the conversion cable between your Mac and the VGA connector with mini D-sub 15 pins for yourself.

The available software is Microsoft Office 2003, i.e. you cannot use PowerPoint 2007 in your session room. If you are a user of PowerPoint 2007, you will have to make the conversion file by PowerPoint 2007 in advance. Note that converted files cannot always work on PowerPoint 2003. So, you will have to check it at the temporary Internet place to be made properly.

2. The temporary Internet place:

We will make available to registered participants 10 computers with the Internet access at the entrance lobby of West 2 (W2) Building. Those computers will be available from 8 am to 5 pm on Tuesday, Wednesday and Thursday. You are not allowed to drink or eat anything there. Web browsers and PowerPoint 2003 are available, although the software is in the Japanese version; the menu list and help manuals are shown in Japanese. You are not allowed to access wireless LANs in order to keep the security of our campus network.

If you have any questions on IT related matters, please let us know.

Computer Team Chiefs for POM TOKYO 2008
Yukari Shirota, Professor at Gakushuin University
Yutaka Takahashi, Professor at Senshu University

Organization of POM TOKYO 2008

Hosting Organizer

Japanese Operations Management and Strategy Association (JOMSA)

Co-Organizers

European Operations Management Association (EurOMA) and Production and Operations Management Society (POMS)

Conference Co-Chairs

General Co-Chair

Michiya Morita (Gakushuin University)

Co-Chairs

Prof. Jose A. D. Machuca (University of Seville)
Prof. Barbara B. Flynn (Indiana University)

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Manabu Yamaji	Aoyama Gakuin University

POM TOKYO 2008 Plenary Session: Prof. Hau Lee

Tuesday, August 5, 12:40-13:30, W2-201

Title: Architecting the Supply Chain for Value Creation

Abstract: Innovative companies have made use of their super-agile supply chains to create values - develop new products, enter new markets, offer new solutions, and build new customer intimacy. The result is higher market share, faster sales growth, greater profits, better customer service, and ultimately, superior shareholder value. In this talk, we examine how companies, especially those in Asia, have been able to architect their supply chains, integrating suppliers and customers, to create and realize such values. I will also discuss the potential research directions based on such innovations to help companies in emerging economies to win in the market place.

Hau L. Lee is the founding and current co-Director of the Stanford Global Supply Chain Management Forum, an industry-academic consortium to advance the theory and practice of global supply chain management. His areas of specialization include supply chain management, information technology, global logistics system design, inventory planning, and manufacturing strategy.

Biography:
Professor Lee has published widely, and as served on the editorial boards of many international journals. From 1997-2003, he was the Editor-in-Chief of Management Science. He received the Harold Lardner Prize for International Distinction in Operations Research, Canadian Operations Research Society, 2003. He was elected a Fellow of Manufacturing and Service Operations Management in 2001; a Fellow of Production and Operations Management Society in 2005; and a Fellow of INFORMS in 2005. In 2006-7, he was the President of the Production and Operations Management Society. His article, "The Triple-A Supply Chain," was the Second Place Winner of the McKinsey Award for the Best Paper in 2004 in the Harvard Business Review. In 2004, his co-authored paper in 1997, "Information Distortion in a Supply Chain: The Bullwhip Effect," was voted as one of the ten most influential papers in the history of Management Science.

He has consulted extensively for industry. He is a co-founder of several supply chain and price optimization software companies: Evant, DemandTec, SignalDemand and TrueDemand; and is on the board and advisory board of several logistics services and supply chain software companies.

Professor Lee obtained his B.Soc.Sc. degree in Economics and Statistics from the University of Hong Kong in 1974, his M.Sc. degree in Operational Research from the London School of Economics in 1975, and his M.S. and Ph.D. degrees in Operations Research from the Wharton School of the University of Pennsylvania in 1983. He was awarded an Honorary Doctor of Engineering degree by the Hong Kong University of Science and Technology in 2006.

POM TOKYO 2008 Plenary Session: Prof. Chris Voss

Wednesday, August 6, 12:40-13:30, W2-201

Title: Research in Service Operations - Challenges and Directions

Abstract: Services are increasingly becoming a focus of attention for researchers and practitioners in Operations Management. On the one hand OM practices such as Toyota production System are increasingly being applied is services, on the other manufacturing companies are increasingly seeing themselves delivering value through products and service. The services science initiative has highlighted the breadth of the scope of service operations. Professor Voss will review these exciting trends, discuss how research is informing this area and suggest future directions and challenges.

Biography:
Chris Voss is Professor of Operations and Technology Management at London Business School. He has a BSc in engineering from Imperial College London and an MSc and PhD from London Business School. At London Business School, Professor Voss has held many posts including Chair of the Operations and Technology Management Group and Deputy Dean.

Chris Voss has been one of the leading empirical researchers in Operations Management and has studied and written on a wide variety of topics including operations strategy, product and service innovation, lean production and service management. He has published in leading journals including Journal of Operations Management, International Journal of Operations and Production Management, Production and Operations Management, Journal of Service Research, Journal of Product Innovation Management, Research Policy and R&D Management. His current research focuses on service design and innovation.

Professor Voss is active on an international stage, he was co-founder and for many years chairman of the European Operations Management Association. He is a fellow and active member of the Production and Operations management Society, the Decision Science Institute and the British Academy of Management.

POM TOKYO 2008 Plenary Session: Mr. Yukihisa Hirano

Thursday, August 7, 12:40-13:30, W2-201

Title: Always Aiming Higher

Abstract: Central Japan International Airport, nicknamed Centrair, keeps the challenge to make the airport a truly competitive one. The purpose of this lecture is to introduce the Company challenging from the establishment to the present.

Biography:
Yukihisa Hirano is Chairman of Central Japan International Airport Co., Ltd, the airport operator of CHUBU Centrair International Airport that opened in February 2005 as the successor of Nagoya Airport. He was appointed as President & CEO on May 1st, 1998 to be in charge of the new airport project and headed the construction of CHUBU Centrair International Airport. Then, he has been responsible for the management of the airport. In June 2007, he assumed the new position of Chairman to support and work closely with Mr. Inaba, new President & CEO, for the further growth of our company.
Back in 1961, he joined Toyota Motor Corporation and engaged in production engineering. In 1989 he was named to head the newly created Toyota Motor Manufacturing (UK) Limited, where he supervised activities at a plant in UK that began producing Toyota passenger cars in 1992. He became a member of Toyota‘s Board of Directors in 1990.

Business career:

June 2007	became Chairman of Central Japan International Airport Company, Ltd.
May 1998	joined Central Japan International Airport Company, Ltd. as President and CEO
Jun 1997	promoted to President of Kanto Auto Works, Ltd.
Jun 1996	joined Kanto Auto Works, Ltd. as Vice President
Jun 1991	transferred to UK as President of Toyota Motor Manufacturing (UK) Limited
Sep 1990	promoted to Director, Member of the Board / General Manager of Europe Project Division
Dec 1989	promoted to President of Toyota Motor Manufacturing (UK) Limited
Feb 1988	promoted to General Manager, Machines and Tools Engineering Division
Apr 1961	joined Toyota Motor Company Limited (renamed to Toyota Motor Corporation in July, 1982)

Education:
Bachelor Degree of Precision Machinery Engineering at Faculty of Engineering, University of Tokyo

■Session Schedule

Session: New product development 1 Track: New Product Development Chair: Munehiko Itoh

TA202 Managing New Product Platform Development
Martin Skold, Stockholm School of Economics, Sweden
Christer Karlsson, Copenhagen Business School, Denmark

TA202 Is There an Array of Strategic NPD Best Practices and Implementation Patterns That Contributes to Companies' Innovation Performance in an Efficiency-Driven Economy? A Case Study in Chile and Argentina
Luis Domingo Dambra, Roberto Rafael Luchi, Santiago Gallino, Austral University, Argentina

TA202 Decision Making for Innovation under Uncertainty
Samir Dani, Neil Burns, Chris Backhouse, Loughborough University, United Kingdom

TA202 Innovation Impacts in the Digital Equipment Industries: Corporate Strategies to Avoid Commoditization
Munehiko Itoh, Kobe University, Japan

Session: Product-service systems 1 Track: Service Operations Management Chair: Joakim Wikner

TA301 Product-Service Systems: State-of-the-Art and Future Trends
Ashutosh Tiwari, Tim Baines, Howard Lightfoot, Essam Shehab, Mark Johnson, Steve Evans, Joe Peppard, Cranfield University, United Kingdom

TA301 Industrial Service Capability: Building a New Organisational Approach to Developing Service Business
Sanna-Kaisa Ilomaki, Maaria Nuutinen, VTT Technical Research Centre of Finland, Finland

TA301 Quotation Management and Customer Service
Yan-Chong Chan, City University of Hong Kong, Hong Kong

TA301 An Integrative Framework for Manufacturing and Service Activities
Joakim Wikner, Jonkoping University, Sweden

Session: High Performance Manufacturing 1 Track: Invited Chair: Edward James Flynn

TA302 Lean Bundles Implementation and Performance Improvement: An Empirical Analysis
Giorgia Dal Pont, Andrea Furlan, Andrea Vinelli, University of Padova, Italy

TA302 Manufacturing Strategy Alignment
Jan Olhager, Mattias Hallgren, Martin West, Linkoping University, Sweden

TA302 Looking for Effective Cross-Functional Integration Strategies
Virpi Turkulainen, Helsinki University of Technology, Finland

TA302 The Effect of Project Complexity on New Product Success: A Study of Three Mediators
Jeff Yeung, Xiande Zao, Zhiqiang Wang, The Chinese University of Hong Kong, Hong Kong

Session: Empirical research on marketing interface Track: Marketing and Operations Interface Chair: Taeho Park

TA303 Defining Marketing Practices of Small Family Business of First and Second Generation Management
Panagiotis Kyriazopoulos, Irene Samanta-Rounti, Graduate Technological Education Institute of Piraeus, Greece
Konstantinos Terzidis, Graduate Technological Education Institute of Kavala, Greece

TA303 Investigating the Interface between Service and Manufacturing Strategy in Mid-Range Manufacturing Firms
Geum Young Min, John Mills, University of Cambridge, United Kingdom

TA303 Business Development Strategies in Industrial SMEs
Mika Westerlund, Jaakko Aspara, Joel Hietanen, Helsinki School of Economics, Finland
Seppo Leminen, Laurea University of Applied Sciences, Finland
Erik Pontiskoski, Joonas Rokka, Helsinki School of Economics, Finland

TA303 An Empirical Study on the Manufacturing and Marketing Interface in a Supply Chain
Taeho Park, San Jose State University, U.S.A.
Changho Kim, Nam Seoul University, Korea
Minho Lee, Korea University, Korea
Ming Zhou, San Jose State University, U.S.A.

Session: Empirical research on manufacturing strategy 1 Track: Manufacturing Strategy Chair: Sakun Boon-itt

TA401 The Impact of Corporate Strategy on Operations Practice
Keah Choon Tan, University of Nevada, Las Vegas, U.S.A.
Tritos Laosirihongthong, Thammasat University, Thailand
Vijay R. Kannan, Utah State University, U.S.A.

TA401 Operation Strategies and Performance: Empirical Study of the Thai Automotive Industry
Tossapol Kiatcharoenpol, Srinakharinwirot University, Thailand
Kaewta Rohitratana, Tritos Laosirihongthong, Thammasat University, Thailand

TA401 The Relationships between Manufacturing Capabilities: An Empirical Analysis in Thai Automotive Industry
Sakun Boon-itt, Thammasat Business School, Thailand
Chee Yew Wong, University of Hull, United Kingdom

Session: Empirical research on SCM 1 Track: Supply Chain Management Chair: Elena Revilla

TA402 A Knowledge Based View of Supplier Integration in New Product Development: An Empirical Study
Daesik Hur, Sunil Hwang, Yonsei University, Korea

TA402 Collaborative Innovation in Supply Chains: An Empirical Evidence
Veronica Villena Martínez, Elena Revilla, Daisy Escobar, Instituto de Empresa, Spain
TA402 Disentangling Knowledge Integration in Collaborative Supply Chains: An Empirical Evidency
Elena Revilla, Veronica Villena, Daisy Escobar, Instituto de Empresa, Spain

Session: Modeling: Sustainability Track: m-Sustainable Management Chair: Manoj K. Malhotra

TA403 Disruption Risk Analysis of a Food Supply Chain
Monika Weishaeupl, Heidrun Rosic, Werner Jammernegg, Vienna University of Economics and Business Administration, Austria
TA403 Optimal Ordering Policy for Cascade Reuse in Closed-Loop Supply Chain
Yuki Oshita, Yasutaka Kainuma, Tokyo Metropolitan University, Japan
TA403 Models for Staffing and Worker Flexibility in Remanufacturing
Michael R. Galbreth, Manoj K. Malhotra, Patrick R. Philipoom, University of South Carolina, U.S.A.

Session: S-Lean production Track: Spanish Chair: Jordi Fortuny-Santos

TA501 Operations Consultancy: The Case of an Industrial Bakery
Constantino Garcia-Ramos, Jose-Angel Miguel-Davila, University of Leon, Spain
TA501 The Applicability of Value Stream Costing (VSC) in Early Stages of the Maturity Path Toward Lean Manufacturing. Comparison with Activity Based Costing (ABC): A Case Study.
Patxi Ruiz de Arbulo Lopez, University of the Basque Country, Spain
Jordi Fortuny-Santos, Technical University of Catalonia, Spain
TA501 Indicators for Lean Practices Implementation Initiatives at Process or Shop Floor Level
Jordi Olivella, Luis Cuatrecasas, Oriol Cuatrecasas, Jordi Fortuny-Santos, Technical University of Catalonia, Spain

Session: Modeling: Vehicle Routing Problem 1 Track: m-Logistics and Physical Distribution Chair: Rene B. M. de Koster

TA503 Distribution Systems Design with Two-Level Routing Considerations
Jenn-Rong Lin, Hsien-Chung Lei, National Taiwan Ocean University, Taiwan
TA503 Motorcycle-Courier Routing Problems in Urban Areas
Tsung-Sheng Chang, National Dong Hwa University, Taiwan
TA503 Travel Time versus Emissions in Time Dependent VRP: Are They Truly Enemies?
Ola Jabali, Tom van Woensel, A. G. de Kok, Eindhoven University of Technology, Netherlands
TA503 Sequencing Heuristics for Storing and Retrieving Unit-Loads in 3D Compact AS/RS
Yugang Yu, Rene B. M. de Koster, RSM Erasmus University, Netherlands

■TB Sessions: Tuesday, 10:05-11:20

Session: New product development 2 Track: New Product Development Chair: Roberto Rafael Luchi

TB202 A Decision Framework for Outsourcing of New Product Development
Jonas B. Rundquist, Halmstad University, Sweden

TB202 Commonality in Product Line Design under Horizontal Preference Structure
Kilsun Kim, Sogang University, Korea
Dilip Chhajed, University of Illinois at Urbana Champaign, U.S.A.

TB202 A Study of Cognitive Structure of the Management Issues at the Small Businesses Targeting the Business in the New Field
Yoshitoku Fukunaga, Nakamura Gakuen University, Japan

TB202 Leveraged Growth: North-South Technological Alliances and Innovation in Small and Medium Size Enterprises (SMEs): A Case Study in Emergent Economies.
Roberto Rafael Luchi, Luis Domingo Dambra, Alberto Ariel Llorente, Austral University, Argentina

Session: Product-service systems 2 Track: Service Operations Management Chair: Mark R. Johnson

TB301 Implementing a Measurement System for Product-Services
Ingo Christian Lange, Oliver Schneider, ETH Zurich, Switzerland
Gil Fischer, ABB Ltd., Switzerland

TB301 Towards a Better Understanding of the Risks of Servitization
Richard Mark Greenough, Marwan Saleh Alomair, Cranfield University, United Kingdom

TB301 Supply Networks for Product-Service Offerings
Mark R. Johnson, Marko Bastl, Tim Baines, Steve Evans, Rick Greenough, Howard Lightfoot, Andy Neely, Ashutosh Tiwari, Cranfield University, United Kingdom

Session: High Performance Manufacturing 2 Track: Invited Chair: Edward James Flynn

TB302 The Impact of Supply Chain Complexity on Manufacturing Plant Performance
Cecil Bozarth, Don Warsing, North Carolina State University, U.S.A.
Barbara B. Flynn, E. James Flynn, Indiana University, U.S.A.

TB302 Congruency between Manufacturing Strategy and Technology in the Automotive Component Sector
Cesar Humberto Ortega Jimenez, Universidad Nacional Autonoma de Honduras, Honduras
Jose Antonio Dominguez Machuca, Pedro Garrido Vega, Jose Luis Perez Diez de Rios, Universidad de Sevilla, Spain

TB302 Strategic Management Cycle as an Underlying Process for Building an Aligned Linkage of Practices
Michiya Morita, Gakushuin University, Japan
Edward James Flynn, Indiana University, U.S.A., **Shigemi Ochiai,** Jonquil Consulting Inc., Japan

Session: Marketing and operations interface Track: Marketing and Operations Interface Chair: Hassanali Aghajani

TB303 Product Architecture of Mobile Phone and Product Development: Case Illustrations from Korean Companies
Youngwon Park, University of Tokyo, Japan
Gyewan Moon, Kyungpook National University, Korea
Paul Hong, University of Toledo, U.S.A.
Jaekwon Choi, Kyungpook National University, Korea

TB303 Transforming from Materials Provider to Project Marketer in International Construction Industry
Erik Pöntiskoski, Joel Hietanen, Joonas Rokka, Jaakko Aspara, Mika Westerlund, Helsinki School of Economics, Finland

TB303 Estimation of Hand-Values on Men's Suit Clothes Using Image Data
Hiroki Ishikura, Osaka Gakuin University, Japan

TB303 A Prediction Market System for Demand Forecasting with Division and Merger of Fixed-Interval Prediction Securities
Hajime Mizuyama, Yuto Maeda, Kyoto University, Japan

TB303 Coordinating Manufacturing and Marketing Sections in International Firms
Hassanali Aghajani, University of Mazandaran, Iran

Session: Empirical research on HRM Track: Human Resource Management Chair: Constantinos Dimitrios Cantzos

TB305 Presenteeism at Work: How much Does It Cost? An Exploratory Study in Singapore
Hesan A. Quazi, Nanyang Technological University, Singapore

TB305 Feel Free to Feel Comfortable - An Empirical Analysis of Ergonomics in Manufacturing
Jorn-Henrik Thun, Christian B. Lehr, Max Bierwirth, Mannheim University, Germany

TB305 Worker Conscientiousness and Continuous Improvement: Key Factor Relation for Firms
Ricardo Mateo, Hugo Cruz, University of Navarra, Spain

TB305 An Empirical Study of Operations Management in Greek Industry
Constantinos Dimitrios Cantzos, Technological Education Institute of Piraeus, Greece
Andreas Panagiotis Kakouris, University of the Aegean, Greece

Session: e-operations 1 Track: Information Systems and e-Operations Chair: M. Isabel Alonso Magdaleno

TB401 The Impact of Global Environment on B2B Relationships in Greece
Irene Samanta-Rounti, Panagiotis Kyriazopoulos, Graduate Technological Education Institute of Piraeus, Greece
Sandra Connor, Nondas Pitticas, University of the West of Scotland, United Kingdom

TB401 A Method for Analyzing and Improving Clerical Work from the Viewpoint of Information Items
Hirotake Yamashita, Chubu University, Japan
Hirokazu Kono, Keio University, Japan

Yasuhide Ishida, Nippon Koa Insurance Co., Japan, **Yasuchika Wakayama,** Breakpoint Co., Ltd, Japan

TB401 Visualisation of Complex Business System Environment and Operations Management in Networked Production
Janne Hietala, Arcusys Ltd., Finland
Jyri Potry, North Karelia University of Applied Sciences, Finland
Matti Kurki, Kurki Consulting Ltd., Finland

TB401 On-Line Services Production in Municipalities: Do They Have Impact on Citizen Welfare?
Jesús García García, M. Isabel Alonso Magdaleno, University of Oviedo, Spain

Session: Empirical research on SCM 2 Track: Supply Chain Management Chair: Soonhong Min

TB402 Quantifying the Lean Value Network System: The Lean Metrics of Co-Investment and Co-Innovation on Organisation Level
Wouter W. A. Beelaerts van Blokland, Mikołaj A. Fiksiński, Sakyi O. B. Amoa, Sicco C. Santema, Delft University of Technology, Netherlands

TB402 The Effect of Exchange Arrangements on Supplier Commitment
Christina Wong, Mike Lai, T. C. E. Cheng, Venue Lun, Daniel Ng, The Hong Kong Polytechnic University, Hong Kong

TB402 Relationship and Practices in a Shipbuilding Supply Network
Adriane Lopes Queiroz, Marcos Oliveira Pinto, USP-POLI, Brazil
Marcos Mendes Primo, Universidade Federal de Pernambuco, Brazil
Susana Farias Pereira, FGV-EAESP, Brazil

TB402 Managing Long-Term Partnerships as a Core Capability of Supply Chain Management
Soonhong Min, University of Oklahoma, U.S.A.
Jeong Eun Park, Ewha Womans University, Korea, **Sungmin Ryu,** Sungkyunkwan University, Korea

Session: Modeling: Production and inventory management Track: Invited Chair: Qing Li

TB403 Strategic Capacity Rationing when Customers Learn
Qian Liu, Hong Kong University of Science and Technology, Hong Kong
Garrett van Ryzin, Columbia University, U.S.A.

TB403 Optimal Policies for a Two-Product Inventory System under a Flexible Substitution Scheme
He Xu, Hua Zhong University of Science and Technology, China
David Yao, Columbia University, U.S.A., **Shaohui Zheng,** Hong Kong University of Science and Technology, Hong Kong

TB403 Timing and Sequencing Order Fulfillment of Capital Goods
Qing Li, Hong Kong University of Science and Technology, Hong Kong, **Qi-Ming He,** Dalhousie University, Canada

Session: Modeling: Jobshop scheduling Track: m-Scheduling Chair: Norbert C. E. Trautmann

TB405 Solving the Job-Shop Scheduling Problem with an OSH Method Based on Local Search and Valid Inequalities
Helena R. Lourenco, Universitat Pompeu Fabra, Spain, **Susana Fernandes,** Universidade do Algarve, Spain

TB405 Solving an Open Jobshop Scheduling Problem by a Multi-Objective Immune Algorithm
Hadi Panahi, Reza Tavakkoli-Moghaddam, S. A. Torabi, University of Tehran, Iran

TB405 Batching and Scheduling to Minimize Energy Consumption
Saral Mukherjee, Indian Institute of Management, Ahmedabad, India

TB405 A Decomposition Approach to Short-Term Scheduling of Multi-Purpose Batch Plants
Norbert C. E. Trautmann, University of Bern, Switzerland
Rafael Fink, Hanno Sagebiel, Christoph Schwindt, Technical University of Clausthal, Switzerland

Session: S-Quality management Track: Spanish Chair: Javier Merin

TB501 The Effectiveness of TQM: The Key Role of Organisational Learning in Small Businesses
Daniel Jiménez-Jiménez, Micaela Martínez-Costa, University of Murcia, Spain

TB501 Total Quality Management, Knowledge Management and Market Orientation as Determinants of Innovation and Performance.
Daniel Jiménez-Jiménez, Micaela Martínez-Costa, University of Murcia, Spain

TB501 E-Quality Management: Dimensions of Excellence in the Pre-Sale and the Post-Sale Phase
Lucia Melian-Alzola, Victor I. Padron-Robaina, Universidad de Las Palmas de Gran Canaria, Spain

TB501 Measuring Employee Satisfaction: Practices in Spanish and Portuguese Companies
Arturo Jose Fernandez-Gonzalez, Jose Carlos Prado Prado, University of Vigo, Spain

TB501 5-S: Contextual Factors and Impact on Performance
Javier Merino-Diaz de Cerio, Alberto Bayo–Moriones, Alejandro Bello–Pintado, Public University of Navarra, Spain

Session: Modeling: SQC 1 Track: m-Statistical Quality Control Chair: Linguo Gong

TB503 The Effect of Autocorrelation (Stationary Data) on the Integrated Statistical Process Control System
Karin Kandananond, Rajabhat University Valaya-Alongkorn, Thailand

TB503 Repetitive Testing of Multiple Products
Jie Ding, Rider University, U.S.A.
Betsy S. Greenberg, University of Texas at Austin, U.S.A., **Hirofumi Matsuo,** Kobe University, Japan

TB503 An Interactive Repetitive Chip Testing Model
Linguo Gong, Jie Ding, Rider University, U.S.A.

■TC Sessions: Tuesday, 13:40-14:55

Session: New product development 3 Track: New Product Development Chair: Masaharu Ota

TC202 Virtual Pilot Factory (VPF) - A New Model for New Product Development Organization
Tiina K. Valjakka, Ismo Ruohomaki, VTT, Finland

TC202 The Diffusion of Innovations and Communication Methods - An Analysis of Diffusion Mechanism of Innovations in the Marketplace
Hideaki Kitanaka, Takushoku University, Japan

TC202 Organisational Structures to Support Innovation: How Do Companies Decide?
Adriana Marotti de Mello, Mario Sergio Salerno, Roberto Marx, Polytechnic School of University of Sao Paulo, Brazil

TC202 Development of Innovation Methodology for Japanese Enterprise Based on Innovation Capability
Masaharu Ota, Osaka City University, Japan

Session: Health care management 1 Track: Health care management Chair: Angel Diaz

TC301 Customer Value and Lean Operations in Self Care
Jannis Angelis, Warwick Business School, United Kingdom
Cameron Watt, Mairi McKintyre, WMG, United Kingdom

TC301 Computer Simulation for Reengineering the Process of Medical Supplies Distribution to Hospitals
Sung J. Shim, Seton Hall University, U.S.A.
Arun Kumar, Nanyang Technological University, Singapore

TC301 The Evolution of the Hospital Accreditation System in Catalonia (Spain): A Review of 26 Years of Experience
Jaume S. Ribera, University of Navarra, Spain
Ma Lluisa Lopez, Rafael Manzanera, Generalitat de Catalunya, Spain

TC301 The McDonald's of Health Organizations: Lean Practices at Aravind
Angel Diaz, Instituto de Empresa, Spain
Stephan Pahls, Dept. of International Development, Yemen
Juan Pons, Motorola
Luis Solis, Instituto de Empresa, Spain

Session: High Performance Manufacturing 3 Track: Invited Chair: Edward James Flynn

TC302 IFM (Interacting Field Model) as a Model of Communication - An Application to the Production and Operations Management Studies -
Atsuko Ebine, Surugadai University, Japan

TC302 Building Capabilities in Manufacturing Process Innovations
Kimberly A. Bates, Trent University, Canada
E. James Flynn, Indiana University, U.S.A.

TC302 An Empirical Analysis of Cellular Manufacturing
Jorn-Henrik Thun, Peter M. Milling, Mannheim University, Germany

Session: Global transfer in East Asia Track: Invited Chair: Keiju Matsushima

TC303 The Overview of the Global Transfer
Keiju Matsushima, Kim Shouko, Sadayoshi Maeda, Musashi University, Japan
Yoko Ogushi, Niitaga University, Japan
Masakazu Kozakai, Tamagawa University, Japan
Dai Isobe, Osaka Gas Information System Research Institute Co., Ltd., Japan

TC303 The Methodology of our Empirical Study in Global Transfer of Management Practice
Dai Isobe, Ogis Research Institute Co. Ltd., U.S.A.

TC303 Make Delay in Investing the Most Advanced IT in Japan! - Global Transferring IT with Sobering Judgment -
Yoko Ogushi, Niigata University, Japan

TC303 The Study of the Transfer for Managerial Accounting Techniques under Globalization: Focusing on the Comparison of EVA between Japan and Korea
Shoko Kim, Sadayoshi Maeda, Musashi University, Japan

TC303 What Enables Strategic Learning with Strategy Maps? -Global Transferring of BSC-
Masakazu Kozakai, Tamagawa University, Japan

Session: HRM systems Track: Human Resource Management Chair: Shinji Shimizu

TC305 Combinatory vs. Individual Components of Work-Life Balance: Identifying Profiles & Employee Sub-Groups
Phang Riyang, Hesan A. Quazi, Nanynag Technological University, Singapore

TC305 Human Resource Education Strategy for Revitalizing the Manufacturing Culture through Creating the Service Engineering Discipline in Japan
Hiroyasu Ito, Shinji Shimizu, Sophia University, Japan

TC305 A Flexible System of Human Resources in Electronic Industries
Mojtaba Tabari, Toraj Mojibi, Islamic Azad University, Iran
Reza Tavakkoli-Moghaddam, University of Tehran, Iran

Session: e-operations 2 Track: Information Systems and e-Operations Chair: Joao Mario Csillag

TC401 Cue Dependent Systems Intelligence for Integrated e-Operations: A Framework for Risk-Based Decision Support and Production Loss Management Based on a Case from North Sea
Jawad Raza, Jayantha Prasanna Liyanage, University of Stavanger, Norway

TC401 Internet Customer Interaction
Alexandre Reis Graeml, Centro Universitario Positivo, Brazil
Marie Anne Macadar, Universidade Estadual do Rio Grande do Sul, Brazil
Joao Mario Csillag, Escola de Administracao de Empresas de Sao Paulo, Brazil

TC401 The Internet's Role in the Integration of Manufacturing Organizations' Supply Chains in Brazil
Alexandre Reis Graeml, Centro Universitario Positivo, Brazil
Zandra Balbinot, Centro Universitario Positivo, Brazil
Joao Mario Csillag, Escola de Administracao de Empresas de Sao Paulo, Brazil

Session: Seven-Eleven Japan: SCM and Product Innovation Track: Tutorial Chair: Hirofumi Matsuo

TC402 Seven-Eleven Japan: SCM and Product Innovation
Hirofumi Matsuo, Kobe University, Japan

Session: Modeling: Distribution systems design Track: m-Logistics and Physical Distribution Chair: Kuancheng Huang

TC403 Modeling a Hybrid DEA Method for a Dynamic Multi-Commodity Capacitated Facility Location Problem
Reza Tavakkoli-Moghaddam, University of Tehran, Iran
Hooman Malekly, Islamic Azad University - South Tehran Branch, Iran
Saber Saati, Islamic Azad University - North Tehran Branch, Iran

TC403 Determination of Distribution Center Locations for Thai Rubber in China
Karndee Prichanont, Thammasat University, Thailand

TC403 Location Analysis of Distribution Centers: A Case Study of Kinmen Kaoliang Liquor Inc.
Kuancheng Huang, Ying-Hsuann Chen, National Chiao Tung University, Taiwan

Session: Modeling: JIT Track: m-JIT & Lean Production Chair: Ali Ardalan

TC405 Managing an Assembly Production Process with Kanban, CONWIP or Base-stock
Yaghoub Khojasteh-Ghamari, Ryo Sato, University of Tsukuba, Japan

TC405 Analysis of an Adaptive Electronic Kanban System
Ilkka A. Kouri, Juha-Matti Lehtonen, Tampere University of Technology, Finland

TC405 A Heuristic to Enhance Performance of Kanban-Controlled JIT Job Shops
Ali Ardalan, Old Dominion University, U.S.A.
Rafael Diaz, Virginia Modeling and Analysis Simulation Center, U.S.A.

TC405 Capacity Efficiency of Domestic Airports in Taiwan Using Three-Stage DEA Approach
Ming-Miin Yu, Hui-Yi Wei, National Taiwan Ocean University, Taiwan

Session: S-Service OM Track: Spanish Chair: Antonio Pelaez

TC501 Configurations and Strategic Choices in the Operations Strategy: An Application to the Hotel Industry
Tomas F. Espino Rodriguez, Victor Padron Robaina, University of Las Palmas de Gran Canaria, Spain

TC501 Service Quality in Banking: The Spanish Case
Jose-Angel Miguel-Davila, Marcela Florez Romero, Constantino Garcia Ramos, University of Leon, Spain

TC501 Quality Management Systems in Hospitality: An Empirical Analysis in Spanish Hotel Chains
M. Mar Alonso Almeida, José Miguel Rodríguez Antón, Luis Rubio Andrada, Autonomus University of Madrid, Spain

TC501 Managing Immigration at Port Operations: New Dynamic Method on the Application of M/M/S Waiting Lines
Antonio Pelaez, Jose Juan Nebro, Malaga University, Spain

Session: Modeling: SQC 2 Track: m-Statistical Quality Control Chair: Xia Pan

TC503 The Effect of Gauge Measurement Errors on Multivariate Process Capability
Davood Shishebori, Ali Zeinal Hamadani, Isfahan University of Technology, Iran

TC503 Study of the Preventive Maintenance Scheduling Problem for Power Plants by Means of a Decomposition Technique: An Empirical Example of the Spanish Power System
Salvador Perez Canto, University of Malaga, Spain

TC503 Planning Accelerated Life Tests under Interval Censoring with Random Removals
Chunyan Yang, City University of Hong Kong, Hong Kong
Aixia Fan, Yunnan University, China
Siu-Keung Tse, City University of Hong Kong, Hong Kong

TC503 Improved Quality Control Chart Construction by Efficient Simulation via the Golden Ratio Search
Xia Pan, Macau University of Science and Technology, Macau
Jeffrey E. Jarrett, University of Rhode Island, U.S.A.

■WA Sessions: Wednesday, 8:30-9:45

Session: Lean concept Track: JIT & Lean Production Chair: Nico J. Vandaele

WA202 The Sustainability of Continuous Process Improvement in Local Public Administration: A study of Spanish Municipalities
Manuel Suarez-Barraza, Juan Ramis-Pujol, University Ramon Llull, Spain

WA202 Settlement Theory for Improving Productivity and Shortening Lead-Time
Yick Hin Hung, Leon Y. O. Li, T. C. E. Cheng, The Hong Kong Polytechnic University, Hong Kong

WA202 A Dynamic Theory of Lean Practice
Nico J. Vandaele, Inneke Van Nieuwenhuyse, Katholieke Universiteit Leuven, Belgium

Session: Health care management 2 Track: Health care management Chair: Jaume S. Ribera

WA301 A Study of Co-Relationship between the KPI Performance and the Penetration by Using the Balanced Score Card in Medical Industry - A Case of Saiseikai Otaru Hospital -
Hajime Itoh, Otaru University of Commerce, Japan
Junichiro Fukuchi, Gakushuin University, Japan

WA301 E-Commerce in Australia's Public Hospital Supply Chain: Exploring the Impacts on Buyer-Supplier Relationships
Peter O'Neill, Monash University, Australia
Annibal Jose Scavarda, Brigham Young University, U.S.A.
John Michael Hynes, Royal Melbourne Institute of Technology University, Australia

WA301 Learning Points in the Process of Implementation of a Hospital Accreditation System in Catalonia (Spain)
Jaume S. Ribera, University of Navarra, Spain
Lluisa Lopez, Rafael Manzanera, Generalitat de Catalunya, Spain

Session: Case research on manufacturing strategy 1 Track: Manufacturing Strategy Chair: Peter Ralph Knittig

WA302 Modularity of Flat Panel Display TV and Operation Management Practices: A Case Study of LG Electronics
Youngwon Park, Junjiro Shintaku, Junichi Tomita, University of Tokyo, Japan
Paul Hong, University of Toledo, U.S.A.
Gyewan Moon, Kyungpook National University, Korea

WA302 Manufacturing Retention in High Cost Environments
Louis Brennan, Trinity College, Ireland

WA302 Strategic and Operational Effectiveness Considerations for the Extended Enterprise: A Multi-Case Approach
Christos Braziotis, James Tannock, Nottingham University Business School, United Kingdom

WA302 The Possibility of Reinvention and Becoming a Global Player for the Russian Automobile Industry
Peter Ralph Knittig, Shinji Shimizu, Sophia University, Japan

Session: Sustainability and social responsibility Track: Sustainable Management Chair: Linda C. Angell

WA303 A Study of Supply Chain Sustainability in the Apparel Sector
Kamrul Ahsan, Auckland University of Technology, New Zealand
Abdullahil Azeem, Bangladesh University of Engineering and Technology, Bangladesh

WA303 Sustainability Risk vs. Manufacturing Excellence: Managing Future Risk under Complex Conditions
Jayantha P. Liyanage, University of Stavanger, Norway

WA303 Well-being and Operational Competitiveness
Linda C. Angell, American University of Sharjah, U.A.E.

Session: Cost management 1 Track: Cost Management Chair: Patcharaporn Yanpirat

WA305 The Effect of Competitive Strategy, Task Uncertainty, and Organization Structure on the Performance of Management Accounting System (MAS) of Manufacturing Industry
Dauw Song Zhu, National Dong Hwa University, Taiwan
Shaio Yan Huang, Feng Chia University, Taiwan
Cheng Tsung Lu, Wen Lin Young, Providence University, U.S.A,

WA305 Customer Delight - at What Cost?
K. Venkata Subramanian, Sachin S. Vernekar, Bharti Vidyiapeeth's Institute of Management and Research, India

WA305 Model for Simultaneous Measurement of Production Costs at the Highly Automated Lines
Slavko Dolinsek, Matjaz Novak, University of Primorska, Slovenia
Sasa Sokolic, Metronik d.o.o.

WA305 Enhancing Product Costing by Service Cost Reciprocal Flows Consideration in the Activity-Based Costing System
Patcharaporn Yanpirat, Sansanee Supapa, Wijittra Puatatsanon, Kasetsart University, Thailand

Session: e-commerce 1 Track: Information Systems and e-Operations Chair: Rakesh Narain

WA401 Electronic Markets, Data Access and Collaboration: Relative Value to Performance in Firm Operations
Damien James Power, Prakash Singh, Victoria Hanna, Samson Daniel, University of Melbourne, Australia

WA401 e-Procurement in the Manufacturing Industry: Perceptions of Brazilian Managers
Alexandre Reis Graeml, Centro Universitario Positivo, Brazil
Marie Anne Macadar, Universidade Estadual do Rio Grande do Sul, Brazil
Joao Mario Csillag, Escola de Administracao de Empresas de Sao Paulo, Brazil

WA401 The Development of Manufacturing Information Portal for SMEs in Traditional Industries
Jukka Hemila, VTT Technical Research Centre of Finland, Finland
Sebastien Kicin, CAS Software AG

WA401 A Survey on Status of E-Procurement in Small and Medium Enterprises of India

Rakesh Narain, Abdul Samee P., MNNIT, India

Session: Empirical research on SCM 3 Track: Supply Chain Management Chair: Soumen Ghosh

WA402 The Right Supply Chain Strategy Can Still Make the Difference: How Italian Textile Apparel SMEs Quest for Competitiveness
Laura Benedetti, Societa per gli Studi di Settore, Italy
Arnaldo Camuffo, Bocconi University, Italy
Roberto Pozzana, Andrea Vinelli, University of Padova, Italy

WA402 Supply Chain Capability as a Determinant of Foreign Direct Investment
Arshad Alam, Prabir K. Bagchi, George Washington University, U.S.A.

WA402 Evaluating the Congruence between the Competitive Priorities of a Firm and its Outsourcing Drivers
Soumen Ghosh, Georgia Institute of Technology, U.S.A.
James Kroes, University of Rhode Island, U.S.A.

Session: Modeling: Sharing risk and return in SCM 1 Track: m-Supply Chain Management Chair: Albert Y. Ha

WA403 Development of Negotiation Process for Bargaining Contract between Maker and Retailer Using Game-Theoretical Approach
Seung-Jin Ryu, Takuto Sunouchi, Kagehisa Nakayama, Hisashi Onari, Waseda University, Japan

WA403 Channel Coordination and Volume Discounts with VMI
Wen li Wang, Haiyan Wang, Southeast University, China

WA403 Managing Supply Chain: VMI and Option Contract
Alejandra Gomez-Padilla, University of Guadalajara, Mexico
Tsutomu Mishina, Akita Prefectural University, Japan

WA403 Revenue Sharing Contracts in a Supply Chain with Uncontractible Actions
Albert Y. Ha, Shilu Tong, Hong Kong University of Science and Technology, Hong Kong

Session: Modeling: New scheduling model 1 Track: m-Scheduling Chair: Jirarat Teeravaraprug

WA405 Cross-Training Workers in Dual Resource Constrained Systems with Heterogeneous Processing Times
Gerard Gaalman, University of Groningen, Netherlands

WA405 The Effects of Safety Buffers and Schedule Optimization against Supply Uncertainties
Tomohiro Azuma, Kanto Gakuen University, Japan

WA405 Hospital Admission Planning to Optimize Major Resources Utilization under Uncertainty
Nico Dellaert, Eindhoven University of Technology, Netherlands
Jully Jeunet, Universite Paris Dauphine, France

WA405 Part Family Determination: A Case Study of a Paper Manufacturing Company
Jirarat Teeravaraprug, Anchiree Jariyatharasit, Thammasat University, Thailand

Session: S-Manufacturing technology Track: Spanish Chair: Cesar Humberto Ortega Jimenez

WA501 Examining the Effects of Integrated Manufacturing on Job Characteristics
Alberto Bayo–Moriones, Alejandro Bello–Pintado, Javier Merino-Diaz de Cerio, Public University of Navarra, Spain

WA501 A Look at Technology and Manufacturing Strategy in the Automotive Supplier Sector
Cesar Humberto Ortega Jimenez, Universidad Nacional Autonoma de Honduras, Honduras
Jose Antonio Dominguez Machuca, Pedro Garrido Vega, Jose Luis Perez Diez de Rios, Universidad de Sevilla, Spain

WA501 Offsetting Low Performance by Appropriate Levels of Interaction between Technology and Manufacturing Strategy
Cesar Humberto Ortega Jimenez, Universidad Nacional Autonoma de Honduras, Honduras
Pedro Garrido Vega, Jose Antonio Dominguez Machuca, Universidad de Sevilla, Spain

Session: Modeling: New approaches to QM and maintenance 1 Track: m-Quality Management and Six Sigma Chair: Richard Mark Greenough

WA503 Establishment of Bolt Tightening Simulation System for Automotive Industry: Application of the Highly Reliable CAE Model
Toshiya Ueno, Manabu Yamaji, Aoyama Gakuin University, Japan
Hiroe Tsubaki, University of Tsukuba, Japan
Kakuro Amasaka, Aoyama Gakuin University, Japan

WA503 Intelectualization and Accuracy Improvement for the Development of Highly Reliable CAE Software
Takahito Tanabe, Mathematical Systems Inc., Japan
Toshiharu Mitsuhashi, Advancesoft Inc., Japan
Manabu Yamaji, Kakuro Amasaka, Aoyama Gakuin University, Japan

WA503 Optimal Pit Strategy of How Many Stops To Make and When To Make Them for a Formula 1 Team
Ilkay Gultas, Istanbul Kultur University, Turkey

WA503 State-of-the-art in Integrated Vehicle Health Management
Ornella Benedettini, University of Bari, Italy
Timothy S. Baines, Howard W. Lightfoot, Richard Mark Greenough, Cranfield University, United Kingdom

■WB Sessions: Wednesday, 10:05-11:20

Session: Lean perspectives Track: JIT & Lean Production Chair: Norman Faull

WB202 Thoughts on Kaizen and its Evolution: Three Different Perspectives
Manuel Suarez-Barraza, Juan Ramis-Pujol, University Ramon Llull, Spain
Laoucine Kerbache, HEC Paris, France

WB202 Proposal and Demonstration of V-MICS-VM through the Development of Intelligence Operators
Hirohisa Sakai, Toyota Motor Corporation, Japan
Kakuro Amasaka, Aoyama Gakuin University, Japan

WB202 Evolution of TPS Fundamentals Utilizing New JIT Strategy - Proposal and Validity of Advanced TPS at Toyota -
Kakuro Amasaka, Aoyama Gakuin University, Japan
Hirohisa Sakai, Toyota Motor Corporation, Japan

WB202 Scheduling with the Glenday Sieve
Norman Faull, University of Cape Town, South Africa

Session: Service OM 1 Track: Invited Chair: Philip Andrew Smart and Harry Maddern

WB301 Seeking Balance: Designing High-Quality Service Supply Chain
Henk Akkermans, Tilburg University, Netherlands
Paulo Gonçalvez, M.I.T., U.S.A.
Willem van Oppen, KPN BV

WB301 Quality Perceptions and Practices in Logistics Services
Wolfgang Kersten, Jan Koch, Hamburg University of Technology, Germany

WB301 A Framework for Assessing the Impacts of Customer Contributions in Service Delivery
Marlene Amorim, Alejandro Lago, Philip Moscoso, University of Navarra, Spain

Session: Case research on manufacturing strategy 2 Track: Manufacturing Strategy Chair: Alan Friis

WB302 Manufacturing Strategy Implementation: Findings from Multiple Case Studies Analysis
Tritos Laosirihongthong, Thammasat University, Thailand
Lynn Lim, Roehampton University, United Kingdom
Pongsvas Svasti, Thammasat University, Thailand

WB302 An Integrated Framework for Servitized Operation Strategy
Essam M. Shehab, *Tim Baines, Howard Lightfoot, Ashutosh Tiwari, Mark Johnson, Joe Peppard, Cranfield University, United Kingdom

WB302 Theory Building: Relating Variation, Uncertainty, Buffering Mechanisms and Trade-Offs
Roy Stratton, Nottingham Trent University, United Kingdom

WB302 Low-Volume/High-Mix Electronic Manufacturing Service Provision: Challenges for Implementation and Performance Measurement
Alan Friis, Technical University of Denmark, Denmark
Kristian Voldby Olsen, Fritz Hansen
Lasse Lindbjerg, Kromann Reumert
Lars Thielsen, Radio Frequency Systems
Zoran Perunovic, Technical University of Denmark, Denmark

Session: Environment and suppliers Track: Environmental Management Chair: Mihalis Giannakis

WB303 A Study of Environmental Purchasing Practices in Electronics Industries
Xue Shi, Anh Chi Phan, Ayman Bahjat Abdallah, Yoshiki Matsui, Yokohama National University, Japan

WB303 Environmental SCM: Extending Sustainable Practices to Suppliers
Cristina Gimenez, Universitat Ramon, Spain
Rudolf O. Large, Stuttgart University, Germany
Enric Segarra, Universitat Ramon Llull, Spain

WB303 Sustainable Competitiveness in Multinational Supply Chains
Mihalis Giannakis, Warwick University, United Kingdom

Session: Cost management 2 Track: Cost Management Chair: Hirokazu Kono

WB305 Lean Accounting System Design for a Real Life Cellular Manufacturing Environment
Serdar Baysan, Mehmet Bulent Durmusoglu, Istanbul Technical University, Turkey

WB305 Cost-Time Analysis for 3-D Microstructure Fabrication Using Multi-Film Thickness Mask and Current Techniques
Nithi Atthi, National Electronics and Computer Technology Center, Thailand
Chuckaphun Aramphongphun, Patcharaporn Yanpirat, Peerayuth Charnsetthikul, Kasetsart University, Thailand
Jirawat Jantawong, Wutthinan Jeamsaksiri, Charndet Hruanun, Amporn Poyai, National Electronics and Computer Technology Center, Thailand

WB305 Optimizing Permanent and Temporary Workforce under a Budget Constraint
Nico Dellaert, Eindhoven University of Technology, Netherlands
Jully Jeunet, Universite Paris Dauphine, France
Gergely Mincsovics, Eindhoven University of Technology, Netherlands

WB305 Profit and Safety Analysis of Multiple Product Alternatives
Tadahiro Mizumachi, Seikei University, Japan
Hirokazu Kono, Keio University, Japan

Session: e-commerce 2 Track: Information Systems and e-Operations Chair: Amiya K. Chakravarty

WB401 How Retailers' Reputation will Change if They cannot Set the Price in the Internet Market: The Regression Analysis about the Relationship between Real Estate Agencies' Reputation and the Appeal of Advertisements in the Real Estate Market
Hisashi Yamada, Niigata University of International and Information Studies, Japan

WB401 A Framework for the Design and Control of Multi-Channel Services
Rui Sousa, Catholic University of Portugal, Portugal

WB401 Dissemination Motive and the Effect of Electronic Word-of-Mouth: Internet Book Reviews
Yun Kuei Huang, Shin-Yin Hsieh, Takming University of Science and Technology, Taiwan

WB401 Supplier Aggregation in an Online Marketplace
Amiya K. Chakravarty, Northeastern University, U.S.A.
Geoffrey Parker, Tulane University, U.S.A.

Session: SCM framework Track: Supply Chain Management Chair: Raj Selladurai

WB402 Core Supply Chain Management Business Processes - A Literature-Based Framework Proposition
Rodrigo Cambiaghi Azevedo, Sophie D'Amours, Universite Laval, Canada
Mikael Ronnqvist, Norwegian School of Economics and Business Administration, Norway

WB402 A Mean of Supply Chain
Seiji Kurosu, Waseda University, Japan

WB402 Network Marketing Strategy and Supply Chain Management for Effective Operations Management
Raj Selladurai, Indiana University, U.S.A.

Session: Modeling: Sharing risk and return in SCM 2 Track: m-Supply Chain Management Chair: De-bi Cao

WB403 An Option Optimization Model for Apparel Supply Contract
Yuki Kumakiri, De-bi Cao, Keio University, Japan

WB403 Research towards Risk Sharing in Supply Chain Management
Yongfeng Pan, Lindu Zhao, Southeast University, China

WB403 The Agency Cost in Early Supplier Involvement and its Effect on Development Lead Time
Sarah J. Wu, Worawat Margsiri, Fordham University, U.S.A.

Session: Modeling: New scheduling model 2 Track: m-Scheduling Chair: Joanna Krawczyk

WB405 Developing an Implementation Strategy for Workload Control: An Action Research Project
Mark Stevenson, Yuan Huang, Linda C. Hendry, Lancaster University, United Kingdom

WB405 A Fundamental Study on the Efficiency of Production Scheduling in Mixed Products Production
Osamu Ichikizaki, Hiroyoshi Fujioka, Tomoaki Yamazaki, Takashi Kanazawa, Keio University, Japan

WB405 A Manufacturing Operation Classification System to Support the Organisational Design of Production Planning
Jane E. Guinery, University of Nottingham, United Kingdom

WB405 A Case Study into the Implementation of a Manual Production Planning and Control System in a Complex Manufacturing Environment
Joanna Krawczyk, David J. Evans, Cranfield University, United Kingdom

Session: S-SCM 1 Track: Spanish Chair: Jose A. D. Machuca

WB501 Supply Chain Organization as a Source of Competitive Advantages: A multisectorial Study in Spain
Jesus Garcia-Arca, Ana M. Mejias-Sacaluga, Jose Carlos Prado-Prado, University of Vigo, Spain

WB501 A Tool for Researching and Teaching on the Bullwhip Effect through Web-Based Simulation
Jose A. D. Machuca, Rafael Pozo-Baraja, University of Sevilla, Spain

WB501 A Roadmap for Future Research on the Specification of Business Services in Supply Chain Management: The Quest for Synergy between Software Engineering and Service Operations Management Fields
Joaquin Pena-Siles, Jose A. D. Machuca, Maria del Mar Gonzalez-Zamora, University of Sevilla, Spain

Session: Modeling: New approaches to QM and maintenance 2 Track: m-Quality Management and Six Sigma Chair: Wen-Pai Wang

WB503 Understanding Customer-Defined Quality through Quantitative Analysis of Kano's Model
Ting Wang, Ping Ji, Hong Kong Polytechnic University, Hong Kong

WB503 Ranking of Customer Requirements in Quality Function Deployment by a Fuzzy Method
Esmaeil Mehdizadeh, Islamic Azad University, Qazvin Branch, Iran
Farshid Rajabi, Mohammad Reza Masoomi, Islamic Azad University, Abhar Branch, Iran

WB503 Identifying Downs Syndrome Fetuses Using Taguchi's Approach: Selecting the Most Appropriate Detection Method
Shuki Dror, Rachel Ravid, Emil Bashkansky, ORT Braude College, Israel

WB503 Safety Design for Artificial Marble Products
Wen-Pai Wang, National Chin-Yi University of Technology, Taiwan
Chung-Shang Chang, Chienkuo Technology University, Taiwan, **Yu-Jen Chang,** Tunghai University, Taiwan

■WC Sessions: Wednesday, 13:40-14;55

Session: Empirical research on quality management 1 Track: Quality Management and Six Sigma Chair: Ben Clegg

WC202 Quality Management Practices and Competitive Performance: Empirical Evidence from Japanese Manufacturing Plants
Anh Chi Phan, Ayman Bahjat Abdallah, Yoshiki Matsui, Yokohama National University, Japan

WC202 The Impact of TQM and TPM on Business Performance – An Empirical Analysis of a Simultaneous Implementation
Philipp Alexander Konecny, Jorn-Henrik Thun, Peter M. Milling, University of Mannheim, Germany

WC202 A Survey to Understanding What Makes 6 Sigma Training Effective
Ben Clegg, Aston Business School, United Kingdom
Chris Rees, Mike Titchen, SigmaPro, United Kingdom

Session: Service OM 2 Track: Invited Chair: Philip Andrew Smart and Harry Maddern

WC301 Value Moves in Service Delivery and Asset Management: A Segmentation Tool for OEMs Going Downstream to Services
Jan B. Holmstrom, Helsinki University of Technology, Finland

WC301 Mapping Service Processes in Manufacturing Companies
Sabine Biege, Gunter Lay, Fraunhofer Institute for Systems and Innovation Research, Germany
Daniela Buschak, Fraunhofer Institute for Systems and Innovation Research / University of Erlangen-Nuernberg, Germany

WC301 The Partnership Table as an Organisational Tool for Improving Customer-Provider Relationship: A Case Study in Facility Management
Alberto Felice De Toni, Mattia Montagner, University of Udine, Italy

Session: Manufacturing strategy framework Track: Manufacturing Strategy Chair: Attila Chikan

WC302 Strategy Deployment: Linking Business Objectives to Action Plans
Shuki Dror, Ort Braude College, Israel, United Kingdom

WC302 Implications of Cellular Production System to Managements of Machine Tool Builders
Fumihiko Nakazawa, J-Phoenix Research Inc., Japan
Michiya Morita, Gakushuin University, Japan

WC302 Competitiveness of Operations Management
Alejandra Gomez-Padilla, Victor Hugo Ortiz-Muro, University of Guadalajara, Mexico

WC302 Graphical Languages for Manufacturing Operations
Charlotta Johnsson, Lund University, Sweden

WC302 Operations Management Fads and Fashions: A Product Life Cycle Approach to Seeking Truth
Attila Chikan, Corvinus University of Budapest, Hungary
Linda Sprague, Rollins College, U.S.A.

Session: Green operations Track: Environmental Management Chair: Charles J. Corbett

WC303 An Integrated BSC Model for the Performance Evaluation of Public Organizations
Toraj Mojibi, Mojtaba Tabari, Islamic Azad University, Iran
Reza Tavakkoli-Moghaddam, University of Tehran, Iran

WC303 Green Operations: Diagnosing Environmental Initiatives in the Automotive Industry
Breno Nunes, David Bennett, Aston University, United Kingdom

WC303 Adoption of Voluntary Environmental Standards: The Role of Signaling and Intrinsic Benefits in the Diffusion of the LEED Green Building Standards
Charles J. Corbett, Suresh Muthulingam, University of California, Los Angeles, U.S.A.

Session: Performance measurement Track: Performance measurement Chair: Angel R. Martinez-Lorente

WC305 Forward Performance Measurement and Management Integrated Frameworks
Paolo Taticchi, University of Perugia, Italy
Kashi Balachandran, New York University, U.S.A.

WC305 Enabling Performance Management in SMEs: a Study into What SMEs Need to Measure and How They Should Manage Performance
Hakon Fauske, SINTEF Technology and Science, Norway
Marco Busi, Carisma r.c.t. Ltd., Norway
Erlend Alfnes, Norwegian University of Technology and Science, Norway

WC305 Reliability and Validity of Operations Management Measurement Models
Angel R. Martinez-Lorente, Polytechnic University of Cartagena, Spain
Miguel Hernandez-Espallardo, University of Murcia, Spain

Session: Using secondary data in OM Research Track: Tutorial Chair: Vinod Singhal

WC401 A Tutorial on Using Secondary Data in Operations Management (OM) Research: Overview and Research Opportunities
Vinod Singhal, Georgia Institute of Technology, U.S.A.

Session: Case research on SCM 1 Track: Supply Chain Management Chair: Jan Ola Strandhagen

WC402 Marketing Distribution Channels in the Chinese Market: An Exploratory Study of Distribution Centre Performance in Fujian Province
Peter O'Neill, Monash University, Australia

Annibal J. Scavarda, Royal Melbourne Institute of Technology University, Australia

WC402 The Impact of Product Mix on Supply Network Configurations
Nan Wang, Yongjiang Shi, University of Cambridge, United Kingdom

WC402 Successful Supplier Integration in China: A Case Study Approach
Martin Lockstrom, Supply Management Institute SMI – China, China
Roger Moser, Supply Management Institute SMI – India, India
Joachim Michael Schadel, Supply Management Institute SMI – China, China

WC402 Intelligent and Demand Driven Manufacturing Network Control Concepts
Ragnhild Bjartnes, SINTEF Technology and Society, Norway
Jan Ola Strandhagen, Heidi C. Dreyer, Kristian Solem, NTNU, Norway

Session: Modeling: Evaluation of port/terminal operations Track: m-Logistics and Physical Distribution
Chair: Rene B. M. de Koster

WC403 A Study on Specification of Terminal Traffic Estimation System on Geographic Information Systems
Yoichi Shimakawa, Taro Kasahara, Salesian Polytechnic, Japan
Nobuyuki Iwaki, Kazuaki Taniguchi, FACE.com Inc., Japan

WC403 Fuzzy Data Envelopment Analytic Hierarchy Process: A Possibility Approach
Varathorn Punyangarm, Srinakharinwirot University, Thailand
Patcharaporn Yanpirat, Kasetsart University, Thailand

WC403 Sense and Nonsense of Container Terminal Benchmarking
Rene B. M. de Koster, Bert Balk, RSM Erasmus University, Netherlands

Session: Modeling: Scheduling algorithms Track: m-Scheduling Chair: Reza Tavakkoli-Mogahddam

WC405 Memetic Algorithm for Non-Identical Parallel Machines Scheduling Problem with Earliness and Tardiness Penalties
Wisut Supithak, Karn Plongon, Kasetsart University, Thailand

WC405 A Scheduling Model for a Knitting Planning Problem
Carina Oliveira Pimentel, Filipe Pinto Cunha Alvelos, University of Minho, Portugal
Antonio Duarte, Polytechnic Institute of Braganca, Portugal
Jose Manuel Valerio de Carvalho, University of Minho, Portugal

WC405 Multislot Just-in-Time Scheduling in Single Machine Environment
Shao-Chin Sung, Aoyama Gakuin University, Japan
Ondrej Cepek, Charles University, Czech Republic
Kunihiko Hiraishi, Japan Advanced Institute of Science and Technology, Japan

WC405 Solving a Bi-Objective No-Wait Flow Shop Scheduling Problem by a Fuzzy Goal Programming Approach
Reza Tavakkoli-Moghaddam, University of Tehran, Iran
Babak Javadi, University of Science and Technology, Iran

Session: S-SCM 2 Track: Spanish Chair: Juan Ramis-Pujol

WC501 Agile Supply Chain: Difficulties for Implementation in Spanish Fashion Industry
Jesus Garcia-Arca, Ana M. Mejias-Sacaluga, Jose Carlos Prado-Prado, University of Vigo, Spain

WC501 Information View as a Link in the Manufacturing Planning Process Modeling in a Supply and Distribution Chain
Andres Boza, Rosa-Isabel Navarro, Francisco-Cruz Lario, Universidad Politecnica de Valencia, Spain

WC501 Establishing a Framework for Research in the Triple A (Adaptability, Agility, Alignment) in Supply Chains
Ivan A. Arona, Jose A. D. Machuca, Rafaela Alfalla-Luque, University of Sevilla, Spain

WC501 Detecting Supply Chain Innovation Potential for Sustainable Development
Juan Ramis-Pujol, University Ramon Llull, Spain
Raine Isaksson, Gotland University, Sweden
Daniel Arenas, University Ramon Llull, Spain

Session: Modeling: Vehicle Routing Problem 2 Track: m-Logistics and Physical Distribution Chair: Bulent Catay

WC503 A Dynamic Programming Approach to the Time-Dependent VRP with Both Transportation and Time Limitations
Said Dabia, Tom van Woensel, Ton de Kok, Eindhoven University of Technology, Netherlands

WC503 Integrated Inventory Problem and Vehicle Routing Problem in One Warehouse and Multi-Retailer Distribution System
Anchalee Supithak, Eastern Asia University, Thailand
Surya D. Liman, Texas Tech University, U.S.A.

WC503 An Ant Colony Optimization Approach for the Mixed Vehicle Routing Problem with Backhauls
Bulent Catay, Sabanci University, Turkey

■WD Sessions: Wednesday, 15:15-16:30

Session: Empirical research on quality management 2 Track: Quality Management and Six Sigma Chair: Hideo Suzuki

WD202 The Influence of TQM on Innovation and Firm Growth
Julio F. B. Faco, EAESP/FGV, Brazil
Andre Luis Castro Moura Duarte, IBMEC-Sao Paulo, Brazil
Joao Mario Csillag, EAESP/FGV, Brazil

WD202 Relationship between Quality Management Practices and Their Effects on Competitive Performance of Manufacturing Plants
Anh Chi Phan, Ayman Bahjat Abdallah, Yoshiki Matsui, Yokohama National University, Japan

WD202 ISO 9001:2000 Application according to TQM in Small and Medium Companies
Angel R. Martinez-Lorente, Polytechnic University of Cartagena, Spain
Micaela Martinez-Costa, Daniel Jimenez-Jimenez, University of Murcia, Spain

WD202 Structural Analysis of Quality Management Practices and Results in Japanese Manufacturing Companies
Hideo Suzuki, University of Tsukuba, Japan
Hirofumi Matsuo, Kobe University, Japan
Rita Arauz, Goethals Consulting Corp., Panama

Session: Service OM 3 Track: Invited Chair: Philip Andrew Smart and Harry Maddern

WD301 A Review of Scheduling Problems in Hospitals
Fan T. Tseng, J. N. D. Gupta, University of Alabama in Huntsville, U.S.A.
K. H. Hsu, Chang Gung University, Taiwan

WD301 Demand and Supply Management for Professional Services
Cornelia Schoen, University of Karlsruhe, Germany

WD301 Development of Broadcast Radio Production Laboratories at Social Communication Courses
Carlos Fernando Jung, PPGEP/UFRGS, Brazil
Vera Maria Broilo, FACCAT,RS, Brazil
Jose Luis Duarte Ribeiro, Carla Schwengber ten Caten, PPGEP/UFRGS, Brazil

Session: International OM 1 Track: International Operations Management Chair: Ann Vereecke

WD302 Offshoring Process: A Comparative Investigation of Danish and Japanese Companies
Dmitrij Slepniov, Aalborg University, Denmark
Hiroshi Katayama, Waseda University, Japan

WD302 Architecture and Global Competitiveness in Japanese Process Industry
Junichi Tomita, Toyo University, Japan

WD302 The Globalisation of Automotive Component Suppliers
Chee Yew Wong, University of Hull, United Kingdom
Sakun Boon-itt, Thammasat Business School, Thailand

WD302 Survival of the Fittest: Impact of Networking on the Future of Plants
Ann Vereecke, Vlerick Leuven Gent Management School and Ghent University, Belgium
Arnoud De Meyer, University of Cambridge, United Kingdom

Session: Remanufacturing and recycling Track: Environmental Management Chair: Tomoaki Shimada

WD303 The Need for Inspection in Remanufacturing Operations
Mark Errington, Stephen J. Childe, Exeter University, United Kingdom

WD303 Analysis of Reverse Logistics of Operations for a Computer Company
Albert Wee Kwan Tan, Arun Kumar, University of Wollongong, U.A.E.

WD303 The Impact of a Large Retailer's Environmental Activities on Consumers' Purchasing Behavior in Japan
Takeshi Hama, International University of Japan, Japan
Tomoaki Shimada, Kobe University, Japan

Session: Evaluating sourcing Track: Purchasing and Sourcing Management Chair: William Ho

WD305 Developing Performance Measures for Critical Outsourcing
Araya Sakburanapech, Richard Mark Greenough, Cranfield University, United Kingdom

WD305 The Supply Risk Construct and Measurement Methods
Fabio Z. Cerquinho, Marc Sachon, University of Navarra, Spain

WD305 Modeling IT Outsourcing Decisions Involving Vendors
Jayavel Sounderpandian, University of Wisconsin at Parkside Kenosha, U.S.A.
Chun-Hung Cheng, Chinese University of Hong Kong, Hong Kong
Jaydeep Balakrishnan, University of Calgary, Canada
Wai-Chi Wong, Chinese University of Hong Kong, Hong Kong

WD305 An Integrated Analytical Approach for Selecting Suppliers Strategically
William Ho, Aston University, United Kingdom

Session: Information systems 1 Track: Information Systems and e-Operations Chair: Chien-Hua Mike Lin

WD401 Agile Supply Chains through Information Systems Integration
Yi Wu, Jannis Angelis, Margi Levy, Warwick Business School, United Kingdom

WD401 Issues in Implementation of Information Systems in Factories: The Role of Similarity and Difference of Business Functions
Osam Sato, Tokyo Keizai University, Japan

Yoshiki Matsui, Yokohama National University, Japan
Hideaki Kitanaka, Takushoku University, Japan

WD401 Changes and Transitions in the Development of Enterprise Information Systems in Japan: An Empirical Study
Kazuko Hozumi, Kanagawa University, Japan

WD401 A Framework of EAI for Extending and Enhancing ERP
Chien-Hua Mike Lin, Stephen Taraszewski, Cleveland State University, U.S.A.

Session: Case research on SCM 2 Track: Supply Chain Management Chair: Macarena Sacristan-Diaz

WD402 Open Innovation in Operation: Organizational Performance and Engineering Networks
Susan C. Morton, Neil D. Burns, Loughborough University, United Kingdom
Roula Michaelides, Liverpool University, United Kingdom

WD402 Vendor Managed Inventory Model in Case of Industrial Low-Cost Materials Management
Jukka Hemila, VTT Technical Research Centre of Finland, Finland

WD402 Measuring Supply Chain Performance - A Framework for Proritizing Measures
Aron Chibba, Halmstad University, Sweden

WD402 Measuring Supply Chain Performance: What Metrics Do Matter?
Job A. C. de Haan, Tilburg University, Netherlands
Macarena Sacristan-Diaz, University of Seville, Spain

Session: Modeling: Supply Chain Management Track: Invited Chair: Sean X. Zhou

WD403 Optimal Purchasing Policies of Fresh Product with Random Delivery Times
Xiaolin Xu, Xiaoqiang Cai, Chinese University of Hong Kong, Hong Kong

WD403 Dynamic Pricing and Inventory Control in a Make-to-Stock Queue with Information on the Production Status
Liuxin Chen, James Z. Pan, *Frank Y. Chen, Chinese University of Hong Kong, Hong Kong

WD403 Competitive and Collaborative Quality and Warranty Strategies in a Supply Chain
Yue Dai, Fudan University, China
Sean Zhou, Chinese University of Hong Kong, Hong Kong

WD403 Optimal Control of Inventory Systems with Multiple Types of Remanufacturable Products
Sean X. Zhou, Zhijie Tao, Chinese University of Hong Kong, Hong Kong
Xiuli Chao, University of Michigan, U.S.A.

Session: Modeling: Capacity and inventory management Track: m-Inventory Theory Chair: Zhe George Zhang

WD405 A Multi-Component Available-to-Promise Stochastic Programming Model
Chien-Yu Chen, George Mason University, U.S.A.

WD405 Optimal Sourcing Decisions under Alternative Capacitated Suppliers
Tarkan Tan, Eindhoven University of Technology, Netherlands
Osman Alp, Bilkent University, Turkey

WD405 Inventory Models with Multiple Uncertain Supply Sources
Zhiyuan Chen, Houmin Yan, Chinese University of Hong Kong, Hong Kong

WD405 Modeling Production and Inventory Systems with Multi-Server Vacation Models
Zhe George Zhang, Western Washington University, U.S.A.
Siping Su, Simon Fraser University, Canada

Session: S-Purchasing management and strategy Track: Spanish Chair: Luis Alejandro Rodriguez

WD501 The Environment as a Determinant Factor of the Implementation of Advanced Purchasing Practices
Javier Gonzalez-Benito, Universidad de Salamanca, Spain
Duilio Reis da Rocha, Universidade de Fortaleza – UNIFOR, Spain

WD501 Comparative Study of Purchasing and Sourcing Management in Spanish Industry
Ana M. Mejias-Sacaluga, Jesus Garcia-Arca, Jose Carlos Prado-Prado, University of Vigo, Spain

WD501 Approach to a Methodology to Verify the Development and Coherence of an Operations Strategy
Luis Alejandro Rodriguez R., Universidad Nacional de Colombia, Colombia

Session: SCM practices Track: Supply Chain Management Chair: Andrew Junfang Yu

WD503 Supplier Risk Relationship Management (SR2M): A Theoretical Framework.
Amrik Singh, Naomi Brookes, Aston University, United Kingdom

WD503 Optimal Operation of Petrochemical Product Chain
Kentaro Yasuda, Kagoto Nakagawa, Masayoshi Takada, Mitsubishi Chemical Corporation, Japan

WD503 Strategic Global Supply Chain Positioning
Watcharavee Chandraprakaikul, Tim Baines, Roland Yan Guan Lim, Cranfield University, United Kingdom

WD503 Proactive Supply Chain Planning: a Dynamic Quantitative Planning
Timothy P. Tsai, Texas Instruments, U.S.A.
Andrew Junfang Yu, Southern Methodist University, U.S.A.
Wang Yiu Yuen, Texas Instruments, U.S.A.

■RA Sessions: Thursday, 8:30-9:45

Session: Perspectives on quality management 1 Track: Quality Management and Six Sigma
Chair: Natcha Thawesaengskulthai

RA202 Performance Appraisal of RAJA Passenger Trains Operating Co. Using EFQM Organizational Excellence Model
Hassanali Aghajani, University of Mazandaran, Iran
Mohammad Alikhani, Islami Azad University of Ghaemshahre, Iran
Zohreh Allai, Iran

RA202 Managing Quality in the Chinese Context
Yun Qiu, James D. Tannock, University of Nottingham, United Kingdom

RA202 Concept for Collaborative Quality Management in Manufacturing Networks
Patrick Sitek, Marcus Seifert, Klaus-Dieter Thoben, Bremen Institute for Production and Logistic, Germany

RA202 Selecting Quality Management and Improvement Initiatives
Natcha Thawesaengskulthai, Chulalongkorn University, Thailand

Session: Mass customization Track: Mass Customization Chair: Dian Yan Liou

RA301 Customers' Perceptions of Mass Customized Products in Service Sector in Greece
Irene Samanta-Rounti, Graduate Technological Education Institute of Piraeus, Greece

RA301 Developing Ramp-up Strategies for A New Product Introduction in the Area of Mass Customization
Herwig Winkler, Michael Slamanig, Bernd Kaluza, Alpen-Adria-University Klagenfurt, Austria

RA301 The impact of Customer Learning on Mass Customizat Capability: An Exploratory Study of the Contextual Factors
Min Zhang, Xiande Zhao, The Chinese University of Hong Kong, Hong Kong

RA301 The Flexibility of Service Operations for Banks: An Empirical Approach in Taiwan
Dian Yan Liou, Yu Da College of Business, Taiwan

Session: International OM 2 Track: International Operations Management Chair: Kasra Ferdows

RA302 The Impact of National Culture on Operations Management
Zheng Liu, **Yongjiang Shi,** University of Cambridge, United Kingdom

RA302 Born Globals from Brazil: How Do They Operate Internationally?
Luis Henrique Pereira, Universidade Ibirapuera, Brazil
Susana Farias Pereira, FGV-EAESP, Brazil

RA302 Bridging Cultural Gap between Thai and Japanese Expatriates: Case of Japanese Expatriate Developing Local Suppliers in the Thai Automobile Industry
Phallapa Petison, Mahidol University, Thailand

RA302 Models of Global Production Networks
Kasra Ferdows, Georgetown University, U.S.A.

Session: Panel Discussions: RFID Track: Invited Panel Discussions Chair: Brooke Saladin

RA303 Research and Applications of RFID in Goods and Services
Brooke Saladin, Wake Forest University, U.S.A.
David Collier, Florida Gulf Coast University, U.S.A.
Kurt Hozak, Indiana State University, U.S.A.
Kirk Karwan, Furman University, U.S.A.

Session: Manufacturing technology and ergonomics Track: Manufacturing Technology Chair: Charlotta Johnsson

RA305 The Different Electrode Materials Affect to Micro-Cracking Defective on Tungsten Carbide Surface in EDM Process
Natdanai Suetragul, Apiwat Muttamara, Thammasat University, Thailand
Pichai Janmanee, Rajamangala University of Technology Krungthep, Thailand
Yasushi Fukuzawa, Nagaoka University of Technology, Japan

RA305 Robotics and ISA 88 Batch Control Standard - Opportunities and Challenges -
Charlotta Johnsson, Lund University, Sweden

RA305 The Application of Ergonomic Research Principles for Workstation Enhancement of Apparel Machinists
Kem Ramdass, University of Johannesburg, South Africa
Leon Pretorius, University of Pretoria, South Africa

RA305 The Role of Ergonomics towards Performance Improvement
Kem Ramdass, University of Johannesburg, South Africa
Leon Pretorius, University of Pretoria, South Africa

Session: Information systems 2 Track: Information Systems and e-Operations Chair: Susan Morton

RA401 The Virtual Development Office Framework in Enterprises Network Organization: The GPT Case Study
Paolo Taticchi, Marco Botarelli, Luca Cagnazzo, University of Perugia, Italy

RA401 Proposal of a Framework for the Analysis of the Innovation Process in Networks
Jose Alcides Gobbo Junior, Sao Paulo State University, Brazil
Marcos Augusto de Vasconcellos, FGV-EAESP, Brazil

RA401 A Choice Model in Voting for a Political Party
Ilkay Gultas, Istanbul Kultur University, Turkey

RA401 Vote for Performance Improvement: Virtual Organizational Teams and e-Collaboration
Roula Michaelides, Liverpool University, United Kingdom

Susan C. Morton, Loughborough University, United Kingdom

Session: Disaster management Track: Invited Chair: Duncan Shaw

RA402 Supporting Security Officers: A Study of Operational Performance
Ben Clegg, Duncan Shaw, Pavel Albores, Prasanta Dey, Andrew Greasley, Aston University, United Kingdom

RA402 Disaster Recovery and Business Resumption Planning
Luis Antonio Delgadillo Gutierrez, Aida Fajardo Montiel, Jose de Jesus Gonzalez Hinojosa, Universidad de Guadalajara, Mexico

RA402 Evacuation Responsiveness by Government Organisations (ERGO): A Preparedness Toolkit for Europe
Duncan Shaw, P. Tissington, P. Albores, Aston University, United Kingdom

Session: Modeling: Simulating SCM Track: m-Supply Chain Management Chair: Henk Akkermans

RA403 What is the Right Supply Chain Flexibility? An Evaluation Framework and Model
Yvan Nieto, Gerald Reiner, University of Neuchatel, Switzerland

RA403 Exploring the Use/Abuse of Inventory Control Policies and Forecasting in Relation to the Bullwhip Effect and Customer Service by Means of Spreadsheet Simulation
Robert Boute, Vlerick Leuven Gent Management School, Belgium
Marc Lambrecht, Katholieke Universiteit Leuven, Belgium

RA403 Concept, Processes, and a Supply Chain Simulation Approach for Vendor Managed Inventory
Guillaume Marques, Jacques Lamothe, Caroline Thierry, Didier Gourc, Toulouse University, France

RA403 Short-Lived like Brushwood: On the Applicability of "Lean" Supply Chain Coordination Mechanisms to Short Product Life Cycle Industries
Henk Akkermans, Tilburg University, Netherlands

Session: Modeling: Inventory policies Track: m-Inventory Theory Chair: Taner Bilgic

RA405 An Inventory Model for Deteriorating Items with Stochastic Supply Lead-Time
Reza Tavakkoli-Moghaddam, University of Tehran, Iran
M. Sheikh-Sajadieh, Islamic Azad University - South Tehran Branch, Iran
T. Mojibi, Islamic Azad University - Firoozkuh Branch, Iran
M. Tabari, Islamic Azad University - Ghameshahr Branch, Iran

RA405 Exact Performance of (r, Q) Policies for a Lost-Sales Inventory System Where Multiple Replenishment Orders May Be Outstanding
Anders Thorstenson, Søren Glud Johansen, University of Aarhus, Denmark

RA405 The Joint Replenishment Problem with Truck Cost Structures
Mehmet Mustafa Tanrikulu, Alper Sen, Osman Alp, Bilkent University, Turkey

RA405 Expediting Decisions for an Assemble-to-Order System
Onder Tombus, Taner Bilgic, Bogazici University, Turkey

Session: S-Teaching innovation in POM Track: Spanish Chair: Rafaela Alfalla-Luque

RA501 Information Technologies and University Teaching Methods in Business Administration: Analyzing OM Students' Opinions
Francisco J. Arenas, Carmen Medina-Lopez, Jose A. D. Machuca, University of Seville, Spain

RA501 Environmental Management System Performance Indicators for a Knowledge Organization: Experiences at the Technical University of Catalonia (UPC)
Juan Carlos Aguado-Chao, Pere Busquets-Rubio, Adriana Carolina Cortes-Cardonia, Jordi Fortuny-Santos, Maria Rosa Gonzalez-Siso, Ramon Navarro-Antunez, Antonio M. C. Verdu-Gonzalez, Technical University of Catalonia, Spain

RA501 OM-Multimedia Applications: An Improvement in the Learning Process or Just a Technological Fad?
Carmen Medina-Lopez, Francisco J. Arenas-Marquez, Jose Carlos Ruiz-del-Castillo, University of Sevilla, Spain

RA501 Learning Experiences: Making Operations Management More Interesting and Appealing for the Student Through ICT
Rafaela Alfalla-Luque, Francisco J. Arenas-Marquez, Carmen Medina-Lopez, University of Seville, Spain

Session: Modeling: Project management Track: m-Project Management Chair: Indra Gunawan

RA503 PERT/GERT Project Network Simulation with Arena
William J. Cosgrove, California Polytechnic University - Pomona, U.S.A.

RA503 Procurement Performance Analysis for International Development Projects
Kamrul Ahsan, Auckland University of Technology, New Zealand

RA503 An Interdisciplinary Approach towards Managing Projects and Change: Revisiting some Old Concepts
Samir Dani, Neil Burns, Chris Backhouse, Loughborough University, United Kingdom

RA503 Implementation of Design Structure Matrix to Reduce Design Iterations in Engineering Development Projects
Indra Gunawan, Auckland University of Technology, New Zealand

■RB Sessions: Thursday, 10:05-11:20

Session: Perspectives on quality management 2 Track: Quality Management and Six Sigma Chair: Matthew Pepper

RB202 Establishment of Strategic Quality Management Model Utilizing Science TQM
Manabu Yamaji, Kakuro Amasaka, Aoyama Gakuin University, Japan

RB202 Quality Management and Management Innovation: The Challenge for Innovators
Teerapon Tanomsakyut, Natcha Thawesaengskulthai, Chulalongkorn University, Thailand

RB202 The Integration of Lean Six Sigma
Matthew P. J. Pepper, Trevor A. Spedding, University of Wollongong, Australia

Session: Finance and operations interface Track: Invited Chair: Genaro J. Gutierrez

RB301 Offshore or Not to Offshore: Capacity Planning Under Exchange Rate and Demand Uncertainties
Shanling Li, Letian Wang, McGill University, Canada

RB301 Private Label Products: When Structural Inefficiency Increases Supply Chain Profits
Stephen Gilbert, University of Texas at Austin, U.S.A.
Yusen Xia, Georgia State University, U.S.A.
Liwen Chen, University of Texas at Austin, U,S,A,

RB301 Historical and Risk-Neutral Probability Measure Approaches to the Valuation of Operations Management Decisions and Contracts
Genaro J. Gutierrez, Ramesh K. S. Rao, University of Texas at Austin, U.S.A.

Session: International OM 3 Track: International Operations Management Chair: Chee Y. Wong

RB302 Outsourcing Value Creation Activities: Achieving Overall Optimal Performance
Shishank Shishank, Rob Dekkers, University of the West of Scotland, United Kingdom

RB302 Strategic Supply Management of Japanese Companies' Overseas Operating Facilities
Osamu Sam Uehara, NPO Institute for Supply Management, Japan

RB302 A Sino-European Framework of Cultural Standards SCM Performance Improvement through Cross-Cultural Communication in China
Roger Moser, Supply Management Institute SMI – India, India
Martin Lockstrom, Supply Management Institute SMI – China, China

RB302 Key Issues of Manufacturing in China
Hong Seng Woo, Middlesex University, United Kingdom

RB302 Organizational Innovation and Paradigm Shift: Comparing the Change Process of Two China's State-Owned Enterprises (SOEs)
Rui H. Gao, Chee Yew Wong, Kobe University, Japan

Session: RFID 1 Track: RFID Chair: Mihalis Giannakis

RB303 Inventory Management and RFID Technology in Supply Chain
Reza Tavakkoli-Moghaddam, University of Tehran, Iran
H. Amoozad-Khalili, S. Ayani, Islamic Azad University - South Tehran Branch, Iran
A. Haghparast, Islamic Azad University - Qhazin Branch, Iran

RB303 Three Dimension (3D) Anthropometric Age
Marie-Eve Faust, Hong Kong Polytechnical University, Hong Kong
Serge Carrier, Universite du Quebec a Montreal, Canada

RB303 Streamlining Supply Chains with the Use of RFID Technology
Mihalis Giannakis, Warwick University, United Kingdom

Session: Teaching innovation in POM 1 Track: Teaching Innovation Chair: Uttarayan Bagchi

RB305 Teaching Supply Chain Management (SCM): A Modified Beer Game
Antonio Ka Wing Lau, City University of Hong Kong, Hong Kong
L. S. Kong, University of Queensland, Australia

RB305 Effect of Online Business Game on SCM Education
Motonari Tanabu, Yokohama National University, Japan

RB305 The Design of Industrial Engineering Education Using Supply Chain Management
Katsuhiro Sakamoto, Aoyama Gakuin University, Japan
Yoshiki Nakamura, Nihon University, Japan

RB305 Laws of Operations
Uttarayan Bagchi, University of Texas at Austin, U.S.A.

Session: Knowledge management 1 Track: Knowledge and Technology Management Chair: Chengter Ho

RB401 Knowledge Management Tools for Transfer Information: Case Study in One OEM
Ricardo Mateo, University of Navarra, Spain

RB401 The Management of Process Planners' Knowledge Based on Manufacturing Feature Concept
Hendry Muljadi, Tokyo Metropolitan College of Industrial Technology, Japan
Koichi Ando, Hayato Yagyu, Shibaura Institute of Technology, Japan

RB401 Case-Based Reasoning System for Fastener Forging Process Design
Chengter Ho, Jerri Mathew, National Kaohsiung University of Applied Sciences, Taiwan

RB401 Automatic Filing Mechanism for New Cases in Case-Based Reasoning System
Chengter Ho, Gin-Feng Kuo, National Kaohsiung University of Applied Sciences, Taiwan

Session: Case research on SCM 3 Track: Supply Chain Management Chair: Simon T. Alexandre

RB402 Using a Methodology for Evaluating the Supply Chain Management in Industrial Companies
Simon T. Alexandre, Silvio R. I. Pires, Methodist University of Piracicaba, Brazil

RB402 A Practical Tool for Supply Chain Improvement - Experiences with the Supply Chain Maturity Assessment Test (SCMAT)
Torbjoern H. Netland, SINTEF, Norway
Erlend Alfnes, Norwegian University of Technology and Science, Norway

RB402 Upgrading in the Dual Chain: A Case Study of Wanxiang
Xiaozheng Jin, University of Cambridge, United Kingdom

Session: Modeling: SCM optimization 1 Track: m-Supply Chain Management Chair: Yalcin Akcay

RB403 Dual Sourcing with Contract Manufacturing
Youssef Boulaksil, Jan C. Fransoo, Eindhoven University of Technology, Netherlands

RB403 The Study of Real Option Trading in a Secondary Market and its Impact on the Supply Chain Management
Gang Hao, City University of Hong Kong, Hong Kong
Xu Chen, University of Electronic Science and Technology of China, China

RB403 A Stochastic Programming Model for Production Loading Problems under Global Supply Chain Environment
Yue Wu, University of Southampton, United Kingdom

RB403 Pricing of Random Quality Products
Yalcin Akcay, Fikri Karaesmen, Seray Aydin, Koc University, Turkey

Session: Modeling: New formulations for inventory management Track: m-Inventory Theory Chair: Peter Kischka

RB405 A Single-Period Inventory Model with Possibilistic Information
Peijun Guo, Yokohama National University, Japan

RB405 Interval Probabilities and its Application to Newsvendor Problems
Peijun Guo, Yokohama National University, Japan
Hideo Tanaka, Hiroshima International University, Japan

RB405 Inventory Model with Stock-Level Dependent Rate and Variable Holding Cost Under the Given Total Inventory Cost
Masatoshi Tanaka, Matsumoto University, Japan
Shin'ichi Yoshikawa, Nagoya Keizai University, Japan

RB405 Stockout-Averse and Loss-Averse Newsvendors
Peter Kischka, Werner Jammernegg, Friedrich Schiller University, Germany

Session: S-New product development and knowledge management Track: Spanish Chair: Elena Revilla

RB501 Managing New Product Development Processes: A Study of Concurrent Engineering from a Contingency Approach
Sandra Valle, Daniel Vazquez-Bustelo, University of Oviedo, Spain

RB501 Team Vision: Its Components and Impact on Product Development. An Empirical Evidency
Elena Revilla, Instituto de Empresa, Spain
Beatriz Rodriguez, Universidad de Valladolid, Spain

RB501 The Effect of Tacit Knowledge and Value of Knowledge on Franchise Systems Performance
Beatriz Minguela-Rata, Maria Concepcion Rodriguez-Benavides, Jose Ignacio Lopez-Sanchez, Universidad Complutense de Madrid, Spain

RB501 Knowledge Complexity, Absorptive Capacity and Weak Ties: An Empirical Analysis of Its Effects on Franchise Systems Uniformity
Beatriz Minguela-Rata, Maria Concepcion Rodriguez-Benavides, Jose Ignacio Lopez-Sanchez, Universidad Complutense de Madrid, Spain

Session: Modeling: Forecasting Track: m-Forecasting Chair: De-bi Cao

RB503 Synergy of Chaos Theory and Artificial Neural Networks in Time Series Prediction
Muhammad Ardalani-Farsa, Saeed Zolfaghari, Ryerson University, Canada

RB503 A Fuzzy Mathematical Programming Approach for Time Series Forecasting
Josefa Mula, Raul Poler, Universidad Politécnica de Valencia, Spain

RB503 A Method for Forecasting Model Selection
Raul Poler, Josefa Mula, Universidad Politécnica de Valencia, Spain

RB503 Tacit Knowledge Aggregation for Demand Forecasting in Prediction Market
Akihiro Nakatsuka, De-bi Cao, Keio University, Japan

■RC Sessions: Thursday, 13:40-14:55

Session: Lean production 1 Track: JIT & Lean Production Chair: Mikko V. Koho

RC202 Lean Production within the German Capital Goods Industry - An Empirical Analysis
Kai-Ingo Voigt, Lothar Czaja, Christian W. Scheiner, University of Erlangen-Nuremberg, Germany

RC202 Key Characteristics of a Well-Performing Make-to-Order Production System
Mikko V. Koho, Seppo J. Torvinen, Tampere University of Technology, Finland

RC202 Key Performance Indicators (KPI) for the Implementation of Lean Methodologies in a Manufacture-to-Order Small and Medium Enterprise
Markus Leonard Stamm, Thomas Neitzert, Auckland University of Technology, New Zealand

RC202 Value Stream Mapping (VSM) in a Manufacture-to-Order Small and Medium Enterprise
Markus Leonard Stamm, Thomas Neitzert, Auckland University of Technology, New Zealand

Session: Science TQM - Toyota's New Strategy Track: Tutorial Chair: Kakuro Amasaka

RC301 Science TQM - Toyota's New Strategy
Kakuro Amasaka, Aoyama Gakuin University, Japan

Session: Empirical research on manufacturing strategy 2 Track: Manufacturing Strategy Chair: Andy David Neely

RC302 Competitiveness Evaluation of the Manufacturing Sector: An Empirical Investigation
Himanshu Kumar Shee, Victoria University, Australia
Alka Nand, University of the South Pacific, Fiji

RC302 An Empirical Analysis of Formulation and Implementation of Manufacturing Strategy
Jorn-Henrik Thun, Mannheim University, Germany
Rob Dekkers, University of West Scotland, United Kingdom
Marie-Christine Anselmann, Mannheim University, Germany

RC302 Plant Roles and Decision-Making in Manufacturing Networks
Andreas Feldmann, Jan Olhager, Linkoping University, Sweden

RC302 The Servitization of Manufacturing: Further Evidence
Andy David Neely, Cranfield University, United Kingdom

Session: RFID 2 Track: RFID Chair: Stephen C. H. Leung

RC303 A Review of Radio Frequency Identification (RFID) Contemporary Trends
Apichaet Thanachareonkit, Natcha Thawesaengskulthai, Chulalongkorn University, Thailand

RC303 The Management of Medical Assets across Australian Defence Force Supply Chains - A Radio Frequency Identification Enabled End-to-End Process Model
Peter O'Neill, Monash University, Australia
Annibal J. Scavarda, Royal Melbourne Institute of Technology University, Australia

RC303 Design of an RFID-Enabled Decision Support System for Outbound Logistics
Stephen C. H. Leung, Jie Wei, City University of Hong Kong, Hong Kong
Ben Kwok, S. C. Lee, Avanti Innovation Technology Group Ltd., Hong Kong

Session: Teaching innovation in POM 2 Track: Teaching Innovation Chair: Prafulla Joglekar

RC305 Teaching Manufacturing Operations and Strategies in Higher Education
Charlotta Johnsson, Carl-Henric Nilsson, Lund University, Sweden

RC305 Technology for Teaching Operations Management
Prafulla Joglekar, La Salle University, U.S.A.

RC305 Application of Lean Principles in Academic Support, Focused in the Current Programme of Industrial Engineering (School of Engineering) at the Pontificia Universidad Javeriana, Bogota-Colombia
Joseph Robert Voelkl, Pontificia Universidad Javeriana, Colombia

RC305 Design of a Methodology Based on CRM, as Input of Lean Thinking in Services, in the Definition of the Value Added Expected by the External Customers of the Industrial Engineering Undergraduate Programme at the Universidad Javeriana
Joseph Robert Voelkl, Jorge Alberto Silva Rueda, Clara Mabel Solano Vanegas, Edward Parra Florez, Pontificia Universidad Javeriana, Colombia

Session: Knowledge management 2 Track: Knowledge and Technology Management Chair: Ian Hipkin

RC401 New Production Development and Manufacturing Methodology Based on Subject-Oriented Service Engineering toward 21 Century Industry Era
Takeshi Kamogawa, PHOENIX Co., Ltd., Japan

RC401 Importance of a Solid Cultural Base to Implement Productive Methods in Small and Medium Size Mexican Manufacturing Enterprises
Eligio Espinoza Mendez, Uiversidad Politecnica de San Luis Potosi, Mexico

RC401 Operational Competence and Competitive Advantage through Absorptive Capacity in Process Industries
Ian Hipkin, University of Exeter, United Kingdom

Session: Modeling: SCM optimization 2 Track: m-Supply Chain Management Chair: Matthieu Lauras

RC403 The Impcats of Process Synchronization on the Lead Time of Linear Manufacturing Supply Chains
Hongyan Dai, Mitchell M. Tseng, Hong Kong University of Science and Technology, Hong Kong

RC403 RFID Tagging Level on Inventories
Evsen Korkmaz, Istanbul Technical University, Turkey

Tarkan Tan, Eindhoven University of Technology, Netherlands

RC403 Impact Analysis of Information Sharing to Chaotic Behavior in Supply Chain System

Yu Wang, Haiyan Wang, Southeast University, China

RC403 Order Fulfillment in Stock-out Situations Using a Non Sequential Advanced ATP Model

Matthieu Lauras, Uche Okongwu, Verane Humez, Lionel Dupont, Toulouse University, France

Session: Modeling: Production and inventory management Track: m-Inventory Theory Chair: Antonio Arreola-Risa

RC405 Production and Inventory Problem for a System Comprising an Assembly Supply Chain and a Distribution Network

Yu-Cheng Hsiao, Tai-Yueh Lin, Ya-Han Yang, Takming University of Science and Technology, Taiwan

RC405 An Optimization Approach for Stochastic Production-Inventory Systems

Antonio Arreola–Risa, Texas A&M University, U.S.A.

Víctor M. Giménez–García, José Luis Martínez–Parra, Universitat Autònoma de Barcelona, Spain

RC405 The One-Vendor Multi-Buyer Problem with Permissible Delay in Payments

Beatriz Abdul-Jalbar, Jose M. Gutierrez, Marcos Colebrook, Joaquin Sicilia, La Laguna University, Spain

RC405 An Integrated Single-Vendor Two-Buyer Inventory Model with Credit Period Incentives

Beatriz Abdul-Jalbar, Roberto Dorta, Jose M. Gutierrez, Joaquin Sicilia, La Laguna University, Spain

Session: S-Information systems and e-operations Track: Spanish Chair: Mariano Aguayo

RC501 Analysing the Information Technology Paradox in the Supply Chain

Beatriz Minguela-Rata, Jose Fernandez-Menendez, Jose Ignacio Lopez-Sanchez, Antonio Rodriguez-Duarte, Francesco Domenico Sandulli, Universidad Complutense de Madrid, Spain

RC501 ERP System Selection with Fuzzy Modelling

Jose L. Salmeron, Salvador Bueno, Victor A. Banuls, University Pablo de Olavide, Spain

Maria-Teresa Gonzalez-Zurita, University of Seville, Spain

RC501 Integrated Enterprise Architecture Framework for Business and Information Technology Alignment

Llanos Cuenca, Angel Ortiz, Andrés Boza, Univesidad Politécnica de Valencia, Spain

RC501 A Qualitative Decision Support Tool for Operational Managers

Jose L. Salmeron, University Pablo de Olavide, Spain

Mariano Aguayo, Rafael Del-Pozo, University of Seville, Spain

Session: Modeling: Pricing Track: m-Marketing and Operations Interface Chair: Vincent Chi-Wei Li

RC503 Optimization Problem for the Column Assignment of a Vending Machine

Junichiro Fukuchi, Gakushuin University, Japan

Hajime Itoh, Otaru University of Commerce, Japan

Toshiko Takeuchi, Gakushuin University, Japan

RC503 Monotonicity in Revenue Management under a Discrete Choice Model of Consumers

Hideo Miki, Yasushi Masuda, Keio University, Japan

RC503 Markdown Pricing of Seasonal Products in Retail Chains

Vincent Chi-Wei Li, Yat-Wah Wan, Kate Chao, National Dong Hwa University, Taiwan

■RD Sessions: Thursday, 15:15-16:30

Session: Lean production 2 Track: JIT & Lean Production Chair: Luis Fernando Nino

RD202 Current Issues for Internationalization of Japanese Manufacturing Companies
Kodo Yokozawa, University of Twente, Netherlands
Harm-Jan Steenhuis, Eastern Washington University, U.S.A.
Erik Joost de Bruijn, University of Twente, Netherlands

RD202 Customer Involvement, Modularization of Products, and Mass Customization: Their Relationship and Impact on Value to Customer and Competitiveness
Ayman Bahjat Abdallah, Anh Chi Phan, Xue Shi, Yoshiki Matsui, Yokohama National University, Japan

RD202 Validation of a Methodology for the Implementation of Lean Manufacturing System in Selected Mexican Industrial Plants
Mariusz Bednarek, Luis Fernando Nino, Polythecnical University of San Luis Potosi, Mexico

Session: Teaching innovation in POM 3 Track: Teaching Innovation Chair: José A. D. Machuca

RD305 About THENEXOM and its survey on Operations Management, Supply Chain Management and Service Operations Management
José A. D. Machuca, Macarena Sacristán-Díaz, Rafaela Alfalla-Luque, Antonio Moreno-Moreno, University of Seville, Spain

Session: Knowledge management 3 Track: Knowledge and Technology Management Chair: Dian Yan Liou

RD401 Factors Affecting Business Process Reengineering in China
Xin James He, Fairfield University, U.S.A.

RD401 Proposal and Validity of Patent Evaluation Method
Koichiro Anabuki, Haruhiko Kaneta, Manabu Yamaji, Kakuro Amasaka, Aoyama Gakuin University, Japan

RD401 Complementarity in Innovation Strategies and Innovation Performance: Evidence from Spain
Ana M. Serrano Bedia, M. Concepcion Lopez Fernandez, Gema Garcia Piqueres, University of Cantabria, Spain

RD401 Dynamic Guanxi (Relationship) in High-Tech Firms for Knowledge Transfer and Decision Making
Dian Yan Liou, Yu Da College of Business, Taiwan

Session: Supply chain risk management Track: Invited Chair: Arvinder P. S. Loomba

RD402 Global Supply Chains and Risk: Petroleum Supply
Richard O. D. Lane, University of Queensland, Australia

RD402 Managing Risk by Sorting before Product Recovery in Reverse Value Chains
Kenichi Nakashima, Osaka Institute of Technology, Japan
Arvinder P. S. Loomba, San Jose State University, U.S.A.

RD402 HRM Implications of External Risks to Firms in Supply Chain
Carol Reade, San Jose State University, U.S.A.

RD402 Risk Management in Modular Supply Chain Structures
Arvinder P. S. Loomba, San Jose State University, U.S.A.

Session: Modeling: SCM optimization 3 Track: m-Supply Chain Management Chair: John J. Liu

RD403 Supplier Selection and Order Allocation using MAUT and LP
Amir Sanayei, M. Reza Abdi, S. Farid Mousavi, Bradford University, United Kingdom

RD403 Supply Chain design based on the QFD and AHP approaches
Uche Okongwu, Toulouse Business School, France

RD403 Organizing Supply Chain by Integrating of Manufacturing Planning and Control Systems
Ayako Kawai, Ryo Sato, University of Tsukuba, Japan

RD403 QVI Characteristics of Risk-Pooling in Port-Focused Logistics
John J. Liu, Kevin X. Li, Jiguang Laser Yuan, Hong Kong Polytechnic University, Hong Kong

Session: Modeling: Batch sizing and inventory management Track: m-Inventory Theory Chair: Tej S. Dhakar

RD405 Optimal Logistics and Inventory Policies in a Serial Supply Chain with Variable Number of Batches and Mixed Batch Shipment
Yu-Cheng Hsiao, Wen-Tsung Ho, Takming University of Science and Technology, Taiwan

RD405 Stochastic Model for a Single-Vendor Single-Buyer Integrated System with Mixed Batch Shipment Policy and Variable Safety Factor
Wen-Tsung Ho, Yu-Cheng Hsiao, Takming University of Science and Technology, Taiwan

RD405 Solving the Unconstrained Multi-Level Dynamic Lot Sizing Problem with a Database
Dong-Shang Chang, National Central University, Taiwan
Fu-Chiao Chyr, Chang Jung Christian University, Taiwan
Fu-Chiang Yang, National Central University, Taiwan

RD405 Efficient Heuristics for Determining Near-Optimal Lot Sizes for MRP Systems
Tej S. Dhakar, Southern New Hampshire University, U.S.A.
Charles P. Schmidt, University of Alabama, U.S.A.
Takayoshi Tamura, Nagoya Institute of Technology, Japan

Session: S-Knowledge and technology management Track: Spanish Chair: Eva Martinez-Caro

RD501 Integrating Knowledge and Technology for Competitive Advantage: An Analysis of Two Different Approaches
Eva Martinez-Caro, Technical University of Cartagena, Spain

RD501 The Impact of e-Business on Capital Productivity: An Analysis of the UK Telecommunications Sector

Eva Martinez-Caro, Juan Gabriel Cegarra-Navarro, Technical University of Cartagena, Spain

Session: Modeling: Marketing and operations interface Track: m-Marketing and Operations Interface Chair: Rick So

RD503 Behavioral Experiments on Dual Sales Channel Management
Murat Kaya, Sabanci University, Turkey
Ozalp Ozer, Stanford University, U.S.A.
Kay-Yut Chen, Hewlett Packard Laboratories, U.S.A.

RD503 Optimal Promotion Decision Balancing Control of Promotion Effectiveness and Competency in a Market
Hisashi Kurata, International University of Japan, Japan

RD503 A Stochastic Approach to Diffusion Model with Asymmetric Influence
Naomichi Suzuki, Masatoshi Tanaka, Kazuhiro Kasai, Kijung Sung, Matsumoto University, Japan

RD503 The Effect of Supply Reliability with Joint Marketing and Inventory Decisions
Rick So, Shaoxuan Liu, Fuqiang Zhang, University of California - Irvine, U.S.A.

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■Tutorials and Panels

TC402 Tuesday, 13:40-14:55 Track: Tutorial Chair: Hirofumi Matsuo
Room: W2-402 Session: Seven-Eleven Japan: SCM and Product Innovation

TC402 Seven-Eleven Japan: SCM and Product Innovation
Hirofumi Matsuo, Kobe University, Japan
Seven-Eleven Japan Co. Ltd. (SEJ) is the largest convenience store chain in Japan. Its total store sales in 2006 is 2,533 billion yen, and the number of stores is 11,735 as of February 28, 2007. Remarkably, SEJ generates, with the same floor space, 20% more customer traffic and 10% more spending per visit than Lawson, which is the closest convenience store competitor. This talk sheds light on why this difference exists from two angles. First, SEJ's supply chain is described with a particular attention on how fresh products can be sold within twenty four hours after their production while their supply chain costs are kept at the minimum. Then, SEJ's efforts in drawing customers into their stores are discussed. SEJ refreshes its store impression by continuously developing original products through collaboration with manufactures. The concept of sales process innovation and supply chain innovation is introduced to explain its innovative new product development that is difficult for competitors to imitate.

WC401 Wednesday, 13:40-14:55 Track: Tutorial Chair: Vinod Singhal
Room: W2-401 Session: Using secondary data in OM Research

WC401 A Tutorial on Using Secondary Data in Operations Management (OM) Research: Overview and Research Opportunities
Vinod Singhal, Georgia Institute of Technology, U.S.A.
Operations Management (OM) researchers have started using secondary data to link operations decisions to shareholder value and operating performance. This tutorial will provide an overview of how to use secondary data in OM research. It will discuss data sources that are available, the research methods and statistics for use with secondary data, and an approach for carrying out this research. Basics of the event study methodology will be discussed. An application that uses this approach will also be discussed.

RA303 Thursday, 8:30-9:45 Track: Invited Panel Discussions Chair: Brooke Saladin
Room: W2-303 Session: Panel Discussions: RFID

RA303 Research and Applications of RFID in Goods and Services
Brooke Saladin, Wake Forest University, U.S.A.
David Collier, Florida Gulf Coast University, U.S.A.
Kurt Hozak, Indiana State University, U.S.A.
Kirk Karwan, Furman University, U.S.A.
Radio frequency identification devices (RFID) and technology is experiencing rapid adoption in a wide variety of applications such as in manufacturing, health care, and supply chains. This session will focus on RFID research and applications in factories, services, and supply chains. Research results are presented on the impact of RFID on transfer lot and sequencing decisions using performance criteria such as flow time, tardiness, and number of material movements in a job shop operating environment. RFID applications are also presented in service systems such as in health care and retail stores. We end the session by summarizing RFID applications across the entire supply chain.

RC301 Thursday, 13:40-14:55 Track: Tutorial Chair: Kakuro Amasaka
Room: W2-301 Session: Science TQM - Toyota's New Strategy

RC301 Science TQM - Toyota's New Strategy
Kakuro Amasaka, Aoyama Gakuin University, Japan
In this tutorial, the author proposes “Science TQM”, a new quality management principle. This principle consists of the “Total Development System, TDS”, “Total Production System, TPS”, “Total Marketing System, TMS”, “Total Intelligence Management System, TIS”, and “Total Job Quality Management System, TJS”. It aims to realize an integrated form of a next-generation management strategy. Furthermore, this paper demonstrates how the utilization of “Science SQC” and a “Strategic Stratified Task Team” contributes systematically and organically to solving quality management problems. Its validity has been verified through its application within the Toyota Motor Corporation, Toyota group companies, and others.

■Abstracts

TA202	Tuesday, 8:30-9:45	Track: New Product Development	Chair: Munehiko Itoh
	Room: W2-202	Session: New product development 1	

TA202 Managing New Product Platform Development

Martin Skold, Stockholm School of Economics, Sweden
Christer Karlsson, Copenhagen Business School, Denmark

Product platforms have become a central strategy to handle diverse and rapid new product development. The necessity of managing product platforms is increasing since mass production activities and product variation offerings are fundamental dimensions of business activities (Mikkola, 2006). Hence, platform strategies are an obligation in undertaking efficient product development in almost every industry today (Holmqvist, 2004; Sawhney, 1998). However, managing new product platform development is a challenging strategy (Halman, 2003). One defy is to manage commonality and distinction as two poles in a joint and all-embracing goal (Robertson, 1998). Another is to develop new platforms within organizations where platforms already exist (Skold, 2007). Strange to say, managerial challenges is an underestimated perspective, and previous research is foremost focusing platform development from a strategic, technological or organizational perspective (Muffatto, 1999; Muffatto, 2000).

This paper complements previous research by identifying managerial challenges when developing new product platforms. Findings from a thirty-six month in-depth clinical field study identify three areas of managerial challenges. The first (1) is the importance of determining boundaries of product platforms in terms of defining platform 'width' and 'height'. A second area (2) deals with development sequences. To this subject critical issues are to determine if development efforts should start from a product high-tech or low-tech point of view. The third area (3) is to decide the accurate number of product platforms to develop. The literature-base derives from two fields that are combined. A first field of references originates from innovation and operations management literature. A second derives from the field of strategic management. The combination of the two fields offers possibilities to undertake a complementary perspective of managerial challenges of new product platform development. Data methods such as participating observation interviews, workshops, and documents are the prime sources of data.

TA202 Is There an Array of Strategic NPD Best Practices and Implementation Patterns That Contributes to Companies' Innovation Performance in an Efficiency-Driven Economy? A Case Study in Chile and Argentina

Luis Domingo Dambra, Roberto Rafael Luchi, Santiago Gallino, Austral University, Argentina

Innovation- New Product Development (NPD) and the best practices (BP) (Kahn, 2006), are considered to be core sources of sustained competitive advantage and growth (Barney, 1991). Our research is an empirical cross-case study, which aims to study BP in firms operating in economies in Stage 2 and Transition from Stage 2 to Stage 3 of development (e.g. Hungry, Poland, Argentina) according to the WEF's competitiveness classification (Lopez-Claros, 2006). A framework to array best NPD practices and effective implementation had been developed based on more than twenty-five Chilean and Argentinean companies. The objective is to clarify the contribution of best NPD practices to firms' innovation performance (IP).

The best NPD practices were selected after a careful study of literature (Dooley 2002; Cooper 2004) and have been distributed in three dimensions: internal networking, development of innovation strategy and external networking. Innovation performance has been measured in terms of a) frequency of firm's new product launch; b) innovativeness of new products. Although BP has demonstrated to be associated with performance improvement through broad real-life implementation, no single practice can guarantee success. The effectiveness of BP strongly depends on implementation context and its strategic impact (Eisenhardt & Martin, 2000). CEOs of the case-studies firms were asked to characterize the implementation (Szulanski, 1996) of the best NPD practices on the basis of 5-point Likert-scale. Some of the dimensions used are: a) perceived contribution of each practice to the IP; b) mechanisms used to incorporate each practice; c) degree of involvement of the organization, resources assigned and the hierarchy of the implementation leader.

Our main theoretical and managerial contribution highlights that the impact of the best NPD practices on the IP depends on a balance between strategically selected practices and implementation pattern of the practices. To our knowledge, little research has been done on the contribution of best NPD practices to the firms' IP in efficiency-driven economies. Thus, we expect this paper will encourage scholars and practitioners to further explore this field.

TA202 Decision Making for Innovation under Uncertainty

Samir Dani, Neil Burns, Chris Backhouse, Loughborough University, United Kingdom

Uncertainty exists in many forms. Organisations and production systems have to cope with a various types of uncertainty. For example, for a production system: environmental uncertainties can typically be variations in demand amplitude, production mix of products; internal uncertainties can be failures of machines, absenteeism of people and implementation uncertainties are typified by a lack of knowledge in connecting with the difficulties associated with the implementation process. Production schedules are much easier to guarantee in situations of certainty and organisations strive to either control the uncertainty, to filter it out or to live with it and perhaps thrive on it. The company can adopt a strategy that is adaptive in that it attempts to build agility and quick reconfiguration of processes in the face of uncertainty. It can also adopt a strategy of filtration removing uncertainty as far as possible by the company boundary spanning departments (sales, purchasing, quality control and others) essentially filtering out sources and manifestations of uncertainty. By doing this the company ensures that the production environment operates in a certain world making scheduling easier and more reliable. Alternatively, the company can operate a shaper strategy where it attempts to shape the environment that it operates in to reduce the sources of uncertainty. These three strategic orientations can be combined with different solutions being adopted for different value streams. The systems used in a certain environment, often typified in a lean company, include Standard Operating Procedures (SOPs), schedule stability, potential for automated systems together with measurements of the work-force to optimise behaviours. If the company decides to live with and thrive on the uncertainty, completely different systems are needed, for example, decision support systems, output measures because behavioural controls are difficult to use and agile quick re-configuration systems are required.

This paper discusses uncertainty and uncertainty filtration strategies and also discusses the effectiveness of boundary

spanning activities, positing methods of measuring the effectiveness of departments, in filtering out uncertainty. The discussion is focussed around the selection of strategic processes leading to innovation. The paper also revisits the "Garbage Can" model to check for its usefulness in today's innovation driven world.

TA202 Innovation Impacts in the Digital Equipment Industries: Corporate Strategies to Avoid Commoditization
Munehiko Itoh, Kobe University, Japan
The purpose of this paper is to deduce the mechanisms that cause commoditization, and to clarify their impact on the price of product innovation activities. The technologies and product development activities of companies generate a variety of novel qualities, and these are then offered to consumers. Yet not all qualities necessarily foster value and utility for users. This type of product development risk is explained by the concept of market uncertainty. Innovation results in value creation in the form of product quality; innovation also engenders a price premium, and is thus an activity linked with a company's value acquisition. This type of innovation is extensive in the digital equipment industry. On the other hand, commoditization occurs, and such commoditization is related to the phenomenon of insufficient profits for a company.

In the present research, Hedonic analysis is performed using POS data on notebook computers to find a quality-adjusted price index. The present research also made it clear that incremental improvements of quality and performance played an important role in price changes for digital equipment. Since digital equipment is modular with an open product architecture, horizontal specialization can readily occur within the industry structure. Within such an industrial structure, only those companies that acquire a price premium through rapid market placement will gain a profit, while companies that lag behind in product-to-market placement will find it difficult to gain a profit. In this type of configuration, one can estimate the power structure that will be formed between set companies and parts and module companies. In the case of notebook PCs, it was suggested that the decline in transaction price was less for companies that supply parts and modules that can be incrementally improved, and thus have a strong impact on price (e.g., liquid crystal displays, CPUs, OSs), than for companies that supply parts and modules having a weak impact on price (e.g., HDDs, memory media, memory cards, etc.). The horizontal specialization model has the advantage of being able to avoid the risks inherent in developing the most advanced parts and modules, as such risks can be dispersed within the relational structure formed between companies and their suppliers.

TA301 Tuesday, 8:30-9:45 Track: Service Operations Management Chair: Joakim Wikner
Room: W2-301 Session: Product-service systems 1

TA301 Product-Service Systems: State-of-the-Art and Future Trends
Ashutosh Tiwari, Tim Baines, Howard Lightfoot, Essam Shehab, Mark Johnson, Steve Evans, Joe Peppard, Cranfield University, United Kingdom
A Product-Service System (PSS) is an integrated product and service offering that delivers value in use. This embraces a service led competitive strategy focusing on the 'sale of use' rather than the 'sale of product'. This concept originated in Northern Europe in the late 1990s and, to date, there is a diverse range of PSS examples in the literature with some demonstrating economic success but most tending to emphasise significant environmental and social gains. An illustration of a PSS is the Total-Care Package in which Rolls-Royce lease out "power-by-the-hour" to the airlines.

The aim of the research presented in this paper is to identify, interpret and summarise the literature currently available on PSS within a wider manufacturing context. The literature is classified and the major outcomes of each study are addressed and analysed. On this basis, this paper defines the PSS concept, reports on its origin and features, gives examples of applications along with potential benefits and barriers to adoption, summarises available tools and methodologies, and identifies future research challenges.

The findings in this paper provide a useful basis for more in-depth research. The paper confirms that PSS solutions provide routes for companies to move up the value chain, exploit higher value business activities, and decouple environmental pressure from economic growth by focusing on asset use rather than on asset ownership. There are however some key barriers to the adoption of PSS, such as the lack of regulatory drivers and little enthusiasm for ownerless consumption. The principal issues also concern the lack of well developed tools and methodologies that can provide manufacturers with a business wide guide for the implementation of PSSs. Here, of particular benefit would be a geographical widening of the research community and an increased contribution from authors in Manufacturing, Engineering, Design and Management.

TA301 Industrial Service Capability: Building a New Organisational Approach to Developing Service Business
Sanna-Kaisa Ilomaki, Maaria Nuutinen, VTT Technical Research Centre of Finland, Finland
The purpose of this paper is to describe the concept of industrial service capability. The new concept is key building block in an approach for analysing and supporting the change in manufacturing companies towards industrial service business.

Manufacturing companies are increasingly investing in building industrial services. Typically industrial services are developed as an extension to products, for example to support the life cycle maintenance of products. Nowadays, it is not uncommon that companies would also invest in developing services outside their traditional product business area. The transition of the companies from product provider to service provider can be considered as a stepwise strategic development. Entering the level of service partnership requires strategic changes in the business models and service offerings, but also intentions to build industrial service capability. Understanding the changes needed in management practices, organizational culture and competence development is crucial for the development of service capability.

Industrial service capability in our study is seen as a particular form of organisational capability. Organisational capabilities are collective and often used to address complex organisation-wide processes, such as customer relationship management, supply chain management or, in our study, service management. The concept of industrial service capability integrates the theoretical perspectives of product service systems, service quality, service management and organisational culture. Building industrial service capability reflects two basic dual dimensions; one related to focusing on customer needs at the same time with companies own operational culture, and the other dimension related to finding a balance between strategic and operational development efforts during the transition towards services. Industrial service capability in our study forms a conceptual basis for evaluation and development models used to lead the organisational change towards service operation in manufacturing companies. Development of

service capability is systemic nature, demands multi-level and cross-functional collaboration and structures to support both business pilot and continuous development strategies.

TA301 Quotation Management and Customer Service

Yan-Chong Chan, City University of Hong Kong, Hong Kong

For most of the manufacturing company, the customer may firstly contact the company's salesperson, supplying their details of proposed order including device items and quantities, and then ask for the price to be quoted by the company. The company may record the request for quotation which we may call this as Request for Quotation (RFQ). Then these RFQ entries will be routed to corresponding parties: one to the production control section to determine whether the production schedule has any slack for the order, and another one to marketing section to determine the price and terms offer to the customer. The customer may receive quotation in the next few days. Then the customer may or may not place order in given terms in any time within the time stated by the quotation. Since there is an uncertainty of placing or not placing order, the company may have to balance the interest of production and marketing. The production may have to reserve some time lot for the RFQ which may or may not turn into order. If the production department only plans their schedule after the actual order arrives without any reserve, they may face the problem of delivery in time; this means poor customer service.

The objective of this study is to set up a system to offer an integrated suggestion. The study was based on a case study of Motorola Semiconductor Hong Kong Ltd. Basically, this is an integrated priory with "Hit" rate, order size and weighting of customers as the factors for consideration. The Hit Rate may be defined in terms of business volume or in number of RFQ entries. It is important to study the performance of individual customers. There are several areas to be studied: the number and volume of RFQ submitted by a customer, the number and volume of confirmed order submitted, the length of time lags between the RFQ and corresponding order, how much of resource spent by a customer and how much of sales generated, and the Hit Rate. Considering the customer located in different region group, an analysis was run to check if there is any difference in performance, in terms of customer base size, transaction volume, and Hit Rate, among the four regions. The customers were then grouped together according to the above factors. Fuzzy Clustering technique was employed.

TA301 An Integrative Framework for Manufacturing and Service Activities

Joakim Wikner, Jonkoping University, Sweden

Operations and logistics are all about performing value adding processes to create customer value. The value is delivered in terms of products that constitute a combination of goods and services. In some industries the focus on the service aspect is dominating which has generated service management as a separate field of knowledge. A closely related area, from a conceptual point of view, is the concept of the closed-loop supply chain but in the literature they live almost completely separate lives. Operations management has traditionally emphasized the goods aspect and to a large extent avoided the influence of services. Partly this is due to the definition of services with its foundation in traditional service industry. The goods and service aspects of the offering could however be treated as an integrative whole joined by the value adding processes that are focusing on offering a value match with the needs of the customer. Taking a process approach, it can be shown that there are three key components in the value match. The value driven consumption system closely interacts with a demand driven and service based supply system that is eliminating the value mismatch with the output from the forecast driven and goods based supply system. The differentiator between the goods based and the service based system is referred to as the service decoupling point (SDP) which provides an excellent foundation for defining the key areas of operation. Operations management can then be seen as a holistic approach focusing on goods management before the SDP and service management after the SDP providing the necessary support for closing the product mismatch. Using this definition of services may among many things sharpen the customer focus in demand driven manufacturing and provide better transparency into the management of demand vs. forecast driven activities in what usually is referred to as service industries.

TA302 Tuesday, 8:30-9:45 Track: Invited Chair: Edward James Flynn
Room: W2-302 Session: High Performance Manufacturing 1

TA302 Lean Bundles Implementation and Performance Improvement: An Empirical Analysis

Giorgia Dal Pont, Andrea Furlan, Andrea Vinelli, University of Padova, Italy

Literature defines lean production as set of integrated socio-technical practices aimed at eliminating wastes along the whole value chain within and across companies (Womack et. al, 1990; Holweg, 2007). Researchers maintain that it is the implementation of the whole set of lean techniques that leads companies to high performance, due to the synergistic effects among practices (Schroeder and Flynn, 2001). However most of the empirical studies focus on the relationship between individual practices and performance rather than considering performance improvement due to the implementation of a set of lean practices.

The aim of our research is to study the implications on company's performance of lean bundles implementation (Shah and Ward, 2003 and 2007). We seek to answer the following research question: does the full implementation of all the lean bundles, compared to a partial implementation of them, lead to superior performance? The underlying belief is the existence of some empirical relations between the kind and number of implemented bundles and operational performances.

We run statistical analysis using the High Performance Manufacturing round III database, a WCM survey that involves 238 plants in eight countries (Austria, Korea, Finland, Germany, Japan, Italy, US, Sweden) across three different industries (auto suppliers, machinery and electronics). We follow a three-step procedure. Firstly, we employ a step-wise regression to identify the lean practices that actually contribute to the relevant operational performances (i.e. quality, dependability, speed, flexibility, and cost). Secondly, we use factor analysis to cluster the practices identified in the previous step into lean bundles, comparing them to those identified by Shah and Ward (2007). Finally, we run appropriate regression analyses to test how the kind and number of implemented lean bundles affect operational performances. Our study offers original contributions both to academicians and practitioners. On the one hand, we contribute to refine the definition of lean bundles and provide empirical evidence on the existence of the synergistic effects among lean bundles. On the other hand, we advance a guide to those firms that need to go lean and to those that have already introduced some lean techniques but without enjoying satisfactory performance

TA302 Manufacturing Strategy Alignment

Jan Olhager, Mattias Hallgren, Martin West, Linkoping University, Sweden

The competitive positions of manufacturing firms is typically considered to stem from the strategic alignment between market opportunities and manufacturing abilities; the foundation for manufacturing strategy. In this paper we investigate the role of alignment in a broader sense, including the business strategy. We review the concept of alignment between business strategy, manufacturing strategy, and other functional strategies, and develop a conceptual model linking alignment to manufacturing strength and operational performance. We test this model with data from the High Performance Manufacturing study; a total of 238 plants from three industries and eight countries.

TA302 Looking for Effective Cross-Functional Integration Strategies

Virpi Turkulainen, Helsinki University of Technology, Finland

Cross-functional integration has received great attention in Operations Management for example in the context of new product development. Majority of the prior research has focused on empirically assessing the performance implications of various integration mechanisms such as information systems, managerial job rotation, and reward systems. The underlying assumption has been that more investments in integration mechanisms lead to better performance. Although important, this perspective tends to ignore that the use of integration mechanisms is likely to be more important in some situations than in others. Furthermore, majority of the prior research has addressed integration mechanisms individually, whereas, the research on integration strategies (configurations of integration mechanisms) is limited.

In this paper, we start with the assumption that integration is an investment and that the importance of it varies from context to context. According to the early structural contingency theorists (e.g., Lawrence and Lorsch, 1967), in effective organizations, there is a fit between the requirements for integration and the use of integration mechanisms. In this paper, we exploratively look for different integration strategies. Our aim is to find effective integration strategies under various initial conditions of integration requirements. We address these issues with a sample of 236 High Performance Manufacturing plants in three industries (electronics, metalworking, and transportation) and eight countries (Austria, Finland, Germany, Italy, Japan, Korea, Sweden, and USA).

TA302 The Effect of Project Complexity on New Product Success: A Study of Three Mediators

Jeff Yeung, Xiande Zao, Zhiqiang Wang, The Chinese University of Hong Kong, Hong Kong

New product development (NPD) is very important for a company's growth and prosperity. However, there is great risk in new product development because of the complexity of managing the process of new product development and high probability of failures. Part of the reasons has been attributed to the lack of information and knowledge. As key resources of information and knowledge, supply chain involvement activities in NPD are crucial to the outcome of new product development. Previous studies have viewed this issue from different theoretical lens, such as resource-based view or relationship marketing.

In this study, we apply organizational information processing theory to investigate the impact of fit between product development project complexity and supply chain involvement activities on product development project performance. The third round High Performing Manufacturing (HPM) data which include recent data from China are used to test the proposed model and the related hypotheses. The results show that there is close fit between the project complexity and supply chain involvement activities. In addition, the fit between project complexity and supply chain involvement activities has a significant impact on product development performance, which supports the organizational information processing theory in the new product development context from supply chain perspective.

TA303	**Tuesday, 8:30-9:45**	**Track: Marketing and Operations Interface**	**Chair: Taeho Park**
	Room: W2-303	**Session: Empirical research on marketing interface**	

TA303 Defining Marketing Practices of Small Family Business of First and Second Generation Management

Panagiotis Kyriazopoulos, Irene Samanta-Rounti, Graduate Technological Education Institute of Piraeus, Greece
Konstantinos Terzidis, Graduate Technological Education Institute of Kavala, Greece

Purpose: The objective of this research is to investigate the reasons behind the use of the particular marketing practices of first and second generations in a family business. More specifically, we investigate the areas on which the management of different generations should focus if they are to gain a competitive advantage in the new economy.

Design/methodology/approach: Primary data of a non-probability sample of respondents convenient to the researchers were collected with the use of a structured questionnaire. Data were collected from a database of 6854 small family retailing and services firms from the Chamber of Commerce in Athens and Piraeus. We contacted 685 firms -10% of the total population- and obtained a response rate of 55.5% (n=380), using personal interviews of owner/managers of first or second generation.

Findings: According to the findings, economic recession takes a leading role in the planning of the family business's strategy - reduction in demand, high competitive prices, profits and revenues are matters that concern the majority of the businesses. The results show that from the first generation's point of view the marketing practices are limited, informal and unstructured, which means that they cannot adapt to the sensitivity of the new economic cycle, while the second generation focuses on an independent policy with a specific sales strategy, new customer relationships and international activities. It is clear that small family businesses should focus on the areas where bigger firms face problems in order to create a competitive advantage.

Managerial implications: Family small business firms have the advantage of tailor-made production, individual customer relationships and a combination of quality and pricing policy

Originality/value: The significance of the current research can be traced to the fact that formerly there have not been any reviews undertaken in Greece emphasizing small family businesses that differentiate from first and second generation.

TA303 Investigating the Interface between Service and Manufacturing Strategy in Mid-Range Manufacturing Firms

Geum Young Min, John Mills, University of Cambridge, United Kingdom

While the traditional manufacturing strategy has focused on management of the product production process and new product development, a marketing strategy has been designed to identify the market opportunities and fill the customer needs. Within the field of the marketing strategy services represent one mechanism through which manufacturing firms can improve the attractiveness of their products to customers. As there have been differences between the scope of the manufacturing strategy and the marketing strategy, services have also been treated as distinct from the manufactured goods. However, the disruptive market changes brought

about by globalisation and electronic communications has led to the traditional boundary between services and manufacturing becoming less distinguishable. As a response to these market changes, academic attention has turned towards examining the convergence between the service and manufacturing sectors and the study of the interface between service operations and production operations. Yet research into this field has neglected to analyse those firms which provide both service and production elements in their offerings. As a consequence, academic research has yet to provide a generalisable framework which can be applied to these mid-range firms.

In this paper, we examine the interface between marketing and operations by investigating how service concepts have been developed and managed in these firms. Employing a case study methodology in the European motorsport sector, 15 firms are selected for analysis. We study how they have changed their service offerings over time, what is the cause behind these changes, and how services are provided in the organisation. By observing the history of the company we discover that those firms which are intrinsically motivated to provide services are more likely to be competence-enhancing and gain a sustainable competitive advantage than those firms which are extrinsically motivated. In addition, we suggest that the service and production operations are interdependent to one another. On the basis of these findings we develop a framework that categorises service strategy in manufacturing firms, a first step towards the development of appropriate theory for services in mid-range manufacturing firms.

TA303 Business Development Strategies in Industrial SMEs

Mika Westerlund, Jaakko Aspara, Joel Hietanen, Helsinki School of Economics, Finland
Seppo Leminen, Laurea University of Applied Sciences, Finland
Erik Pontiskoski, Joonas Rokka, Helsinki School of Economics, Finland

This paper analyzes the antecedents and diversity of development strategy in industrial SMEs. Various strategies and their application are suggested in the industrial marketing literature. To achieve superior top-line results, a company must know how to grow, get the right people, partner effectively, and position its production and sales resources efficiently in its operations. McWilliams et al. (2001) point out that the ability of managers to draw from multiple human resource pools creates competitive advantage and becomes a central tenet in strategy development. Moreover, building a strong brand name and enhancing customers' long-term loyalty are goals for firms (Wilcox & Gurau 2003). Yet, much of the extant research focuses the development strategy of large firms and little is known about its drivers in small and medium sized firms (SME).

For the purposes of our research, a set of quantitative data from one thousand industrial SMEs was collected through an online survey (n=91). The factor analysis revealed three factors (KMO=.844; P=.00; Cronbach's alphas >.74) that reflect firms' point of interest. These factors are: development of business support systems, development of international supply, and development of production management. The K-means cluster analysis resulted in a three-group solution (P<.05) that can be logically interpreted. Firms can be categorized into three groups by their business development strategy: (1) production excellence seekers, (2) global operations establishers, and (3) international sales facilitators. The groups differ by their essential characteristics and were further analyzed through ANOVA. Our results suggest that the valuation of brands, the extent of networking, and the degree of global competition in the industry are significant explanators (P<.05) of diversity in industrial SMEs' business development strategy. Surprisingly, the intensity of customer care does not explain the diversity.

TA303 An Empirical Study on the Manufacturing and Marketing Interface in a Supply Chain

Taeho Park, San Jose State University, U.S.A.
Changho Kim, Nam Seoul University, Korea
Minho Lee, Korea University, Korea
Ming Zhou, San Jose State University, U.S.A.

Companies are striving to establish an effective supply chain system to satisfy customer demands on time. This supply chain system connects suppliers through all functions in a company to customers. Research on supply chain management has heavily focused on an inbound supply chain between a supplier and a manufacturer, an outbound supply chain between a manufacturer and a customer, and an internal supply chain within a manufacturing company relating to material flows in a production facility, inventories and their control, quality, and so on. However, to achieve the ultimate goals of a supply chain system, companies should have effective communication and collaboration among the various links in their supply chains as well.

This research is to focus on the interaction between the manufacturing and marketing departments in terms of communication and collaboration. Marketing and manufacturing departments at a company have usually paid attention on their own goals and objectives. For example, while the manufacturing department focuses on stable production quantity and schedule, cost reduction, quality improvement, productivity improvement, etc., the marketing department is interested in customer satisfaction, on-time delivery, increase in sales and profits, new product introduction to the market, etc. Consequently, their relationship may affect the performance of a company's business negatively or positively. Thus, this research has studied on the impact of the communication and cooperation between the two departments on on-time delivery, product quality, customer service, and new product development, subsequently on sales and profits, through a survey with 170 responses from manufacturing companies. Structural equation modeling shows that close communication and high cooperation between the manufacturing and marketing departments result in better supply chain system performance and higher sales and profits.

TA401 Tuesday, 8:30-9:45 Track: Manufacturing Strategy Chair: Sakun Boon-itt
Room: W2-302 Session: Empirical research on manufacturing strategy 1

TA401 The Impact of Corporate Strategy on Operations Practice

Keah Choon Tan, University of Nevada, Las Vegas, U.S.A.
Tritos Laosirihongthong, Thammasat University, Thailand
Vijay R. Kannan, Utah State University, U.S.A.

A key element of successful organizations is the alignment between strategy and tactics. We explore the relationship between a firm' competitive strategy as it relates to the breadth of markets and customers it serves, operations tactics, and operational performance. Two competitive strategies were examined; a niche market strategy characterized by targeting specific customer/market groups, and a broad market strategy characterized by serving a broad range of customers and market segments.

Three sets of operations practices consistent with sustainable value creation and continuous improvement were examined; process management practices based on lean manufacturing principles, workforce related practices consistent with the principles of TQM, and inter-organizational relationship development practices consistent with the underlying premise of supply chain management to leverage information flows. Using data from managers in Thailand, hierarchical cluster analysis was used to partition firms based on their strategic orientation. Regression analysis was used to identify significant relationships between strategy, operations practice, and operational performance, measured in terms of on time delivery, efficiency, and customer satisfaction. A structural equation model was then tested to explore specific relationships between the variables of interest.

Results demonstrate that for firms adopting a niche strategy, corporate strategy directly influences process management and relationship development practices, which in turn positively influence workforce commitment. It is through workforce commitment that corporate strategy, process management, and relationship development impact operational performance. For firms adopting a broad focus, corporate strategy directly influences workforce commitment, which in turns influences process management and relationship development practices. It is these practices that directly influence operational performance.

TA401 Operation Strategies and Performance: Empirical Study of the Thai Automotive Industry

Tossapol Kiatcharoenpol, Srinakharinwirot University, Thailand
Kaewta Rohitratana, Tritos Laosirihongthong, Thammasat University, Thailand

Manufacturing companies are confronting pressure due to more sophisticated markets, changing customer needs, and flat world competition. With globalization and regionalization, broadening the marketplace, and increasing competition, customers are placing greater demands on manufacturers to increase quality and flexibility while maintaining or decreasing costs.

This paper presents findings of an empirical survey on operation (manufacturing) strategies implementation in the Thai automotive industry that has been considered as one of the most important manufacturing sectors, contributing significantly to employment, gross domestic product (GDP), and export values. Research question is on the extent to which operation strategies are implemented and their impact on firms' performances. This question is examined by using data obtained from 50 automotive manufacturing companies in Thailand. This is counted as 32.7% response rate. Inferential statistics including factor analysis, correlation analysis, and multiple regression analysis was carried out to answer the research question.

The results of data analysis indicates that companies try to enhance the competitive priorities by implementing lean production and supply chain management, which has been categorized as an infrastructural operation strategies. In addition, the result of correlation analysis confirms that both strategies are related and supported to each others. Finally, only lean production shows a significance impact on operation performance including cost, delivery, and degree of customer satisfaction. Managerial implications are provided for both industry practitioners and policy makers in the country.

TA401 The Relationships between Manufacturing Capabilities: An Empirical Analysis in Thai Automotive Industry

Sakun Boon-itt, Thammasat Business School, Thailand
Chee Yew Wong, University of Hull, United Kingdom

Regardless of the importance of manufacturing strategy and capability, the relationship among manufacturing capabilities has been recognised as an important element of operations strategy. However, there are still a lack of full comprehension and limited empirical evidence in support of the precise nature and relationships between elements in manufacturing capability. Between the two suggested models from the literature, the cumulative (or sand-cone) model appears to be more sensible as oppose to the trade-off model. Furthermore, as technology uncertainty increases, the relationships among manufacturing capabilities can be affected. Understanding of the role of technology uncertainty is importance as it provides contingent to manage different countries or industries at different level of technology maturity.

Therefore, the objectives of this research are to develop and test hypotheses based on the cumulative model of manufacturing capability relationships and investigate how technology uncertainty affects such relationships. Based on quantitative investigation of 151 firms from Thai automotive industry using structural equation modelling (SEM), we reveal interesting relationships especially in supporting the cumulative model and the effect of technology uncertainty on these relationships. This study adds a new knowledge to the operations management by investigating the relationships and fills the gap in the literature on manufacturing capabilities. As a result, it takes the next step of trying to not only examine but also strengthen the relationships in the previous manufacturing capability model.

TA402 Tuesday, 8:30-9:45 Track: Supply Chain Management Chair: Elena Revilla
Room: W2-402 Session: Empirical research on SCM 1

TA402 A Knowledge Based View of Supplier Integration in New Product Development: An Empirical Study

Daesik Hur, Sunil Hwang, Yonsei University, Korea

Past studies suggested involving suppliers in new product development process has a positive effect in project execution success and product performance. Yet few study addresses when and why such collaborative efforts are necessary. We develop a model from a knowledge based view of the firm and empirically test using multi-country, multi-industry data from the High Performance Manufacturing survey.

TA402 Collaborative Innovation in Supply Chains: An Empirical Evidence

Veronica Villena Martínez, Elena Revilla, Daisy Escobar, Instituto de Empresa, Spain

Corporate emphasis on knowledge and knowledge-based capabilities as means to create value and achieve superior performance, demands supply chains that go beyond of the exchange of materials and information. Because individual firms no longer have the sole possession of knowledge resources, they increasingly rely on their supply chain for innovation. Supply chains are moving towards complex collaborative value networks, where partners share their knowledge to create new knowledge and innovation. With organizations more dependent of their inter-firms networks to innovate and develop competitive products and process, analyzing how the supply chain influences on innovation capabilities of committed partners is critical.

This research project uses the knowledge-based theory of inter-firm collaboration (Grant and Baden-Fuller, 2004) and the relational view of competitive advantage (Dyer & Singh, 1998) to examine the influence of supply chain on an enterprise's competitiveness. The central thesis of this project is that firms with superior integrative capabilities in their supply chain will

experience superior innovation performance and competitive advantage. This capability enables supply chain partners to integrate, build and reconfigure their capabilities to address rapidly changing environments. Higher supply chain capabilities are indicative of tighter integration and coordination within a firm and across its boundaries with its suppliers and customers. Accordingly, this research attempts to give answers to: 1. what are the components of the integrative capabilities at the supply chain level? 2. How are these components associated with greater supply chain partner success?

Proposed hypothesis are tested through analysis of surveys. Research methodology for the empirical analysis utilizes two essential steps. First, we use a cluster technique to categorize supply chain integrative capability according to joint operational versus strategic decision making. Next, we check variances in innovation (radical versus incremental). In order to do this, this study develops valid and reliable measures for each variable. Our results provide statistically differences in terms of innovation, indicating that successful supply chains require both, joint operational and strategic decision taking.

TA402 Disentangling Knowledge Integration in Collaborative Supply Chains: An Empirical Evidency

Elena Revilla, Veronica Villena, Daisy Escobar, Instituto de Empresa, Spain

The new rules of competition are moving from stand-alone firm competition toward supply chain competition (Christopher, 2005). Firms recognize that they do not possess the full range of resources and capabilities to design, produce and deliver the products and services that demanding markets require. They therefore seek to complement their weaknesses with resources and capacities offered within their supply chains.

The integration of suppliers, manufactures and customers is now seen as a key success factor in deriving competitive advantage from supply chains (Frohlich and Westbrook, 2001). This is due to integrated chains allows committed partners to reduce overall cost of supply, increase flexibility of processes and improve innovative capabilities.

In this regard, the process of integration has become more complex and requires more sophisticated management skills. In many cases, firms discover that their efforts to enhance supply chain performance fail, not necessarily because of lack of coordination or workflow disruptions, but because of a lack of cross-organizational or inter-specialty knowledge about problem constraints (Wadhwa, 2006). Integration has to occur on a conceptual level-beyond operational work.

Based on the knowledge-based theory of inter-firm collaboration (Grant and Baden-Fuller, 2004) and the relational view of competitive advantage (Dyer and Singh, 1998), this research explores knowledge integration at supply chain level. It aims to answer three research questions: 1. Which are social drivers that promote knowledge integration at the supply chain level? 2. What are the components of an effective knowledge integration at this level? 3. How these components are associated with greater supply chain success? We consider these issues very important since firms are now forced to re-examine the way they do business and increasingly they rely on inter-firm collaboration to achieve competitive advantage.

This study develops valid and reliable scales to measure all constructs and tests the hypotheses through OLS. Preliminary results show that three important social drivers (i.e. trust, commitment and learning culture) facilitate knowledge sharing within a supply chain, which is associated to improved supply chain capabilities in terms of efficiency, responsiveness and innovation.

TA403 Tuesday, 8:30-9:45 Track: m-Sustainable Management Chair: Malhotra Manoj
Room: W2-403 Session: Modeling: Sustainability

TA403 Disruption Risk Analysis of a Food Supply Chain

Monika Weishaeupl, Heidrun Rosic, Werner Jammernegg, Vienna University of Economics and Business Administration, Austria

At the moment, disruption risks are a heavily discussed topic. Thus, we examine a food supply chain regarding alternative mitigation strategies in case of a disruption using the method of simulation. Disruptions are delays with high impact on the performance of the supply chain but low probability of occurrence. For instance, this is a technical failure of a critical machine with long repair times or external influences like fire or extreme weather patterns. The mitigation of the impacts is usually difficult to handle. A distinctive feature of the supply chain under consideration is that the time during which the production campaigns take place is limited due to the availability of the raw material and the fact that the raw material is perishable. Another characteristic is that the primary product, which becomes non-perishable after production, is stored in hoppers before packaging. Demand for the end product occurs continuously over time. Therefore, completion and packaging of the product is based on both forecasts and existing orders. Particularly, the production and distribution system of the supply chain is centrally organized.

The initial step of making a supply chain more resilient in case of disruptions is to analyze the current state and indentify the existing risks. Risk assessment can be conducted in an empirical, analytical or system-oriented way. Different risk assessment approaches are compared based on their applicability and results. The next step is to define reasonable disruption scenarios on the basis of previous risk assessment. Simulation is applied to evaluate the mitigation strategies handling the situation in case of a disruption. These strategies range from decentralization of production and warehousing up to different sourcing options.

TA403 Optimal Ordering Policy for Cascade Reuse in Closed-Loop Supply Chain

Yuki Oshita, Yasutaka Kainuma, Tokyo Metropolitan University, Japan

Japan has undergone a long period of economic growth based on mass production and mass consumption, and mass disposal. As a result, Japan is facing environmental problem, such as resource constraints and depletion of mineral resources. A lot of companies tend to carry out remanufacturing system under these circumstances. The product reuse and parts reuse are the important business strategy.

In this paper, we develop the optimal ordering policy for cascade reuse of parts in Closed-loop Supply Chain. The manufacturer in the supply chain decides the order quantities of new parts and reuse parts on condition of minimizing manufacturer's total cost. We confirm the results of numerical examples show the efficiency of the proposal.

TA403 Models for Staffing and Worker Flexibility in Remanufacturing

Michael R. Galbreth, Manoj K. Malhotra, Patrick R. Philipoom, University of South Carolina, U.S.A.

Remanufacturing of used items is a rapidly growing industry, driven by factors such as extended warranties, environmental legislation, and high return rates from direct sales channels. In this paper we study the potential for innovative staffing and a flexible workforce to improve the performance of a remanufacturing facility. We describe models that can help remanufactures determine

optimal base staffing levels, overtime use, and dynamic worker assignments. Using parameters from a Hong Kong based cell phone remanufacturer; the models are shown to have the potential for significant reductions in both costs and throughput times.

TA501 Tuesday, 8:30-9:45 Track: Spanish Chair: Jordi Fortuny-Santos
Room: W2- 501 Session: S-Lean production

TA501 Operations Consultancy: The Case of an Industrial Bakery
Constantino Garcia-Ramos, Jose-Angel Miguel-Davila, University of Leon, Spain
The financial operations consultancy is currently a useful tool for companies' management, as it allows defining and developing operational decisions oriented to improve the productive process. In this sense, the operations consultant plays a key role, as he provides the necessary assistance to implement relevant decisions in order to establish the most efficient productive process. This paper attempts to show the consultancy work made for a company in the field of industrial bakery, located in A Coruna (Spain). The analysis was made in 2006, compiling data related to different strategic and tactic decisions related to the operations area. Several factors were considered as, for example, the design of products and processes, the location and layout of the factory, the inventories and quality control systems, and so on. The main results achieved in this study focus on a double goal. On the one hand, from an academic point of view, this work proves that case study is a useful research tool which can be applied by scholars. On the other hand, from a practical point of view, this consultancy has detected several weak points in the production process under review, and it has also proposed a series of improvements to increase the company's efficiency and flexibility.

TA501 The Applicability of Value Stream Costing (VSC) in Early Stages of the Maturity Path Toward Lean Manufacturing. Comparison with Activity Based Costing (ABC): A Case Study.
Patxi Ruiz de Arbulo Lopez, University of the Basque Country, Spain
Jordi Fortuny-Santos, Technical University of Catalonia, Spain
Many companies try to introduce lean manufacturing because this system promises improvements in quality, flexibility, cost and delivery. Nevertheless, traditional costing systems seem to work against the lean thinking (Ahlstrom and Karlsson, 1996; Womack and Jones, 2003) and operational improvements are not reflected in financial benefits. In consequence, the implementation of lean manufacturing requires methods of accounting aligned with its principles and strategies in order to effectively show the benefits of the lean efforts. This clash between traditional costing systems and lean management raises important research questions: - Do companies that adopt lean management principles and practices require a new cost management system? - How should such a system be? Much has been written about the problems related to accounting systems that focus on internal costs. Practitioners and academics agree on the need for change but there is not a real agreement on how they must be developed in order to enable and lead the transition to lean manufacturing (Ward et al, 2003, p59).

In our paper, by means of a case study, we present an analysis of the application of Value Stream Costing (VSC) (Maskell and Baggaley, 2003) in companies that are still in the early stages of the path toward lean manufacturing. We also compare VSC to Activity Based Costing. In literature we find how VSC is introduced when a company's lean manufacturing methods begin to be mature (VSC focuses on the cost of the value chains instead of isolated processes, helping the companies concentrate on the resources that are being used along the whole process) while the applicability of VSC in companies that still have not reached such an advanced level of maturity has not been analyzed yet.

TA501 Indicators for Lean Practices Implementation Initiatives at Process or Shop Floor Level
Jordi Olivella, Luis Cuatrecasas, Oriol Cuatrecasas, Jordi Fortuny-Santos, Technical University of Catalonia, Spain
Lean management implies the use of management indicators supporting its principles and strategies. The selected indicators must have the following characteristics (Maskell, B.; 1991): - A direct relationship to manufacturing strategy; - Non-financial measures are incorporated; - Different measurements for different areas of a company; - Simple, easy to use and provide fast feedback; - The measures change over time; - The measures are aimed at fostering improvement rather than simply monitoring.

Lean adoption initiatives can be classified according to their scope in: Cells and assembly lines, Shop-floor, Value stream and Value systems (Hines et al., 2004). In this paper, lean transformations at either the process or shop floor levels are considered.

When an enterprise-wide adoption is under scrutiny, general indicators (like overhaul lead time or the use of concurrent engineering) predominate. The adoption of lean at the cell or assembly line level needs more precise and direct measures. For lean adoptions at either the process or shop floor levels, a set of performance indicators must be defined. They must cover different analysis perspectives and fit the characteristics and circumstances of each particular case.
The indicators can be: 1.Global measures, as Cash flow, Productivity, Sales and Earnings. 2.Operational indicators, as Lead times, Inventories, Capacity, Overall equipment efficiency, Scrap and rework, Changeover times, Walking distances, Dock-to-Dock time, Build to schedule ratio, First time through, Material travel distance, Output, Crews size, Productivity, Floor space used and Overhaul cycle time. 3. Indicators referred to particular aims defined by top management according to the company priorities. 4.Organizational lean assumption indicators, as the referred ones to Training, Rotation, Suggestions, Improvement activities and Teams assumption of quality, production planning, maintenance, security and improvement tasks.

TA503 Tuesday, 8:30-9:45 Track: m-Logistics and Physical Distribution Chair: Rene B. M. de Koster
Room: W2-503 Session: Modeling: Vehicle Routing Problem 1

TA503 Distribution Systems Design with Two-Level Routing Considerations
Jenn-Rong Lin, Hsien-Chung Lei, National Taiwan Ocean University, Taiwan
We formulate and analyze a strategic design model for three-echelon distribution systems with two-level routing considerations. The key design decisions considered are: the number and locations of distribution centers (DC's), which big clients (clients with larger demand) should be included in the first level routing (routing between plants and DC's) , the first-level routing between plants, DC's and big clients, and the second-level routing between DC's and other clients not included in the first-level routing. A hybrid genetic algorithm embedded with a routing heuristic is developed to efficiently find near-optimal solutions. The quality of solution to a series

of small test problems is evaluated by comparison to the optimal solution solved by LINGO 9.0. In test problems for which exact solutions are available, the heuristic solution is within 1% of optimal.

TA503 Motorcycle-Courier Routing Problems in Urban Areas

Tsung-Sheng Chang, National Dong Hwa University, Taiwan

Due to the worsening congestion and accessibility problems in urban areas, motorcycles have been replacing large vehicles and becoming one of the major transportation modes for distributing small packages and high priority consignments. Nowadays, motorcycle-courier industry, in some cities, has become fiercely competitive. Therefore, the motorcycle couriers have been struggling with price competition and lower profit margins. This research, thus, intends to help the motorcycle couriers efficiently and effectively solve their routing problems in urban areas to promote their competitive power.

In this research, the motorcycle-courier routing problem is modeled as a street routing problem with time windows (SRPTW); the street routing problem consists of both node and arc routing problems. It is difficult to directly solve the SRPTW. Thus, we first transform the SRPTW into a multiple shortest route problem through specified nodes with workload balancing and time window constraints (m-SRPSNWBTW). Then, we further transform the m-SRPSNWBTW into a multiple traveling salesman problem with workload balancing and time window constraints (m-TSPWBTW). The goals in solving the m-TSPWBTW are as follows: 1) minimize total travel time while satisfy time window constraints; and 2) ensure workload balance in terms of total travel time among routes. It is easy to verify that the SRPTW, the m-SRPSNWBTW and the m-TSPWBTW are equivalent to each other. However, we find that it is much easier to tackle the m-TSPWBTW than the other two problems from the point of views of models and algorithms development. Notwithstanding, the three problems are all NP-hard. Since the m-TSPWBTW is NP-hard, our proposed solution algorithm is a heuristic. To the best of our knowledge, this research topic has not been studied in the vehicle routing literature.

TA503 Travel Time versus Emissions in Time Dependent VRP: Are They Truly Enemies?

Ola Jabali, Tom van Woensel, A. G. de Kok, Eindhoven University of Technology, Netherlands

Distribution is a vital component in virtually any supply chain; thus when addressing this growing concern with environmental issues, distribution should be encompassed as well. Regardless of whether companies are going to voluntarily incorporate green policies in practice or they will be forced into doing in the context of new legislation, change is foreseen in the future of transportation management. Thus, transport companies should make strategies accordingly. Assigning and scheduling vehicles to service a predetermined set of clients is a common distribution problem. Incorporating time-dependent travel times between the links has been recently adopted as a more relevant way of modeling travel time, as apposed to the classical approach that assumes constant travel times between the links.

Within this framework, and to identify the tradeoff between jointly minimizing emissions and the total travel time, we look into this routing problem from two extreme standpoints: one seeks to optimize exclusively on total travel time; the other does so on total emissions. To model emissions we look into the emission functions of a number of pollutants in conjuncture with speed profiles, and examine the effect of varying speeds on total emissions produced by routes. We conclude that while there exists an optimal speed v* at which emissions per kilometer are minimal (per pollutant), traversing at this speed is sub-optimal, in terms of total emissions, since the affect of congestion needs to be taken into consideration. This is due to the fact that during congestion vehicle are constrained by lower speeds, thus making it worthwhile, in terms of emissions to travel at speeds higher v*, where possible, in order to avoid congestion. Finally we experiment with various sets form literature and solve the models via tabu search.

TA503 Sequencing Heuristics for Storing and Retrieving Unit-Loads in 3D Compact AS/RS

Yugang Yu, Rene B. M. de Koster, RSM Erasmus University, Netherlands

Properly sequencing storage and retrieval requests can substantially reduce the total makespan in automated storage and retrieval systems (AS/RS), and thereby enhance the throughput capacity of such systems. Although this problem has been studied extensively in literature for single-deep storage AS/RS, it has not yet been studied in compact multi-deep (3D) systems. We study compact systems were every load can be accessed individually. Compact storage systems are becoming increasingly popular as they save space, operate in full automation and can increase throughput. The 3D system we study consists of a storage and retrieval machine (S/R machine) taking care of the x- and y- movements and multiple independently rotating conveyors, taking care of the z-movement. The conveyors can continuously preposition loads in parallel. We compare known sequencing heuristics in the 3D system by simulation. We also introduce a new heuristic: percentage priority to retrievals with shortest leg (PPR-SL).

The results show that: 1) sequencing in the 3D system can bring much more cycle travel time reduction compared with the benchmark (first-come first-served) than in 2D systems; 2) The nearest neighbor (NN) heuristic that performs very well in 2D systems, performs poorly in the 3D system, even worse than FCFS; 3) The PPR-SL heuristic consistently outperforms all other heuristics. Generally, it can outperform FCFS more than 20-90%. Furthermore, based on FCFS and PPR-SL, we find robust rack dimensions that yield short makespans for different numbers of storage and retrieval requests. We also find that, regardless of the size and dimensions of the system, and the number of retrieval and storage requests, 100% priority to retrieval requests in the PPR-SL heuristic, nearly always gives a close-to-best performance. This parameter is therefore easy to determine in practice.

TB202	Tuesday, 10:05-11:20	Track: New Product Development	Chair: Roberto Rafael Luchi
	Room: W2-202	Session: New product development 2	

TB202 A Decision Framework for Outsourcing of New Product Development

Jonas B. Rundquist, Halmstad University, Sweden

The focus of this paper is the outsourcing of activities in the New Product Development (NPD) process. Outsourcing of NPD refers to the outsourcing of development activities for the developing of new products (goods and/or service), where all or just the innovative part of the NPD process is purchased externally based on a contract with organizational units separate from the outsourcing firm. This definition implies that (A) the activity should be an innovative part of the NPD process, (B) the activity should have previously been conducted internally, and (C) the activity should be purchased under a contractual agreement between the organizations.

The paper presents a decision framework that is based on three empirical studies (two survey studies and one case study) and a literature review. The framework presented in the paper is commonly used to understand outsourcing questions in general. In the present paper the framework is applied in the specific situation of outsourcing a knowledge intensive activity (such as NPD) in the context of medium sized firms. Transactions cost, resource based, resource dependency, knowledge based, agency cost, and institutional theories are revisited.

Outsourcing can lead to advantages in form of lower costs, access to knowledge or other resources, as well as access to markets, but it can also result in a knowledge drain, lower motivation among in-house staff, or an increased level of dependency on external organizations. Therefore the decision to outsource is not always a good one, and the pros and cons must be carefully evaluated. The decision framework maps factors affecting the decisions that need to be made when outsourcing NPD. The implications can be of value to the outsourcing firm as well as to the potential outsourcing partner. The framework has been presented to the firms in the studies and thus has already proved its value to some extent.

TB202 Commonality in Product Line Design under Horizontal Preference Structure

Kilsun Kim, Sogang University, Korea
Dilip Chhajed, University of Illinois at Urbana Champaign, U.S.A.

Use of commonality or common features among products in a line is a popular design practice and examples of this can be found in many product categories ranging from automobiles to service goods to consumer electronics. We present an analytic model of product line design with two attributes for which consumer segments exhibit opposite preference ordering, and analyze implications of having attributes with different characteristics common or not in the product line design.

Our results show that commonality strategy with cost saving can result in design of better discriminating product line so that first best solution can be implementable when it is not under non commonality strategy, and that design of common attribute may or may not affect the design of custom attribute and it can lead to increased or decreased amount of quality differentiation along custom attribute under different conditions. Our analysis also indicates that the notion of commonality with associated cost saving could increase the amount of social welfare and under certain condition firm's decision to adopt commonality can benefit consumers as well so that both parties can benefit from commonality strategy.

TB202 A Study of Cognitive Structure of the Management Issues at the Small Businesses Targeting the Business in the New Field

Yoshitoku Fukunaga, Nakamura Gakuen University, Japan

Small Businesses, even if they have discovered a business opportunity and entered the market with their new technology and distinct services, may sometimes be required to make additional efforts and open up a new field. This can be regarded as a significant challenge in the process of business expansion.

There are some distinctive differences in management issues on which many enterprises put weight in relation to new field development especially if the competition environments in the market are different, according to the data on managerial problems for small businesses published in the Nikkei's 2003 Annual Corporation Reports of Venture Business, and by analysis of the questionnaire-based surveys. This paper suggests first that, due to certain combinations of recognized management issues, a company may maintain flexibility in the working capital management process, by citing as an example a causal loop model for system dynamics that explains changes in the significance of management issues. This paper further shows that the differences in conditions of competition result in differences in the forces of some feedback loops within this causal loop.

Development of a new business field sometimes causes negative feedback loops that may threaten the survival of the company, especially in the aspect of working capital management. These feedback loops may extensively increase the necessity of securing more working capital, because aggressive reinforcement of company activities for providing products and services in any new field in addition to existing main products and services requires new customer groups or suppliers, as well as diversification of customer groups and suppliers. This reinforcement will also trigger an increase in working capital for maintaining the existing business over time, and in the next financial term, it may bring about an unexpected capital shortfall. In a market of intense competition, such management issues as "cost reduction, increase in efficiency of the production section," "fund-raising" and "promotion of IT" increase in importance, and these issues are expected to weaken the effects of the negative feedback loops. Moreover, for a company intending to open up a new business field in the less competitive market, "expansion and strengthen the domestic sales network" will be far more important than other management issues. And this very fact holds a possibility of developing a negative feedback loop that may threaten the survival of the company in regard to working capital.

In this way, this paper addresses the operational process flexibility in developing a new business field, while shedding light on the cognitive structure of the management concerning the management issues they especially care for, and point out major underlying problems, especially those that may affect the sustainability of those small businesses.

TB202 Leveraged Growth: North-South Technological Alliances and Innovation in Small and Medium Size Enterprises (SMEs): A Case Study in Emergent Economies.

Roberto Rafael Luchi, Luis Domingo Dambra, Alberto Ariel Llorente, Austral University, Argentina

Small and Medium size Enterprises (SMEs) engage in Technological Alliances (TAs) to pursue innovation and New Product Development (NPD) when they perceive their resources are insufficient to do it by themselves (Das & Teng, 2000). Our research is an empirical single case study (Eisenhardt, 1989), which aims to study the instrumental role played by NPD, conducted within transnational TAs, on an Argentinean SME which by such means evolved from being a crop producing unit into an agribiotechnological firm with a leading stand in its home country soy bean seed market. The objective is to clarify the joint contribution of NPD and transnational TAs for SMEs' growth in a sector characterized by processes of consolidation and vertical integration (Lerner & Merges, 1998).

This explanatory case analyzes how challenges posed by NPDs based on transnational TAs were faced. We conducted a within-case analysis of two collaborations, with polar outcomes (Pettigrew, 1990), between the Argentinean SME and, in both instances, an American counterpart. One led to register the Argentinean SME's first own soy bean seed; its market success, several others followed, drove the firm into a period of sustained growth. The second one, considering that technological TAs typically imply long term commitment and multiple NPDs (Schmidt, Montoya-Weiss & Massey, 2001; Reuer & Arino, 2002) to compensate both parties' innovative and learning efforts and the resources invested, failed: only one NPD was completed, the first hybrid corn seed registered in Argentina during the 20th century's last decade, and the TA ended because of a drastic change in the American firm's involvement.

Our main theoretical and managerial contribution emphasizes the positive impact on SMEs of NPDs based on transnational TAs; three features surged as essential for success: complementary technological and managerial capabilities, sustained trust between the parties and reciprocal accomplishment of goals. To our knowledge, little research has been done on the contribution of NPDs based on transnational TAs to SMEs in emergent economies environment. Thus, we expect this paper will encourage scholars and practitioners to further explore this field.

TB301 Tuesday, 10:05-11:20 Track: Service Operations Management Chair: Mark R. Johnson
Room: W2-301 Session: Product-service systems 2

TB301 Implementing a Measurement System for Product-Services
Ingo Christian Lange, Oliver Schneider, ETH Zurich, Switzerland
Gil Fischer, ABB Ltd., Switzerland
Within the context of the EU-Project InCoCo-`S`, a Service Performance Measurement System (SPMS) has been developed, in order to quantify the efficiency and the effectiveness of industrial service operation activities like repair and maintenance of machines and to support the quantification of the customers` benefit.

BACKGROUND: Especially the manufacturers of complex machines are facing increasingly ambitious customer requirement targets, cost-cutting competition and raised technology complexity. This trends forces machine manufacturers to offer customized services for the installed machine base to generate turnover and to gain decisive competitive advantage. As a result, manufacturers are becoming full service providers and represent an integral part of the customers' production process. However, there is an unsatisfied need for a systematic approach for a common goal deployment as a basis for collaborative service business relations.

CASE STUDY: The industry partner is an international operating manufacturer of packaging machines. The service unit is operating as a profit center and consists of four service hubs located in Europe, UK, USA and Japan. Within a pilot project with a key customer the value added maintenance (VAM) approach consists of joint planning of resources and maintenance programs, monitoring and improving productivity of the customers` packaging lines. In order to quantify the customer benefit from this VAM initiative there was a basic requirement to develop a performance measurement system for packaging line effectiveness.

RESULTS: The SPMS addresses the integrative character of industrial service operations and provides both service providers and customers with a structured set of performance indicators (PI), which are applicable to a wide range of industrial services. Based on a case study, the paper presents a generalized concept enabling the definition, design and implementation of a measurement system in co-operative supplier customer relationships.

CONCLUSION: From a service providers perspective transparency on service operation performance can be seen as an essential precondition facilitating them to commit themselves to long-term service agreements and to market comprehensive service products.

TB301 Towards a Better Understanding of the Risks of Servitization
Richard Mark Greenough, Marwan Saleh Alomair, Cranfield University, United Kingdom
Servitization is the innovation of an organisation's capabilities and processes to better create mutual value through a shift from selling product to selling product-service systems. It is a growing trend, particularly in the developed world, as manufacturers seek to add value to their products and generate proportionally more revenue by adding a service element to their value proposition. There are different types of product-service system that are differentiated by the relative proportions of value delivered by the product and service components of the offering. Servitization implies a transfer of risk from the user of a product-service system to the provider, with the greatest risk being transferred where the service component is greatest. Not all servitization programmes are successful and there is some evidence a gradual transition, typical of managers who are risk averse might be less likely to succeed than a more revolutionary approach. Since managers tend to evaluate risk according to their individual perceptions, a framework for risk management would be valuable to support the servitization process.

This paper reviews the literature on servitization and relevant literature on business risk before identifying nine categories of business risk that might be expected to apply to servitization. These risk categories were then validated and refined through discussions with experts in product-service systems from industry and academia in order to form a foundation for the development of a risk management framework for servitization.

TB301 Supply Networks for Product-Service Offerings
Mark R. Johnson, Marko Bastl, Tim Baines, Steve Evans, Rick Greenough, Howard Lightfoot, Andy Neely, Ashutosh Tiwari, Cranfield University, United Kingdom
Within manufacturing, product- and process-based competitive advantage is easily imitable. Therefore, manufacturers are adopting a strategy of bundling products and services into integrated solutions to create sustainable competitive advantage. This strategy is

called servitization, and it is becoming increasingly relevant for manufacturers to improve competitiveness. Despite the concept of servitization existing for almost 20 years, there has been little empirical work which studies the principles, structures and processes of servitization.

The aim of the current research is to explore the roles that members of the supply network play in the design, delivery and support of product-service offerings. The research adopted a purposive sampling strategy to perform three case studies. The first was the focal firm of the study, a blue-chip UK manufacturer which has adopted a well-publicised strategy of servitization. The remaining two companies were a vendor and joint-venture from the supply chain of the focal firm.

The findings are classified into three areas where the supply networks differ between those that are involved in the provision of product-based and 'servitized' offerings. These are: supply network type, relationships within the supply network and the design of the supply network.

Our findings indicate a need for servitized companies to operate supply chains of different types, from those for new products to those that support legacy products. There was also evidence of a shift towards more partnership-based relationships in order to support the integrated offering from the focal company. However, the shift did not apply at all levels of the relationship but applied specifically at the formal contractual levels; to the specific product base; and to specific individual behaviours. The research also indicated that the design of supply networks for servitized offerings needs to account for increased levels of complexity, information sharing, communication and responsiveness. This can impact the physical proximity of network members to the focal firm. This research is novel and of particular interest to all organisations aiming to adopt servitisation strategy and members of their supply network. It also indicates that there is still a considerable amount of work for practitioners and academics to do.

TB302 Tuesday, 10:05-11:20 Track: Invited Chair: Edward James Flynn
Room: W2-302 Session: High Performance Manufacturing 2

TB302 The Impact of Supply Chain Complexity on Manufacturing Plant Performance
Cecil Bozarth, Don Warsing, North Carolina State University, U.S.A.
Barbara B. Flynn, E. James Flynn, Indiana University, U.S.A.
This paper puts forth a model of supply chain complexity and empirically tests it using plant-level data from 206 plants across seven countries. In addition to testing the impact of supply chain complexity on plant performance, we also examine the potential direct and moderating effects of four sets of information-processing alternatives – slack resources, self-contained tasks, information systems and lateral relations (Galbraith, 1973; Flynn and Flynn, 1999). The results show that supply chain complexity has a significant, negative impact on operational and market-based measures of plant performance. Furthermore, all four of the information-processing alternatives have a significant, positive impact on at least one measure of plant performance. Nevertheless, our analysis shows that plants with the highest level of supply chain complexity are least likely to use the information-processing alternatives and demonstrate the worst overall plant performance. These results suggest a gap in plants' understanding of the impacts of supply chain complexity and what mechanisms might be used to offset these effects.

TB302 Congruency between Manufacturing Strategy and Technology in the Automotive Component Sector
Cesar Humberto Ortega Jimenez, Universidad Nacional Autonoma de Honduras, Honduras
Jose Antonio Dominguez Machuca, Pedro Garrido Vega, Jose Luis Perez Diez de Rios, Universidad de Sevilla, Spain
The High Performance Manufacturing (HPM) paradigm maintains that each plant has to develop its own path to high performance, based on contingencies and on the links between manufacturing practices. Previous works do not shed much light on the reasons why the implementation of the same practices produces higher performance in some plants and lower performance in others. The doctrine of HPM advocates the view that the lack of success may be due to a deficient interconnection between practices. Drawing on this underlying feature of HPM, this work examines the following two manufacturing practices: manufacturing strategy and technology.

Apart from the importance of knowing in detail how these two practices should interrelate, their empirical exploration has not been well documented in HPM research or in the general literature on Production and Operations Management (POM). This paper looks at a critical aspect of empirical HPM research: the possible adapting of manufacturing strategy and technology to each other (i.e. their interrelationship). In order to verify how manufacturing strategy and technology are related, the link between them is tested by selection fit (i.e. adjustment test of congruency). Results show that there is a strong congruency between both practices, which suggests that when implementing or adjusting either of these manufacturing practices, the other should also be considered; otherwise they may not operate effectively.

TB302 Strategic Management Cycle as an Underlying Process for Building an Aligned Linkage of Practices
Michiya Morita, Gakushuin University, Japan
Edward James Flynn, Indiana University, U.S.A.
Shigemi Ochiai, Jonquil Consulting Inc., Japan
This study explores the mechanism to establish effective linkages of manufacturing practices based on the High Performance World Manufacturing Project data including 8 countries, Austria, Finland, Germany, Italy, Japan, South Korea, Sweden and USA. Past research mostly emphasizes the importance of linkage of practices as one of the most important factors to be a competitive manufacturing company and most of business people understand it as well. But how such linkage can be established remains fuzzy.

The study shows comparatively linkage patterns of the countries and confirms the importance of the linkage again based on the data above mentioned. Our research hypothesizes planned behaviors under clear visions and goals underlie the effective linkage. Then next agendum is what determines the effectiveness of planned behaviors. We advocate the effectiveness is strengthened and sustained by effective P-D-C-A cycles. Also if defining high performance manufacturing as one that is competitively sustainable over time, we need to pay attention not only to the one on the floor, but also strategic one driving the whole company. We call it strategic management cycle. The cycle consists of visionary planning, strategic planning and implementation (practice implementation), and steering and controlling practices to performance. We will show the relationship of the cycle with the effective linkage structure of manufacturing practices. Then we suggest the cycle's working determines the effectiveness of the linkage.

Also we will concern with the sustainability of the cycle. We argue about causes of malfunctioning of the cycle. They suggest why the company fails to sustain the effective linkage over time, that is, long-run competitiveness. Once Porter suggested strategy differs from manufacturing operations. But strategy and manufacturing operations are both important to be competitive over

time. The implications drawn from the study will suggest the importance of integrating both aspects.

Finally we will explore into the possibility to secure the integration systematically. We advocate one important key factor is the quality of front-end loaded planning of the company.

TB303 Tuesday, 10:05-11:20 Track: Marketing and Operations Interface Chair: Hassanali Aghajani
Room: W2-303 Session: Marketing and operations interface

TB303 Product Architecture of Mobile Phone and Product Development: Case Illustrations from Korean Companies

Youngwon Park, University of Tokyo, Japan
Gyewan Moon, Kyungpook National University, Korea
Paul Hong, University of Toledo, U.S.A.
Jaekwon Choi, Kyungpook National University, Korea

Increasingly, the product architecture of electronic products is rapidly moving toward modularity. Although its overall product architecture is becoming modularized, the particular pattern of product architecture is responsive to the strategic focus and the extent of the value-added components. Within the family of mobile phones, high-end models adopt integral product architecture while low-end models take modular product architecture. Based on product architecture of mobile phones, we compare product strategy of the two Korean manufacturers --Samsung and LG. Our case studies show that Samsung have pursued high-end models focusing on integral product design. Recently, Samsung targets emerging markets with low-end models. On the other hand, LG's product strategy is recently moving rapidly toward high-end models. This is a real shift in its product strategy in that LG has traditionally focused on low-end models.

In this paper we examine the inter-relationships between product architecture of mobile phones and product strategy of Korean mobile phone-makers. First, we present a research model of product architectures and strategic focus. Second, we state comparative case illustrations of Samsung and LG in terms of their product strategy. Third, we discuss theoretical and managerial implications.

TB303 Transforming from Materials Provider to Project Marketer in International Construction Industry

Erik Pöntiskoski, Joel Hietanen, Joonas Rokka, Jaakko Aspara, Mika Westerlund, Helsinki School of Economics, Finland

Firms in many global industries are struggling to transform from selling tangible, pre-developed products, towards selling consultative, solution- or system-like projects, with integrated product and service components. This phenomenon has been noted by growing academic literatures of project marketing (Tikkanen, 1998; Welch et al., 1996) and (customer) solutions/systems selling (Davies et al. 2006; Galbraith 2002; Tuli et al. 2007; Wise & Baumgartner 1999). However, the course of transformation from materials to solutions provider has received rather little attention. The first challenge lies in coordinating two different kinds of business models during the transformation phase: (a) increasing selling and supplying/delivering of solution projects, yet (b) continuing to sell of simpler (bulk) products to support profitability. The second challenge exists in spreading the solution business model and projects across various geographical market areas with potentially different local demand conditions and milieu.

This study contributes to project marketing and solutions selling literatures by identifying specific problems concerning the transformation. The problems are analyzed through a case study of an industrial firm in international construction business. Problems relate to four areas. First, high growth in bulk sales within target markets easily hides real local problems in the selling and supplying solution-like projects. Second, the selling and supplying of solutions is hindered by poor communication between the firm's headquarters and local sales and delivery organizations in foreign market areas, and the supply chain. In this case, local sales force tends to sell bulk products due to an unreliable supply chain. Third, traditional performance measurement and reporting systems for marketing and sales organizations and incentives are poorly aligned with the new solutions business model. Fourth, copycats in the target markets hurt the image and sales of the firm.

TB303 Estimation of Hand-Values on Men's Suit Clothes Using Image Data

Hiroki Ishikura, Osaka Gakuin University, Japan

Recently, clothes are traded by using the Internet. When clothes are bought and sold, the textures (hand-values) of these clothes are important for all consumers. However, the Internet cannot transmit the actual texture of clothes to consumers. Therefore, consumers are estimating the qualities of clothes from images in a web site. At first, relationships between consumers' estimations of the textures using images, the consumers' actual touch feelings by hand, and the basic mechanical properties of the clothes measured by KES are analyzed.

In this research, men's suit jackets, of which mechanical properties should be important compared to other clothes, were used for the samples, and 80 university students and 5 experts of clothes were chosen for the consumers. As a result, it became clear that the consumers were not able to estimate the touch feeling of the jackets, the mechanical properties of which were from the image data of average quality currently found on the Internet. However, many studies have proven the influence of clothes mechanical properties on the shape of clothes. Secondly, three-dimensional shapes of clothing at the elbow were examined because the parts show the mechanical properties of the cloth conspicuously. If relations between the KES basic physical properties and the three-dimensional shapes of clothing become clear, there is a possibility to get some idea of hand values from general image data by utilizing three-dimensional shapes and two dimensional photographs. A strong relationship between the distribution of zn－zn-1 -35 to -5 mm of 3D data at the elbow and bending rigidity is found.

TB303 A Prediction Market System for Demand Forecasting with Division and Merger of Fixed-Interval Prediction Securities

Hajime Mizuyama, Yuto Maeda, Kyoto University, Japan

Most demand forecasting methods of today study some past realized demand values (and maybe other related variables as well), find certain structural patterns or trends in the data, and extrapolate them into a certain future point of time to obtain a forecasted demand value or distribution. In recent rapidly changing market environment, however, it is often difficult to prepare sufficient amount of historical data as the input to the methods, and, even when they are available, the patterns or trends extracted from the data will rarely last long enough to be used to tell the future. Thus, this paper proposes an alternative method which will work effectively even in

such circumstances where extrapolate-able demand patterns are hardly available. The proposed method uses an intra-firm prediction market system with an appropriate number of fixed-interval prediction securities to aggregate the tacit knowledge of the firm's sales people on the future demand of a product into a histogram-type forecasted demand distribution. The system is equipped with a market maker algorithm. Thus, transactions can be conducted with the computerized market maker whenever necessary and a sufficient liquidity is supplied into the market even when the number of the traders is small. Further, the paper newly provides an algorithmic procedure that enables a prediction security to be divided into smaller interval securities and/or consecutive securities to be merged into a unified interval prediction security. As a result, the market maker can output at any time an aggregated demand forecast of the sales people as a histogram whose intervals are properly and automatically adjusted. Further, how the proposed method works is investigated through a agent-based simulation.

TB303 Coordinating Manufacturing and Marketing Sections in International Firms

Hassanali Aghajani, University of Mazandaran, Iran

As international strategies become more complex, firms made use of more techniques for coordinating between marketing and manufacturing, with more use of decentralized and informal approaches. Coordinating techniques included individual MBO-reward systems, joint task forces for problem-solving, and direct involvement of manufacturing and marketing in establishing the competitive priorities of the firm.

In this article, it is stated manufacturing experiences much of the turbulence and conflict imposed by the dynamic global marketplace through its relationship with marketing, because marketing is usually responsible for introducing changing competitive priorities and demand patterns to the organization. Through a survey of manufacturing and marketing managers within international firms, the paper develop a profile of manufacturing and marking conflicts experienced in each of four international strategy environments: export, multidomestic, global, and transnational .

TB305 Tuesday, 10:05-11:20 Track: Human Resource Management Chair: Constantinos Dimitrios Cantzos
Room: W2-305 Session: Empirical research on HRM

TB305 Presenteeism at Work: How much Does It Cost? An Exploratory Study in Singapore

Hesan A. Quazi, Nanyang Technological University, Singapore

Absenteeism at work places has drawn attention of many employers and it is one of the mostly measured indicators of a healthy organization. However, absenteeism gives an inaccurate picture of employees' health, work-life quality and workplace productivity, which largely arises from incorrect judgment that when people at work they are being productive. Presenteeism is the counterpart of absenteeism and in fact, it appears to be a much costlier problem than absenteeism. It is estimated that presenteeism can cut individual productivity by one-third or more (Hemp, 2004). Presenteeism is prevalent in all types of organizations and impacts on all types of operations. Measuring presenteeism has become one of the biggest challenges in the workplace. Presenteeism refers to two different types of workplace behaviors. First, presenteeism may mean putting in long work hours as a reflection of job commitment or a way to cope with job insecurity. Second, presenteeism also reflects the situation when employees show up for work sick, injured, stressed or burnt out. Some studies have identified a number of health related conditions that are primarily associated with productivity losses with presenteeism. Some such conditions include- Migraine, Arthritis, Chronic lower back pain, Allergies or Sinus trouble, Asthma, Flue (in the past two weeks), and Depression. List of sicknesses that are usually included in presenteeism study are- Migraine, Arthritis, Chronic lower back pain, Allergies or Sinus trouble, Asthma, Flue and Depression. One study in a major US bank showed that the productivity loss due to presenteeism accounted for as much as 84% of the total indirect medical cost of the employees as compared to the cost absenteeism, short-term disability and log-term disability combined.

The present study reports the findings of a survey on presenteeism in Singapore. We collected relevant data using a survey instrument designed based on current literature on the subject. The respondents were a group of employees working in various organizations in the republic. Two hundred and eight (208) usable questionnaires have been received. The full-length paper will report the results and the implications of the study.

TB305 Feel Free to Feel Comfortable - An Empirical Analysis of Ergonomics in Manufacturing

Jorn-Henrik Thun, Christian B. Lehr, Max Bierwirth, Mannheim University, Germany

The great majority of industrialized countries have to face demographic developments that lead to a fundamental aging of their population and therewith to an aging of the workforce. In consequence, companies have to cope with the challenge of staying competitive with older staff. Manufacturing companies in particular have to think about strategies on how to keep their shop floor employees healthy and able to conduct their work, even if they are in an advanced age. In this context, ergonomics plays a key role in enhancing the quality of work life and the period of time shop floor employees are able to execute their work in a manner that does not impact health negatively.

The purpose of this paper is to examine ways of how to improve ergonomics on the shop floor. Moreover, the impact of certain ergonomic instruments on the companies' economic and social goals is investigated. To do so, a survey has been conducted among manufacturing managers of 47 companies in the German automotive industry. The managers have been asked about their practices and experiences with regard to various measures and strategies in the field of ergonomics and health.

Employee oriented and job oriented instruments of ergonomics are operationalized using factor analysis. By means of cluster analysis, companies with a high degree of implementation of ergonomic measures are differed from companies with a low degree of implementation. Based on this cluster analysis, a comparison of means gives insights on the performance concerning the achievement of economic and social goals. In the consequence, the most promising practices and strategies with regard to an implementation of ergonomic measures on the shop floor can be identified and recommendations for manufacturing companies can be derived from the results of the empirical analysis.

TB305 Worker Conscientiousness and Continuous Improvement: Key Factor Relation for Firms

Ricardo Mateo, Hugo Cruz, University of Navarra, Spain

Many researchers have studied companies as a whole to develop theories of management, paying relatively little attention to different units within the company. However, the production units within a company behave and perform in different ways in Continuous

Improvement terms. This paper focuses on the study of Continuous Improvement generated by units within the company. The conceptual framework shows that different units have different levels of Continuous Improvement results. Given this fact, an understanding of the relationship between level of worker conscientiousness and performance may be of significant interest.

For this research project, the authors had access to an industrial plant located in Spain. First, a model to analyze the flow of information among operative units in the industrial plant was designed. Then, a research hypothesis was established: operative units which better conscientiousness among workers will have better results in the continuous improvement indicators. Data was collected from the results in continuous improvement obtained by the operative units and the level of worker conscientiousness was measured by units. In addition an experiment was developed with students to confirm the hyphotesis. The research yielded the following conclusions. Despite the fact that the units have the same objectives, follow the same process and have access to the same available information, there is a clear difference in the continuous improvement results between the operative units at this industrial plant. The paper states that a higher worker conscientiousness will have a direct effect in reducing the number of quality reworks and increasing the number of suggestion to improve operations.

TB305 An Empirical Study of Operations Management in Greek Industry

Constantinos Dimitrios Cantzos, Technological Education Institute of Piraeus, Greece
Andreas Panagiotis Kakouris, University of the Aegean, Greece

Production and Operations Management (POM) is a critical element through which companies can achieve higher business competitiveness. Its concepts are not confined to one specific department, but it is rather far-reaching involving nearly every functional side of the organization. Independent their particular department, management, accounting, marketing, information technology or logistics, people ought to understand the critical impact POM has on its business. Therefore, the challenge for the people working in the industry is to have a solid foundation of OM concepts and techniques as well as good knowledge on contemporary themes that are emerging and will expand in the future, such as supply chain management, e-business, lean operations, globalization of operations, environmental concerns, IT and services. All these concepts, techniques and contemporary themes that make operations management a vital field in today's complex business world can be the result of the correct education offered by universities and technological institutes. They suppose to convey the essential ideas and techniques through pedagogical ways that will allow students to go much deeper into any given area, to provide an excellent vehicle to relate course concepts with practice and ultimately to truly qualify them in this significant area. But is education relevant to practice? Does OM education reflects the tasks and responsibilities of the OM function?

The present paper concentrates particularly on the practice side of the question by carrying out a survey of operation management practitioners in Greece. The study had the primary objectives of (a) scrutinizing the profile of new graduate managers requested by the companies, (b) analyzing the recruitment criteria for selecting operations managers, (c) detecting the knowledge and the dexterities that are considered of decisive importance for their professional development, (e) exploring the tasks and responsibilities of the operation managers, and (f) investigating the wages element, trying to detect their satisfaction or dissatisfaction. The analysis of the current situation of POM teaching in Greek tertiary institutions together with the content of POM programs is the subject of another work in the future.

TB401 Tuesday, 10:05-11:20 Track: Information Systems and e-Operations Chair: M. Isabel Alonso Magdaleno
Room: W2-401 Session: e-operations 1

TB401 The Impact of Global Environment on B2B Relationships in Greece

Irene Samanta-Rounti, Panagiotis Kyriazopoulos, Graduate Technological Education Institute of Piraeus, Greece
Sandra Connor, Nondas Pitticas, University of the West of Scotland, United Kingdom

Purpose: The research examines whether the changes that have taken place in the global business environment have modulated the way firms do business or whether it is simply transient details that have caused such excitement. Should firms be wary of any proclamations of 'new' ways of doing business? Or should they ignore changes of the new business environment?

Design/Methodology: The method used was qualitative research based on a snowball sampling technique. Semi-structured in-depth interviews were conducted in three focus groups of managers from three major firms operating in Greece. The topics are referred to which variables affect the organisational structure in changing environment.

Findings: The influence of globalization, the intense competition and new technologies in B2B e-commerce are external factors that raise problems and complexities in the future direction of Greek firms. There is also a gap caused by the lack of an innovation culture between top and lesser management. Businesses are required to modernise their practices to move from their present situation at the level of the 2nd industrial revolution of "old economy" to the 3rd industrial revolution of "new era economy" in order to achieve long-term, profitable customer relationships. Firms should redefine their strategy, in order to increase customer satisfaction through effective communication and distribution, better corporate decision-making and more rapid exchange of information.

Practical Implications: The results of this research can be used to assist companies to move to e- business taking into consideration the external and internal factors with regard to the ways in which e-relationships can be modulated.

Origins: As the world entered the new millennium, it seemed that the business environment would never be the same again. It was to be changed forever in a "new" world ruled by "new labour relations" inhabited by a "new employee", who works in the "new" economy and learns about the world through the new "Information Society". It soon became recognized, however, that the "new economy" is very dependent upon the "old economy".

TB401 A Method for Analyzing and Improving Clerical Work from the Viewpoint of Information Items

Hirotake Yamashita, Chubu University, Japan
Hirokazu Kono, Keio University, Japan
Yasuhide Ishida, Nippon Koa Insurance Co., Japan
Yasuchika Wakayama, Breakpoint Co., Ltd, Japan

This paper proposes a method for analyzing and improving objective work, from the viewpoint of Information Items, and a method to design the slimmest operation which is comprised solely of value adding work steps. The paper investigates the indirect clerical work which incorporates transactions and flows of information among multiple operating entities. There are many research papers about

methods of analyzing clerical work, especially in the areas of developing methodology of information systems for the purpose of realizing productivity improvement, given the fact that the analysis of the current work, put as As-Is-model, is separated from improvement of the work process, generally put as To- Be model. Based on this recognition, this paper proposes a method of burying this gap between As-Is and To-Be models.

The paper pays attention to the initial state and final state of the objective work, and focuses on the three factors; information items, work subject and their information media. The paper further proposes a diagram that depicts the relationship among the three factors. The paper proposes the following diagrams: First is the "Information item list," which shows a relationship between the initial state and final state of information items. Second is the "Transition chart of information item," which shows how the information items are changed through the interaction among work subjects. Third is the "Tree diagram of information item," which shows the relationship among the three focused factors. These diagrams are depicted both for the current work and improvement alternatives, in order to visually clarify the effect of efficiency improvement.

In order to prove the effectiveness of the proposed framework, the paper analyzes the actual case of order receipt and shipping procedure at a commodity sales company, and proposes the improvement ideas and discusses their effect toward productivity improvement.

TB401 Visualisation of Complex Business System Environment and Operations Management in Networked Production

Janne Hietala, Arcusys Ltd., Finland
Jyri Potry, North Karelia University of Applied Sciences, Finland
Matti Kurki, Kurki Consulting Ltd., Finland

Operations of production companies and networks are generally managed with the help of distinct decision support systems, user interfaces, reports and views. Visibility over the supply chain is mostly limited to operative business systems. Those systems merely support completion of daily tasks within an individual organisation instead of supporting holistic management of cross-organisational business and production processes, such as processes of a virtual organisation or a supply network. In consequence, this kind of operations management system environment results in sub-optimisation, lack of integrated control and common goals as well as conflicting interests within or between organisations.

At present, business system development is seemingly moving from integrated approach to more service-oriented, distributed peer-to-peer architecture. Another technological trend is utilisation of Software as a Service (SaaS) software application delivery model, aiming e.g. at benefiting supply chain management. This approach requires vast knowledge of supply chain dynamics and information model standards, naming only a few.

All this suggests that a (standardised) model for complex business system visualisation is required. Technically, the model would consist of business system architecture and business visualisation, providing also tools for operations management environment visualisation. The basic concept is flexible presentation of business architecture configured upon a large cross-organisational system landscape, from which business process visualisation collects and presents separate or connected processes forming the networked business logic.

This paper proposes a visualisation model for complex cross-organisational business system environment. The premises are that resulting practical applications have to assist understanding of and provide real-time information on operative production networks. Provided information has naturally to be correct and in suitable format in order to support decision making.

TB401 On-Line Services Production in Municipalities: Do They Have Impact on Citizen Welfare?

Jesús García García, M. Isabel Alonso Magdaleno, University of Oviedo, Spain

The rapid development of modern information and communications technologies (ICTs) is having far-reaching effects on all aspects of modern life, including government. Digital government is defined as government's use of information and communication technologies for the production-exchange and delivery of information and services with citizens, businesses, and other forms of government. The e-government is more than an automation of government services. It is giving rise to an environment characterized by demands for timely delivery of information and services, and a requirement for ready access 24 hours a day, 7 days a week and 365 days a year. At a higher level, it enables the citizen to actually conduct transactions for those services such as paying tax or claiming and receiving benefits.

It offers substantial performance gains so it has become one of the core elements of information reform. The most important anticipated benefits of e-government include improved efficiency, convenience, and better accessibility of public services. It has indirect effects that are no less important to the nation's wellbeing. These include greater transparency and accountability in public decision-making, the ability to stimulate local economies and the strengthening and development of democracy at its most local level. E-government provides benefits to the citizen and to public administration at a number of levels. The rise of the information society has led to major changes in citizen expectations and organizational structures, cultures and working processes.

This paper analyses the role of e-government in the production of public services to the citizens in the municipalities. It also analyses how gradually has been recognised as a strategic approach to transform, or even innovate, government from a citizen point of view. E-government initiatives refocus attention on a number of issues: how to collaborate more effectively across agencies to address complex and shared problems; how to enhance customer focus; and how to build relationships with private sector partners. Public administrations must address these issues if they are to remain responsive to citizen needs.

TB402 Tuesday, 10:05-11:20 Track: Supply Chain Management Chair: Soonhong Min
Room: W2-402 Session: Empirical research on SCM 2

TB402 Quantifying the Lean Value Network System: The Lean Metrics of Co-Investment and Co-Innovation on Organisation Level

Wouter W. A. Beelaerts van Blokland, Mikołaj A. Fiksiński, Sakyi O. B. Amoa, Sicco C. Santema, Delft University of Technology, Netherlands

Continuous innovation is necessary for most companies. Innovation should not only be applied on product level but also on the way the value chain and system are organised. Principles of Lean can be applied throughout the whole supply chain. The end customer becomes an integral part of the value chain. To maximize the value of the total system, companies work together by co-investment and co-innovation. Projection of the 3C model (continuation – conception – configuration) onto a company's traditional value chain,

the adoption of lean principles and re-evaluation of all activities as defined by Porter (1985), induce drastic changes in a company's value chain. Certain supportive activities become primary and primary activities become supportive. Other activities are leveraged to partners throughout the value system. Research shows the growing importance of Supply Network Management and Technology Development. As such the value chain is canting and drives the configuration of a lean value network system around it.

Research about lean has been mainly focused on process or product innovation and improvement. This research takes the lean principles to a higher aggregation; to an organisational level. Adoption of lean principles and the 3C model throughout the whole organisation should improve a company's financial performance. By quantification of the lean enterprise on organisational level it is possible to point out the advantages of a lean organisation to a company's baseline and its lean value network system.

Financial data of companies from various industries has been analysed and compared to the configuration of their value chain. As the value chain of a company is more canted this indicates the sophistication of lean within the enterprise. This should show in an improved financial performance of the company. Plots of proposed performance indicators, combined with the knowledge of the companies' configuration of their value chain and system, enables to draw preliminary conclusions regarding the quantification of their leanness and extent of co-innovation. The authors proceed to give a financial label to the terms 'smart follower' and 'fast mover' companies.

With the configuration of a lean value network system the ambition of faster, cheaper, better can be realised.

TB402 The Effect of Exchange Arrangements on Supplier Commitment

Christina Wong, Mike Lai, T. C. E. Cheng, Venue Lun, Daniel Ng, The Hong Kong Polytechnic University, Hong Kong

This study investigates the structural relationships between contractual, social, and institutional arrangements and their influences on supplier-espoused values and supplier commitment in a buyer-supplier relationship (BSR) by incorporating three theoretical perspectives, namely transaction cost analysis, social network, and institutional pressures. We find empirical support with data collected from 358 suppliers of a multi-national firm. Results of our data analyses suggest that supplier commitment is positively associated with supplier accommodation and implicit control, but not with explicit contract. Furthermore, these exchange arrangements positively affect the supplier-espoused values on relationship stability and social respect, and ultimately their commitment to the BSR.

TB402 Relationship and Practices in a Shipbuilding Supply Network

Adriane Lopes Queiroz, Marcos Oliveira Pinto, USP-POLI, Brazil
Marcos Mendes Primo, Universidade Federal de Pernambuco, Brazil
Susana Farias Pereira, FGV-EAESP, Brazil

This paper looks into the shipbuilding industry, an industry of global nature, make-to-order production and that is growing and expanding around the world. Behind this scenery we can also observe the force of a new type of competitiveness, not among companies anymore, but that is taken among supply chains (SC). This high level of organized, but complex, competition is resultant of many countries demands for their proper national fleet. It is also a consequence of the increase of exportation and of the consequent use of shipping as transportation that aggregate value to the foreign commerce. In Brazil, in particular, a considerable demand appeared in the year of 2004, directed by a national enterprise program of modernization and expansion of their fleets. The program foresees 42 ships orders and underlines the obligation of at least 65% national components for the vessels. Also the company requires the ship to be constructed at a national territory. This demand has put many players into motion around solutions for a new model of supply chain management (SCM).

The main objective of this paper is to identify the types of relationship and practices (involving production and supply management) adopted by the shipbuilding industry in Brazil. The future goal is to contribute for the structuring of a supply network based on the individual capabilities of its key-supplier and the cooperation between the players. The methodology used in this research was based on a quantitative survey. Considering the "rebirth" of this industry in Brazil, and the needs of gradually retaking its activities, we came across an uncertainty concerning which would be the "set of companies" who effectively could act in this industry as a key-supplier.

The research was based on a quantitative survey with 1160 companies and the rate of return was 16%. Responses to the web-based questionnaires were analyzed employing statistical software. Results indicate that the practices taken by these companies, shows the possibility of collaborative relationships. It is a fact of great importance, once it occurs despite the low industry level of development into the Brazilian shipbuilding market, which does not aloud a large scale production from these companies nowadays.

TB402 Managing Long-Term Partnerships as a Core Capability of Supply Chain Management

Soonhong Min, University of Oklahoma, U.S.A.
Jeong Eun Park, Ewha Womans University, Korea
Sungmin Ryu, Sungkyunkwan University, Korea

The concept of supply chain management (SCM) extends functional integration to all firms in the supply chain, so that each firm helps others create end-customer value and improve individual firm and supply chain performance through long-term partnerships. The resource-based view and relational contract theory offer theoretical support for the needs of long-term supply chain partnerships, information sharing, and risk and reward sharing as SCM capabilities--a firm's ability to generate, disseminate, and utilize skills embedded in supply chain partnerships to coordinate and employ available resources. Managing long-term supply chain partnerships represents a core capability, driven by information sharing and, risk and reward sharing among partners, which represent supporting capabilities. Long-term partnerships should increase firm competitiveness (i.e., inventory availability and timeliness) that in turn improve profitability.

We test the research hypotheses using Structural Equation Modeling with survey data. We confirm that (1) sharing information, and risks and rewards among supply chain partners help manage long-term partnerships; (2) information sharing motivates risk and reward sharing; (3) long-term partnerships help improve inventory availability. Against our prediction, it is found that (1) long-term partnerships do not improve timeliness directly but indirectly via inventory availability; (2) only timeliness has a direct impact on profitability; (3) inventory availability improves profitability indirectly via timeliness. We suspect that firms may make inventory available even at a cost disadvantage, but unless products are delivered on time, customers will not be satisfied and firms cannot improve profitability. This study contributes to the body of SCM knowledge by (1) testing an integrative model of SCM

capabilities by which firms create competitiveness; (2) responding to research calls to investigate interactions among information sharing, risk and reward sharing, and managing long-term partnerships; (3) testing the mediating role of long-term partnerships between sharing information, and risks and rewards and firm performance; (4) reporting on the often ignored relationship between inventory availability and timeliness.

TB403 Tuesday, 10:05-11:20 Track: Invited Chair: Qing Li
Room: W2-403 Session: Modeling: Production and inventory management

TB403 Strategic Capacity Rationing when Customers Learn
Qian Liu, Hong Kong University of Science and Technology, Hong Kong
Garrett van Ryzin, Columbia University, U.S.A.
Rationing risk creates an incentive for customers to buy early at higher prices. In such situations, deliberately under-stocking products can be an optimal selling strategy as shown by Liu and van Ryzin (2007). A realistic concern, however, is that customers do not have perfect information on availability; rather, they learn about availability through experience and over time. How then should a firm respond to influence customers' expectations most profitably? Our model assumes customers use a simple heuristic rule to update their expectations. The firm sells products over repeated seasons, each of which includes a two-period sales process - the full-price period and the markdown period. Customers have heterogeneous valuations for the firm's product and are assumed to have identical risk preferences. In each season, the firm commits to prices and capacity upfront. Customers know the firm's capacity choice in the last season, but do not know its current capacity. Based on their expectations of capacity, customers decide to either buy at the full-price period or the markdown period. We imbed this customer learning process in a dynamic program of the firm's capacity choices over time. One main result establishes the existence of a monotone optimal path of customers' expectations, which converges to either a rationing equilibrium or a low-price-only equilibrium. Further, there exists a critical value of customer expectation such that the market converges to a rationing equilibrium if customers' expectations are less than that critical value; otherwise, a low-price-only equilibrium is the limiting outcome. These results show why firms may be stuck with unprofitable selling strategies due to entrenched customer expectations. We also numerically examine how that critical value is affected by the discount factor, the learning speed and the degree of risk aversion. Lastly, we show that the equilibrium under adaptive learning converges to that under fully rational expectations as the discount factor approaches one.

TB403 Optimal Policies for a Two-Product Inventory System under a Flexible Substitution Scheme
He Xu, Hua Zhong University of Science and Technology, China
David Yao, Columbia University, U.S.A.
Shaohui Zheng, Hong Kong University of Science and Technology, Hong Kong
We study a two-product inventory model that allows substitution. Both products can be used to supply demand over a selling season of T periods, with a one-time replenishment opportunity at the beginning of the season. The substitution rule is flexible in the sense that the supplier can choose whether or not to offer substitution and at what price (discount level), whereas the customer may or may not accept the offer, with a probability that is a decreasing function of the substitution price. The decisions are the replenishment quantities at the beginning of the season, and the dynamic substitution-pricing policy in each period of the season. Using a stochastic dynamic programming approach, we present a complete solution to the problem. We also show that the value function is concave and submodular in the order quantities; and the optimal substitution/pricing policy is characterized by thresholds that are decreasing over time.

TB403 Timing and Sequencing Order Fulfillment of Capital Goods
Qing Li, Hong Kong University of Science and Technology, Hong Kong
Qi-Ming He, Dalhousie University, Canada
This paper studies the order-fulfillment process of a supplier producing customized capital goods. It is critical for firms in capital goods industries to determine the optimal time to start the order-fulfillment process. On one hand, their customers expect them to be responsive and the time that they are prepared to wait for the product is much shorter than the time needed to produce and deliver it. On the other hand, it is risky for the firms to start production before customers confirm their orders due to inventory holding costs and the possibility of order cancellation. In this study, we extend the existing literature to consider two different products, which share the same capacity and are ordered by different customers. The supplier can only work on one product at any time due to capacity constraints. The capacity constraints complicate the timing issue significantly because the supplier needs to determine not only the optimal time to start the order fulfillment, but also the right sequence. Apart from late initiation of the process, production scheduling difficulties alone could cause late delivery.

We formulate this problem as a discrete time Markov decision programming. For the problem where the order for one product has been confirmed, but that of the other has not and its arrival time is random, under a set of intuitive conditions, the optimal time to start as well as the optimal sequence follow a threshold-type structure and can be fully characterized. However, for the more general problem in which the arrival times of the orders for both products are uncertain, the optimal policy does not have a simple structure. Three heuristics are proposed and their performance tested.

TB405 Tuesday, 10:05-11:20 Track: m-Scheduling Chair: Norbert C. E. Trautmann
Room: W2-405 Session: Modeling: Jobshop scheduling

TB405 Solving the Job-Shop Scheduling Problem with an OSH Method Based on Local Search and Valid Inequalities
Helena R. Lourenco, Universitat Pompeu Fabra, Spain
Susana Fernandes, Universidade do Algarve, Spain
This paper presents a new Optimised Search Heuristic to solve the Job-Shop Scheduling Problem. The proposed hybrid method is based on Local Search and Valid Inequalities. The basic structure of the method is as follows: a local optimal solution is obtained and after is partially destroyed by applying a randomised greedy procedure; next, a construction method is applied to return a feasible

solution using the valid inequalities to guide this reconstruction and search for a better solution. This combination of Valid Inequalities and Local Search is quite innovative and leads to very good solution.

The job-shop scheduling problem has been known to the operations research community since the early 50's. It considers a set of jobs to be processed on a set of machines. Each job is defined by an ordered set of operations and each operation is assigned to a machine with a predefined constant processing time. The order of the operations within the jobs and its correspondent machines are fixed a priori and independent from job to job.

To solve the problem we need to find a sequence of operations on each machine respecting some constraints and optimizing an objective function; we use the maximum of the completion time of all jobs. The proposed OSH method has two phases: First, a feasible solution is build by using a GRASP algorithm that includes a branch-and-bound method at the building phase solving subproblems of one machine scheduling problems. This procedure performs very well when compared with other procedures that find initial solutions finding a local optimal solution; Next, to continue the search in the solution space, we apply a greedy randomized method to eliminate the sequences of operations in some machines. This method is biased towards machines with large number of operations on the critical path of the correspondent graph of the solution. We then test the existence of violated valid inequalities. These allow us to establish some orders between operations of each machine which sequence has been eliminated. Finally an extensive computational results will be presented and some conclusions and directions of future research.

TB405 Solving an Open Jobshop Scheduling Problem by a Multi-Objective Immune Algorithm

Hadi Panahi, Reza Tavakkoli-Moghaddam, S. A. Torabi, University of Tehran, Iran

This paper considers an open jobshop scheduling problem that minimizes bi-objectives, namely makespan and total tardiness. This problem, due to its complexity, is ranked in the class of NP-hard problems. In this case, traditional approaches can not reach to an optimal solution in a reasonable time. Thus, we propose a well-known and efficient meta-heuristic method, called immune algorithm, in order to solve the given problem. Finally, we compare our computational results with a well-known multi-objective genetic algorithm, namely NSGA II. The outputs show the encouraging results in the form of the solution quality.

TB405 Batching and Scheduling to Minimize Energy Consumption

Saral Mukherjee, Indian Institute of Management, Ahmedabad, India

Minimization of energy consumption is a desirable objective for any organization. However, this objective function has not received due consideration in scheduling literature. We introduce a model for minimization of energy consumption in a job shop. The energy consumed in running a machine is made up of a major component incurred during machine operation and a minor component incurred when the machine is idling but not switched off. We show that a tradeoff exists between the objectives of makespan minimization and minimization of energy consumption. Existence of a batch processor is identified as one of the situations that may lead to a tradeoff. We provide polynomial time procedures for the problem of minimization of energy consumption in static flow shops. The corresponding problem in the presence of dynamic job arrivals is shown to be NP-hard and a branch and bound algorithm is presented. We randomly generated 1800 problem instances to quantify the savings in energy consumption possible in a shop with a single batch processor with dynamic job arrivals. By shifting from a makespan based objective to an energy consumption based objective, we obtained a 16 per cent decrease in energy consumption by allowing a 11 per cent increase in makespan.

TB405 A Decomposition Approach to Short-Term Scheduling of Multi-Purpose Batch Plants

Norbert C. E. Trautmann, University of Bern, Switzerland
Rafael Fink, Hanno Sagebiel, Christoph Schwindt, Technical University of Clausthal, Switzerland

Multipurpose batch plants are typically used in the chemical industry for producing low volumes of multiple products. In batch production mode, the total requirements for the final products and the intermediates are split into batches. A batch is processed by loading the inputs into a processing unit, executing a chemical or physical transformation process, and unloading the output from the unit. The processing units need to be cleaned between the execution of different processes; the duration of this cleaning depends on the process sequence. In general, raw materials, intermediates, and final products can be stored in storage facilities of limited capacity. However, some of the intermediates may be chemically unstable and thus must be consumed immediately after production.

We deal with the problem of computing a minimum-makespan production schedule for given primary requirements. In the literature, monolithic approaches and decomposition approaches have been proposed. The former approaches formulate the problem as a mixed-integer program, which can be solved using standard software. The major drawback of this technique is that for large instances, CPU times tend to grow large. The latter approaches divide the problem into a planning and a scheduling problem. Planning is concerned with determining the batch size and the number of executions for each process. Scheduling refers to allocating the processing units, intermediates, and storage facilities over time to the processing of the corresponding batches. In our talk, we present a novel formulation of the planning problem as a mixed-binary linear program of moderate size. We tackle the resulting scheduling problem with a new priority-rule based method. Computational experience with sample production processes from the chemical engineering literature shows that with this approach, optimal or near-optimal production schedules can be computed at very modest computational cost.

TB501 Tuesday, 10:05-11:20 Track: Spanish Chair: Javier Merino
Room: W2-501 Session: S-Quality management

TB501 The Effectiveness of TQM: The Key Role of Organisational Learning in Small Businesses

Daniel Jiménez-Jiménez, Micaela Martínez-Costa, University of Murcia, Spain

The competitiveness of SMEs is threatened by the lack of resources to implement some of the organisational practices followed in large companies such as Total Quality Management. However, total quality practices could foster the creation of the indispensable knowledge for continuous improvement and for competing in the current markets in this kind of companies. In this research, we have studied the effect on performance of TQM and organisational learning. Both of them are increasingly regarded as sources of competitive advantage for firms (Dervitsiotis, 1998). The literature review has shown that they are related. In particular, organisational learning is viewed as a consequence of the application of TQM practices. Nevertheless, little research has empirically examined these relations is SMEs.

The purpose of this paper has been to explore these relations. Using structural equations modelling with data collected from 706 Spanish firms, this paper analyzes the linkages between total quality management, organisational learning and performance. Our findings have shed light on these relationships that have rarely been studied. Firstly, it was found that organisational learning has a positive effect on performance. Support was also found for the assumption that TQM is related to organisational learning. Finally, the findings provide evidence about the link between TQM and performance. This relationship is both direct and indirect through organisational learning. Consequently, TQM practices could be a competitive strategy in SMEs too (Ahire and Golhar, 1996) since they improve organizational performance and foster the organisational learning process that has also a positive effect in performance.

TB501 Total Quality Management, Knowledge Management and Market Orientation as Determinants of Innovation and Performance.

Daniel Jiménez-Jiménez, Micaela Martínez-Costa, University of Murcia, Spain

Over the last few decades there have been an increasing number of studies focusing upon the fields of Total Quality Management (TQM), organizational learning and market orientation as precursors of innovation (e.g. Hult & Ketchen, 2001; Weerawardenaa & O'Cassb, 2004; Flynn et al., 1994; Baldwin & Johnson, 1996) and organizational performance (Bontis, Crossan, & Hulland, 2002; Hult et al., 2001; Tippins & Sohi, 2003). All of them can be viewed as resources that a firm might employ to attain competitive advantage (Baker & Sinkula, 1999; Celucha, Kasouf, & Peruvembac, 2002; Day, 1994a; Day, 1994b; Dickson, 1996; Hunt & Morgan, 1996) and a key to successful product innovation and performance (Dickson, 1996; Slater & Narver, 1995). The objective of the present paper is to clarify the relationship between these concepts.

In this paper, we revise the specific literature in these topics and propose a model which moderates their relationships. According to this model, TQM will foster the generation of new knowledge from inside and outside of the organization. Thus, TQM could enhance the processes of knowledge management and market orientation. This knowledge will be used to generate innovations through new products for customers. Also, the implementation of a TQM system could foster the innovation process in companies due to TQM elements such as continual improvement or customer focus. Finally, we contemplate how organizational learning, market orientation and innovation contribute to generate a competitive advantage thought organizational performance.

Using data from 706 companies and through structural equation models, this study tested the relationship among TQM, knowledge management, market orientation, innovation and performance. Our results show how TQM has a positive relationship with both market orientation and knowledge management. Also we have found evidence about the relationship between market orientation-innovation and knowledge management-innovation. Finally, the results also indicate that organizational learning and innovation has a positive effect on performance. Implications for both academics and managers and future research lines are discussed.

TB501 E-Quality Management: Dimensions of Excellence in the Pre-Sale and the Post-Sale Phase

Lucia Melian-Alzola, Victor I. Padron-Robaina, Universidad de Las Palmas de Gran Canaria, Spain

This work seeks to contribute a group of reflections and conclusions in relation to the following questions: Does the performance of the company in the pre-sale phase in the electronic purchase have more weight on customer satisfaction than its performance in the post- sale phase? What aspects of the performance pre-sale and post-sale affect more to the disposition to repeat and the disposition to recommend the purchase experience to third parts? What relations do they exist between the pre-sale and post-sale performance in a web site? In the literature that treats electronic commerce we find, among other, works related with our study objective and they come from the area of operations management, quality management, services management and marketing.

Starting from the revision of the most relevant works for the study (among other, Yang, Jun and Peterson, 2004; Yang, Cai, Zhou and Zhou, 2005; Parasuraman, Zeithaml and Malhotra, 2005; Kim and Stoel, 2005), we develop and justify a theoretical scales that collect the important variables of the quality in the pre-sale a post-sale phases in electronic commerce b2c. Our hypothesis is that the performance of the variables of the post-sales phase affects to the global quality perceived by the customer and its behavioural intentions in more grade that the variables of the pre-sale phases. The theoretical justification is in that performance in the web site -electronic format- it is more easily controllable and manageable. On the opposite, in the post-sale phase, take part third part, logistical operators- that hinder the excellence in the service. After the empiric validation of the theoretical scale of quality, by means of factorial analysis, we measure the impact of the pre-sale's dimensions and the post-sale's dimensions on global quality perceived by the customer, on the willingness to repeat and to recommend. As sum, the results confirm the principal hypotheses of the study, that is to say, the dimensions of the post-sale phase impact more on perceived global quality and behavioural intentions than the dimensions of the pre-sale phase.

TB501 Measuring Employee Satisfaction: Practices in Spanish and Portuguese Companies

Arturo Jose Fernandez-Gonzalez, Jose Carlos Prado Prado, University of Vigo, Spain

This paper deals with the practices of measurement and analysis of employee satisfaction used in companies in Spain and Portugal, by means of an empirical study carried out in 305 organizations of the Euro-region comprising Northwest of Spain and the North of Portugal. Nowadays there are hardly any doubts that companies have to act to improve their degree of employee satisfaction to achieve a better degree of their involvement with the business aims, a greater productivity and a more favourable work climate. All this has a direct effect on product and service quality, client satisfaction and, lastly, on the account of results. However, we can not know how much we improve (if we do improve at all) if there are no measurements for quantitative indicators of said satisfaction. The empirical research was developed by a team in the Organization Engineering Group (GIO) at the University of Vigo (Spain), from June 2002 to March 2003.

The aim of this research was to determine the current situation and outlook for the future in quality management implemented in companies within the Euro-Region. Measuring and analysis practices applied to employee satisfaction were one of the key aspects in this research. Data was gathered by personally interviewing those responsible for quality management at the companies. As main results the investigation revealed, among others, that the companies give a medium-high importance to the measurement of employee satisfaction. However, only 22.4% of the companies use some method of measurement of said satisfaction. The great majority (85.3%) of the companies that measure their employee's satisfaction do so based on written and anonymous surveys carried out annually. Only a few companies resort to personal interviews. The usefulness of this practice for the companies that develop it can be described as moderately high. It should be emphasized that practically no other alternative method is used, like

the obtaining of internal indicators, which can show a lack of options and/or of training in this field on the part of the managers of the companies.

TB501 5-S: Contextual Factors and Impact on Performance

Javier Merino-Diaz de Cerio, Alberto Bayo–Moriones, Alejandro Bello–Pintado, Public University of Navarra, Spain

5S is probably one of the methodologies of quality management for continuous improvement from Japanese firms that has been adopted to a greater extent in Western manufacturing companies. This wide incidence can be explained by its simplicity and fast visibility in terms of impact on performance. However, the academic literature has not paid much attention to this methodology separately from other quality management tools. As a consequence, there are few empirical papers about its implementation and effect on performance. This paper is exploratory and tries to draw some conclusions about the relationship between different contextual variables and the introduction of this methodology in firms as well as its effect on some measures of operational results. These issues are analysed in a sample of 200 Spanish manufacturing firms. The results of the paper show the existence of a positive relationship between the introduction of 5S and advanced manufacturing technologies, just in time practices, other quality management practices and some work organization practices. Moreover, 5S has a positive influence on some of the operational performance measures, especially on those referred to quality and productivity

TB503 Tuesday, 10:05-11:20 Track: m-Statistical Quality Control Chair: Linguo Gong
Room: W2-503 Session: Modeling: SQC 1

TB503 The Effect of Autocorrelation (Stationary Data) on the Integrated Statistical Process Control System

Karin Kandananond, Rajabhat University Valaya-Alongkorn, Thailand

At present, business competition requires organizations to increase their products' quality and reduce cost at the same time. Statistical process control (SPC) techniques are important tools for monitoring process performance over time to detect special causes. Automatic process control (APC) systems, on the other hand, are utilized to regulate performance relative to a specified target. The literature indicates that combining APC and SPC systems result in integrated SPC (ISPC) systems offering an effective approach to process improvement. The objective was aimed at identifying the various process factors likely to affect the long-term performance of ISPC systems. The process considered was one of discrete parts manufacturing characterized by the autoregressive moving average model ARMA (1, 1). A simulation model was developed to represent system performance in terms of the mean squared error (MSE) of the resulting output and the average run length (ARL) of the SPC charts (X and EWMA) utilized. Simulated results were analyzed to identify influential factors likely to affect the system performance.

TB503 Repetitive Testing of Multiple Products

Jie Ding, Rider University, U.S.A.
Betsy S. Greenberg, University of Texas at Austin, U.S.A.
Hirofumi Matsuo, Kobe University, Japan

This paper considers the problem of test design and implementation when testing is imperfect. Items that are classified as conforming may be nonconforming, resulting in a poor outgoing quality level. Items that are classified as nonconforming may be conforming, resulting in excessive scrapping of good items. The failed items are commonly retested to reduce the scrapping problem. Alternatively, the accepted items may be retested to improve outgoing quality. This paper considers the problem of determining the numbers of repetitive tests for multiple products to minimize the sum of the expected scrapping cost and variable testing cost subject to a capacity constraint on testing equipment that is shared by all the products.

This paper will involve four components. The first is the development of a nonlinear optimization model. The second component is the derivation of estimators for the unknown parameters that describe the incoming product quality and the accuracy of the testing machine. The next stage will be to design a solution procedure for the optimization model. Finally, computational experiments will be needed to evaluate the estimation and solution procedures. Additional computational experiments will be described to gain managerial insights into the effect of the testing machine capacity.

TB503 An Interactive Repetitive Chip Testing Model

Linguo Gong, Jie Ding, Rider University, U.S.A.

In order to reach high quality standard in semiconductor industry, it is common practice that semiconductor manufacturers test their products repetitively (that is, each chip is tested more than once) before the products are shipped to the customers. However, designing an effective repetitive testing process has always been a big challenge to managers because i) it is a very complicated process that deals with various uncertainties such as incoming product quality and testing accuracy; ii) it needs very expensive testing equipment.

In this research, we are going to investigate an interactive repetitive testing model for chip testing. Different from traditional repetitive testing model in which decision on the number of testing repetitions is made before the testing process, the interactive repetitive testing model makes decision on whether to perform additional testing cycle by analyzing information from previous testing cycles. We develop an interactive quantitative decision model (or models) that formulates a repetitive testing process with i) uncertainties in the incoming product quality; ii) uncertain and non-observable testing equipment condition during testing operation; iii) uncertain dynamics in testing equipment precision. Using the model, we perform experiments to compare our model with existing testing processes, and discuss effects of decision parameters and equipment condition on testing system performance.

TC202 Tuesday, 13:40-14:55 Track: New Product Development Chair: Masaharu Ota
Room: W2-202 Session: New product development 3

TC202 Virtual Pilot Factory (VPF) - A New Model for New Product Development Organization
Tiina K. Valjakka, Ismo Ruohomaki, VTT, Finland

Companies need not only to develop new products in order to retain competitiveness but also improve and upgrade the new product development (NPD) processes and practices as well. New product development is typically considered to be a core competence, but production is often outsourced to contract manufacturers. Changes in processes create changes in the organization and actors involved in new product development.

This paper describes the objectives, principles, and pilot experiences of a concept called Virtual Pilot Factory (VPF). It is a virtual organization of a decentralized company network which is organized based on the needs and requirements of individual new product development projects. The combination of companies may vary widely, depending on the resources and knowledge needed in NPD projects. VPF provides services needed in new product development process: e.g. planning, design, manufacturability, testing, production ramp-up, project management, and product life cycle -related services. The main focus areas of VPF are manufacturability and production ramp-up which are both challenges for global companies due to current separation of new product development and production. VPF is developed by two global technology companies, KONE and Konecranes, in order to shorten the time-to-market and enhance total life-cycle cost efficiency. The experiences from first pilot projects show that VPF has potential as a new means to organize product development. In pilots, KONE concentrated on thorough examination and development of global manufacturability for volume production. An evaluation model was also built to estimate the effects and benefits of VPF compared to the "traditionally" organized NPD project. The first objective of Konecranes in VPF was to construct a basic model that depicts the distribution of tasks and responsibilities in the network. Another basic issue was the management of complex NPD projects, especially the role and responsibilities of the VPF project manager.

TC202 The Diffusion of Innovations and Communication Methods - An Analysis of Diffusion Mechanism of Innovations in the Marketplace
Hideaki Kitanaka, Takushoku University, Japan

The diffusion of innovation is one of essential elements for corporations to survive. Inovation can spread via several manners, such as advertising, promotion, personal communication. In this paper, the author focused on channnel network int the marketplace and word-of-mouth communication exercised there. The author used agent-based approach to analyze network structures those channels have. Conparison of each channel network's property and discussion will be extended before the conclusion is addressed.

TC202 Organisational Structures to Support Innovation: How Do Companies Decide?
Adriana Marotti de Mello, Mario Sergio Salerno, Roberto Marx, Polytechnic School of University of Sao Paulo, Brazil

The purpose of this work is to discuss the issue of how companies aiming to increase their innovative capacity should decide about their Organisational Structure. To accomplish this goal, a bibliographic review about the theme was carried out, as well as an exploratory research, conducted by a case study in a Brazilian petrochemical company that had recently re-organised its structure regarding innovative activities.

Innovation is a complex and multidisciplinary activity, encompassing different areas of a company, its clients, suppliers and other institutions such as universities and research centres. In order to work properly, this network should be efficiently coordinated.

Traditional forms of organisation, based in divisionalized organisation structure, supervision and centralized authority, were suitable for stable environments, but for uncertain, complex and turbulent ones, as innovative environments, they would not be able to cope with the flexibility and agility needed for innovative activities.

In the literature reviewed (Jensen et al, 2007, Mintzberg, 2003, Zarifian, 2001, Brown and Eisenhardt, 1997, Worley and Lawler III, 2006, Hatchuel and Weil, 1999), it was possible to find out that the most suitable organisational form for innovative companies should be flexible, which would change according to the environment, enhancing interaction and communication among its members, agile in decision making and with softened functional demarcations.

Besides that, in deciding upon organisational structures that foster innovative activities, companies should think about innovation as a process flow that integrates most of their functions, from Marketing to Production areas, and consider which, exactly, is the problem about developing innovations prior to changing their structures(Hansen and Birkinshaw, 2007).

The results suggest that the studied company decided upon its organisational structure without considering the whole process of innovation, focusing efforts only on the Research and Development area. Its organisational structure is still based on traditional forms, with centralized decisions and well demarcated functions. A more "adhocratic" structure, considering innovation as an integrated process would foster the company innovative capacity in the future.

TC202 Development of Innovation Methodology for Japanese Enterprise Based on Innovation Capability
Masaharu Ota, Osaka City University, Japan

It is crucial to present effective methodology for innovation management that considers the characteristics of each enterprise in each country. In such circumstance, it becomes an important subject to regenerate out of the unmanaged or unsystematic innovation up to now and to proceed to systematical innovation to get secure result. It means that it reaches the stage where innovation management has to be thought from the view point of the operations management.

In this paper, firstly, the result of a survey analysis for Japanese enterprises is presented, based on Lawson and Samson's Innovation Capability, which can serve as a lead for discussing innovation management at the level of operations management. As a result, in terms of the extent to which capability-related items are focused on, there were correlations between the scale of enterprises and tendency of sales, and the organizational capability and sales. Secondly, the specific results which may be viewed as the peculiarity of Japanese management are provided by the causal analysis among the 7 elements of Innovation Capability. Lastly, the methodology of innovation for Japanese enterprise is developed with the result of the causal analysis.

TC301 Tuesday, 13:40-14:55 Track: Health care management Chair: Angel Diaz
Room: W2-301 Session: Health care management 1

TC301 Customer Value and Lean Operations in Self Care
Jannis Angelis, Warwick Business School, United Kingdom
Cameron Watt, Mairi McKintyre, WMG, United Kingdom
There has been a shift towards independence and choice for patients, as people want more information and control over their health care. This study explores the role of the customer as specifier of value and the tension of customer wants versus patient needs in a lean healthcare environment. The role of the customer as value specifier lies at the heart of Lean principles and operations, which poses a fundamental problem when implementing Lean in healthcare due to the ambiguous notion of the patient as customer. The study is based on a survey of 40 healthcare providers. It identifies a misalignment of perceived want and need along the value chain, with associated implications. Empirically, the study offers lean implementation advice, and conceptually it expands on the debate of appropriate lean application in the healthcare sector.

TC301 Computer Simulation for Reengineering the Process of Medical Supplies Distribution to Hospitals
Sung J. Shim, Seton Hall University, U.S.A.
Arun Kumar, Nanyang Technological University, Singapore
Organizations reengineer their business processes to improve efficiency, to contain costs and to stay competitive in the marketplace. With escalating healthcare costs, hospitals also seek ways to provide quality healthcare services while containing costs. Hospitals have traditionally emphasized breakthroughs in healthcare procedures and technology to stay competitive. As competition among hospitals continues to intensify, however, patients may perceive little difference in the healthcare procedures and technology used by different hospitals. Consequently, hospitals are beginning to understand that process reengineering can be a better solution to achieve competitive advantage. Just as many businesses successfully reduce costs and gain competitive advantage by reengineering their business processes, hospitals can reengineer the way certain processes are carried out to achieve efficiency and cost containment. Computer simulation that has proven successful in improving various business processes can also be an effective tool in the search for more efficient processes in hospitals.

This paper describes a case study that involved three hospitals in Singapore. The three hospitals are owned by a healthcare group that owns more than ten hospitals in Asia and Europe. The management of the healthcare group considered centralizing the process of medical supplies distribution to the three hospitals by building a new distribution center. The existing process of medical supplies distribution was being handled by individual hospitals separately. Using computer simulation, this study assessed the efficiency of the existing and new processes of medical supplies distribution to the hospitals in terms of costs (inventory and operating costs) and utilization of activities (functional areas) and resources (staff) involved in the process. The results will prove helpful to those who are considering reengineering and improving the process of medical supplies distribution to hospitals or other similar processes.

TC301 The Evolution of the Hospital Accreditation System in Catalonia (Spain): A Review of 26 Years of Experience
Jaume S. Ribera, University of Navarra, Spain
Ma Lluisa Lopez, Rafael Manzanera, Generalitat de Catalunya, Spain
The paper describes the 26 years of experience on acute hospital accreditation in Catalonia, an autonomous community in Spain, whose government has full responsibility on policy definition and implementation of its national health care system. The accreditation program, of voluntary participation, was initially linked to the purchasing of health services which are publicly funded but mostly privately provided.

The paper starts by reviewing the concept of hospital accreditation, a process that is key to the improvement of quality of services provided to the citizens. The first regional program of accreditation in Europe started in Catalonia in the 1980's and these programs have grown faster in WHO/Europe than in any other region of the world. We review the background on which this initial program started and its historical evolution, with a special emphasis on the results obtained along these years. The paper focuses on the latest accreditation model, which incorporated important changes on its key elements as well as in the aimed objectives. The current program is based on a model for continuous improvement, patterned after similar models existing in Europe in other industries, adapted to health care to provide both accreditation standards and improvement guidelines.

The paper describes the adaptation required to transform a traditionally administrative process perform by the national health system personnel, into one that involves outsourcing key public administration roles, and defines the creation of the group of entities empowered with external auditing the application of the accreditation process in public and private hospitals, and the supervisory role retained by the Catalonian Department of Health.

The paper presents a historical view and places an important emphasis on the education and training of hospital personnel applying for accreditation, and on the role of leadership and communication, critical for the success of the overall model.

TC301 The McDonald's of Health Organizations: Lean Practices at Aravind
Angel Diaz, Instituto de Empresa, Spain
Stephan Pahls, Dept. of International Development, Yemen
Juan Pons, Motorola
Luis Solis, Instituto de Empresa, Spain
This paper examines the lean operations model of Aravind, the largest eye care provider in the world, with over 2.5 million operations performed and 20 million patients treated in the last thirty years. An Indian not-for profit organization in which two thirds of the patients are treated for free, Aravind uses McDonald's as their operational model, attends its goals by strict attention to cost optimization, and has established a manufacturing operation, Aurolab, to provide lenses and other supplies at a very low cost. Aravind can be considered a mass service or service factory, as it focuses on a reduced portfolio of specialized services performed in large volume following a quasi-assembly line process. Although the company does not explicitly cite the influence of lean practices, such lean principles as process simplification, elimination of non-value activities, waste reduction and a commitment to excellence in operations to deliver superior customer service are clearly present. The methodology used is grounded on in-site primary data collection and on extensive secondary data analysis. Based on process map analysis, the key lean practices of Aravind are identified,

and the scalability and application of the model to different environments are discussed. The contribution of the paper is a grounded analysis of the applicability of established manufacturing lean principles to health service operations.

TC302 Tuesday, 13:40-14:55 Track: Invited Chair: Edward James Flynn
Room: W2-302 Session: High Performance Manufacturing 3

TC302 IFM (Interacting Field Model) as a Model of Communication - An Application to the Production and Operations Management Studies -
Atsuko Ebine, Surugadai University, Japan

Interacting field model (IFM) is developed as a model of communication to analyze not only qualitatively but also quantitatively the quality creating activities in manufacturers from the view point of intra- or inter-organizational communications because preceding researches indicate a positive correlation between the quality creating ability of a manufacturer and the communication level of the organization. This development aims at depicting the structure and function of organizational communication activity simply and clearly, as well as at an absolute measurement of communication level based on data. According to this model, communication is the local interaction between an individual as the subject of communication and the field which is the region of space-time with non-zero density of elementary processes of communication. An elementary process of communication is a single process of one-way transmission of information from an individual to another individual. The field strength is the local density of elementary processes of communication. The communication level of an individual is the product of the local field strength and a coupling constant proper to the individual. The communication level of an organization is the integral of that of an individual, and its approximate value can be obtained by some method. With this model, the “parallel gap” of communication levels, a co-operative phenomenon, among related sub-organizations observed in the preceding researches can be qualitatively interpreted.

TC302 Building Capabilities in Manufacturing Process Innovations
Kimberly A. Bates, Trent University, Canada
E. James Flynn, Indiana University, U.S.A.

This study examines the history of the adoption of 14 manufacturing process innovations over 60 years in manufacturing plants in Germany, Italy, Japan and US, Finland, Sweden, Norway and Korea to understand whether innovation adoption represents capabilities building or pursuit of management fads. A plant's history of prior innovation adoption is the most important variable in predicting future adoption. Other hypotheses addressed country, industry, and diffusion of innovations as predictors of innovation adoption, with results supporting innovation history and diffusion within country as important predictors of innovation adoption. The act of innovation appears to build the capability to innovate in the future, representing a dynamic capability for innovation over time.

"The capacity to reconfigure and transform itself is itself a learned organizational skill. The more frequently practiced, the easier accomplished" according to Teece, Pisano, and Shuen, (1997, pg 521), yet investments in innovations may not always achieve their stated goals. How should firms decide when and how to adopt innovations? This study takes a critical look at the predictors of innovations to better understand how, why and when plants adopt manufacturing process innovations.

Our finding that plant history is one of the best predictors of the propensity to adopt innovations in the future is consistent with the dynamic capabilities perspective; there appears to be some support for the notion that firms developing routine-changing routines through the act of innovation adoption. This may represent differing levels of absorptive capacity for innovation adoption across the plants in this study (Cohen and Levinthal, 1990). This finding addresses our first research question regarding how firm-specific innovation capabilities are developed: the act of innovating is the best way to create and maintain a capability to innovate in the future.

TC302 An Empirical Analysis of Cellular Manufacturing
Jorn-Henrik Thun, Peter M. Milling, Mannheim University, Germany

The necessity to offer a great variety of products forces many manufacturing companies to produce a wide range of different parts. Additionally, they have to manufacture at low cost requiring the transformation process to be on a high efficiency level. Overcoming this trade off between variety and efficiency must be regarded as indispensable key factor for manufacturing systems and can be seen as the most important challenge for Production and Operations Management. A promising approach to counteract the dilemma of producing a great variety of products on a high efficiency level is cellular manufacturing, i.e., a set of practices designed to integrate manufacturing elements. In order to realize one-piece-flow within the production process machines are grouped as manufacturing cells dedicated to a particular part family. This hybrid manufacturing system links the advantages of both, job shop and flow shop.

This paper gives insights about cellular manufacturing contributing some empirical results to the question concerning the trade-off between variety and efficiency. It analyzes the impact of the implementation of its instruments on the interdependencies of variety and efficiency. The data used for the analysis is taken from the international empirical research project “High Performance Manufacturing” which consists of data from over 230 plants. By means of a factor analysis the instruments of cellular manufacturing are operationalized. A cluster analysis distinguishes between plants with a high implementation degree and traditional plants. Based on this cluster analysis a comparison of means allows insights concerning the performance in terms of variety and efficiency. Furthermore, other performance indicators can be investigated showing the potential of cellular manufacturing. Finally, an in-depth-study conducted in the German and Japanese plants allows a closer look on cellular manufacturing. A comparison of the two countries is performed.

TC303 Tuesday, 13:40-14:55 Track: Invited Chair: Keiju Matsushima
Room: W2-303 Session: Global transfer in East Asia

TC303 The Overview of the Global Transfer
Keiju Matsushima, Kim Shouko, Sadayoshi Maeda, Musashi University, Japan
Yoko Ogushi, Niitaga University, Japan
Masakazu Kozakai, Tamagawa University, Japan
Dai Isobe, Osaka Gas Information System Research Institute Co., Ltd., Japan

With expansion over across the border, companies have been established the global business management. Furthermore, the explosion of IT has promoted rapid information exchange, resulting in globalization of business. The focus of globalization is shifting from localization to global business unit. Recently, other than fundamental practices such as market of domestic products, best practice, including right place production and production within market becomes widespread. Particularly, regarding different countries as one domain, a global strategic business unit concept is prevailing widely in large companies. Highest issue of this concept is standardization or common practices. So according to tightly coupled co-operation is substantial, rather than loosely coupled operation among countries, so to say localization. As a result, business process integration that could facilitate seamless operation, may be a highly key success factor. Some solutions such as EDI for order information exchange, and sharing integrated database are highly effective to improve competitiveness, resulting in sharing business process, business practice, and management system and technique. Then transferring successful practices or methods might be encouraged in terms of time and cost. Such transfer is promoted by exchanging huge information via network.

Our research is to focus on the transfer of management practice in East Asia countries. In East Asia area, most advanced practices were transferred from western countries, except Japanese production management practice, namely JIT. Moreover there are many articles which discuss about difficulties of transfer so far; however, our research would focus on evolutionary development, rather than difference or difficulties when transfer. Own capabilities of countries may affect the evolutionary process, so that the management practices in each country may vary existing practices and so on. .

TC303 The Methodology of our Empirical Study in Global Transfer of Management Practice

Dai Isobe, Ogis Research Institute Co. Ltd., U.S.A.

Many companies of countries, other than the U.S., have imported the business management practices developed in the U.S. Certainly, these practices are seemed to be best practice. However, it may be doubtful whether these practices have been transferred successfully to enjoy a variety of benefits. Our research was addressed to solve the major issues by acquiring research findings and implications. In our empirical study, we would identify the transfer process of business management technique and verify the some hypothesis based on previous studies to elucidate transfer process mechanism actually practiced.

For the above issue, we plan three years cross-national survey. This survey will have some difficult problems. At first survey, some foreign companies take so much cost, so we have few survey chance; they have different business custom, so we afraid questionnaire are misunderstood. Through many considerations, we design our survey very structured.

We refer previous cross-national survey as “Open Research Center Project in Musashi Uni,” and “Business process management of LG Electronic Co. in South Korea”. We combine interview survey with questionnaire survey. We call this multi-step survey. Step1 is screening survey by questionnaire, step2 is more detailed questionnaire, and step3 is interview survey. We would get effective data by this method.

And more, our research project is consisted of different countries, different focus-area academician. So we would pay attention to right methodology for our empirical study. Particularly, we would make two kinds of MAP for our discussions. One is a “Research strategy MAP”, it is drawn like as V character. This map identifies research question between hypothesis and motivation. Additionally, we can understand our position in Bird view. The other map is “Relation Map of hypothesis and questionnaire”. This map breaks down hypothesis into logic tree for each questionnaire items. Using the map, we could prepare questionnaires highly structured. In this paper, we would report about latest status of our survey in preparation, such as making questionnaire.

TC303 Make Delay in Investing the Most Advanced IT in Japan! - Global Transferring IT with Sobering Judgment -

Yoko Ogushi, Niigata University, Japan

In general, it is said that a feature of IT (Information Technology) investment in Japan is woefully behind many countries in the advanced world, luck of strategy and so small amount expense. At the same time, these kinds of insists point of possibility that small investment cause low productivity in Japanese companies of their governance field, thus, they need to increase IT investment quickly and dramatically. In additions, it is argued that most IT tools have been originally made in US or EU companies, these tools are not suitable for Japanese companies on their own. So, it has been absolutely required for them to change their way to business process or to customize the tools for making them fit. It would be also bother them to use the tool effectively and prevent from the best practice in the world.

However it might be time to need to revise these points of view. In fact, as many times of global transferring was occurred in Japan so far, companies introduced its essences adjusted for their styles without fully acceptance. The same things might happen again in IT investment. According to some investigations or interviews for CIO of the companies, the stance of their investment for IT is “Money for Value” in real meaning. In other words, if it worth while, they willingly invest money for the latest IT tools and make every efforts to gain a return from them. Moreover there are obvious differences in their approaches of IT investment compared with others.

In our research, we would identify more appropriate approach on IT investment from a view point of global transfer. It shows that top managements evaluate their new system not only financial side but also improving rate of working environment, customer satisfaction and business process management.

TC303 The Study of the Transfer for Managerial Accounting Techniques under Globalization: Focusing on the Comparison of EVA between Japan and Korea

Shoko Kim, Sadayoshi Maeda, Musashi University, Japan

The development of IT and the globalization of management made the base for transferring of world class best practices. Actually, as many authors suggest, however, these transferring have not been successful. It seems that there are not cultural reasons, but some critical factors.Considering that so far no research has been done regarding current status of EVA adoption use, special purpose survey was done in order to figure out how far EVA is adopted by Japan and Korean companies and what is the main purposes of EVA as well as the gap between theory and practices regarding the measurement adjustment.

This study focused on EVA which is one of the key performance indicator techniques developed by the Stern Stewart, consulting company in the United States. Then, Japan-Korea jointly conducted research on “Introduction and actual condition survey of EVA utilization”. As actual condition survey of utilization of EVA, is organized into following four parts: Part one- availability of introduction and utilizations of EVA, e.g. availability of performance-based compensation interaction; Part two- the calculation method of EVA numeric value in company; Part Three- questionnaire about achievement measurement value that is currently-used in

company; Part Four- the company that does not introduce EVA. Thus, this study revealed actual condition survey of EVA utilization and its characteristic in companies in Japan and Korea. Furthermore, this research showed us the growth of stockholder value which is an internal factor and not an original purpose is high reason. By exposing histories, cultures, management methods including organizational operations, and relate to nation differently between Japan and Korea, unified formulation of success factor on the Transfer of Managerial Accounting Techniques should be found.

TC303 What Enables Strategic Learning with Strategy Maps? -Global Transferring of BSC-

Masakazu Kozakai, Tamagawa University, Japan

We would discuss the key success factor of the global transfer of BSC. BSC is customized in American style, and different from Japanese Hoshin-Management. Now, BSC includes Scorecard, Strategy Map, Strategic Portfolios of Intangibles, and Alignment Map.

Our topics of research are global transfer of management tool. We are to discuss about how to introduce BSC in implementing in countries other than the United States. We also evaluate which method is valuable.

We would describe three types that BSC is introduced into the organization in the global transfers. These are some differences in whether it is done so voluntarily or compulsorily. First, the "compulsory type" is an organization that compulsorily urges the implementation on the local establishment from the headquarters in the United States. Second, the "voluntary type" is an organization that implements BSC voluntarily, pursuing the advantage of BSC. Moreover, a voluntary type also includes the "faithful type" and the "interpretation type". The faithful type means that organizations faithfully execute the theory of BSC. The interpretation type means that organizations alter the interpretation the theory of BSC to some extent.

However, the success of implementing BSC becomes a point under discussion. For instance, it includes the evaluation of the implementation project, the evaluation of a financial result, and so on. The evaluation of the implementation project relates just to an implementing process. In this point, it is evaluated whether BSC was introduced without delaying the project. However, it is unrelated to the success of BSC directly. Other, it is also difficult to evaluate just financial results that creates in use of BSC, because we cannot measure it appropriately.

We focus on the strategic learning of organization. In BSC environment, "the scorecard serves the linchpin of the strategic learning process, linking the operations control process with learning and control process for managing strategy." If the purpose of the implementing is strategic management, the establishment of strategic learning becomes a key that measures the success. Moreover, the establishment of strategic learning can be observed. Therefore, we discuss the type of a global transfer of BSC from the viewpoint of strategic learning.

TC305 Tuesday, 13:40-14:55 Track: Human Resource Management Chair: Shinji Shimizu
Room: W2-305 Session: HRM systems

TC305 Combinatory vs. Individual Components of Work-Life Balance: Identifying Profiles & Employee Sub-Groups

Phang Riyang, Hesan A. Quazi, Nanynag Technological University, Singapore

Job Flexibility is a common initiative of the HR function, yet its impact on businesses is felt most by those responsible for planning work schedules. Whilst empirical evidence of its impact on bottom-line exists, applications by practitioners often assumed staff homogeneity and business similarity. Seldom is this the case. And when they do not, the direct cost of failed implementation will often be confounded by the indirect cost on workflow and process recovery. Such importance, calls for more information to guide Job Flexibility implementation. Yet unlike other value-chain activities, HR practitioners had been slow to adopt statistical advances to this cause.

This paper explores and illustrates the use of Profile Analysis via Multidimensional Scaling in the area of Job Flexibility and Work-Life Satisfaction, and compares the result with commonly used analytical methods. Although a much complex method than descriptive statistics and regression analyses frequently used in this domain, this research shows how much more information can be derived from the same climatic surveys often conducted in organizations, and argues that better knowledge of staff profile prevents blanket-type application of HR policies. Through prioritizing resources at points of higher leverage, organizations can see greater returns on HR investment, benefit from a leaner way of people management, and mitigate potential disruptions to operations.

TC305 Human Resource Education Strategy for Revitalizing the Manufacturing Culture through Creating the Service Engineering Discipline in Japan

Hiroyasu Ito, Shinji Shimizu, Sophia University, Japan

In this paper, first of all, the typical comparisons of the manufacturing technological cultures among three different territories such as the Europe, the United States and Japan have been overviewed through analyzing the historically major events which provoked the creations and fostered the increases of wealth and power. In the 21th century, it is necessary for us to catch and create the new waves of continuous innovations. So, we want to plan to create the new wealth beyond the restrictions of the current Japanese manufacturing, corporate and industry cultures. In order to do so, the continuously bettering the human resource education is indispensable for the future generations to contrive to make it. One of the betterment is to create the educational curriculum to train blue-color as well as white-color personnels who can think the efficient way they perform and the flexible work rules, and the business methods.The traditional manufacturing and businesses models need to be reevaluated, changed and evolved by introducing global culture-based and organization-based human management. We analyze the fundamental framework of human resource management examples based on the territorial characteristics of the different manufacturing cultures. Also, we develop the service engineering education models, with emphasisis on the intellectual property rights management strategy to revitalize Japan's industries.

TC305 A Flexible System of Human Resources in Electronic Industries

Mojtaba Tabari, Toraj Mojibi, Islamic Azad University, Iran
Reza Tavakkoli-Moghaddam, University of Tehran, Iran

A flexible system of human resources is a process that provides the objectives of any organization in dynamic conditions. The purpose of this system lies in the ability of using the human considering the critically internal and external factors. In this paper, 33 characteristics are identified, which are divided into four main groups and connected to a special hierarchy. A quantitative model is proposed to use such a flexible system. The important rate of each characteristic along with the view points of the electronic experts

of human resource management (HRM) is considered in a multi-criteria decision making (MCDM) method, such as analytical hierarchy process (AHP). The situation of each electronic industry is measured and compared with the main system and four related subsystems. Finally, we discuss the analysis of the proposed model and its significant factors are identified. To adapt various policies in electronic industries, the flexible system of HRM is applied in a period of one year. The related result shows the efficiency of this system.

TC401 Tuesday, 13:40-14:55 Track: Information Systems and e-Operations Chair: Joao Mario Csillag
Room: W2-401 Session: e-operations 2

TC401 Cue Dependent Systems Intelligence for Integrated e-Operations: A Framework for Risk-Based Decision Support and Production Loss Management Based on a Case from North Sea

Jawad Raza, Jayantha Prasanna Liyanage, University of Stavanger, Norway

Aging facilities in the North Sea, high market demands and higher oil prices have exposed the E&P companies to a great global pressure. The challenge is to retain minimum operational interruptions while maintaining a higher production and safety profile. It demands excellent planning, management, coordination and follow up of offshore-onshore field operations and activities. Recent introduction of Integrated Operations (IO) in the Norwegian Continental Shelf (NCS) have opened new opportunities as well as challenges in the Norwegian oil sector. Norwegian Oil Association (OLF) concludes that IO represents a potential value of NOK 250 billion (NPV). Recent establishment of Onshore Support Centers in major oil and gas companies worldwide have successfully created a perception of being offshore. These have introduced a dynamic working environment for offshore and onshore personnel and successfully enhanced mutual collaborations and decision making in several operational areas especially within production, Operations & Maintenance, and logistics. Moreover with the present day's sophisticated ICT (Information Communication Technology), visualization and analysis of data has become increasingly advanced. A greater challenge for today's oil and gas companies is not only to adapt to this cognitive change but also to resolve the issue of how to manage and optimize systematic use of enormous amount of real-time online data. In this context, cue-dependent systems intelligence plays a critical role to mitigate operational risk through early prognosis/diagnosis of threats to technical integrity.

This paper suggests a framework to manage data from systems & equipment failures in an integrated real-time environment and suggests an intelligent platform that can be used to support decision-making during risky scenarios. Such settings will help diagnose and prognose critical system failures, based firmly on interpretation of early indicators (performance cues in this context), such system will have the ability to generate early warnings that can clearly support early decisions. This is based on an industrial project initiated in 2006, with a major oil producer in North Sea to cope with present operational challenges of 24/7 online real-time mode that pose big threat to offshore oil and gas production facilities.

TC401 Internet Customer Interaction

Alexandre Reis Graeml, Centro Universitario Positivo, Brazil
Marie Anne Macadar, Universidade Estadual do Rio Grande do Sul, Brazil
Joao Mario Csillag, Escola de Administracao de Empresas de Sao Paulo, Brazil

This paper presents the results of a study about how Brazilian manufacturing companies use the Internet in order to improve their interaction with customers and consumers. Initially, the authors reviewed the literature, to find descriptions of possible such uses of the web. Then a Likert scale questionnaire was prepared, based on the information gathered from the literature. Among the investigated issues were: virtualization of pre-sale and after-sale activities; development of virtual intimacy with customers; customer relationship management; mass customization; dynamic pricing; supply chain information systems; and virtual communities of consumers.

The survey was applied twice. Managers of 655 manufacturing companies filled in the survey the first time, from November 2003 to February 2004. Three years latter, from November 2006 until February 2007, the same companies were invited to participate in the same survey, again. At the second time, 105 companies returned useable forms. The reason to apply the same questionnaire twice, after a period of three years, was that each of the cross-sectional surveys attempted to gather some longitudinal information, since they included questions about changes perceived over the previous three years and changes expected for the next three years. The authors believe that the design of the survey in such fashion added an important time component to the research. For the purpose of this paper, only the data on the 105 companies that filled in the questionaire twice were considered. Answers to the survey questions were organized and presented in bar graphs discriminating the time and size of the company. Several analyses were then possible, which helped to understand how the scenario evolved from 2003/2004 to 2006/2007 and to depict possible trends. The results many times support findings of previous research on the discussed issues. Other times, they raise new questions, which pose interesting questions for future research, as will be shown in the complete version of the paper.

TC401 The Internet's Role in the Integration of Manufacturing Organizations' Supply Chains in Brazil

Alexandre Reis Graeml, Centro Universitario Positivo, Brazil
Zandra Balbinot, Centro Universitario Positivo, Brazil
Joao Mario Csillag, Escola de Administracao de Empresas de Sao Paulo, Brazil

There has been a lot of discussion, in recent years, about the importance of supply chain management for the competitiveness of any business. That is particularly relevant in the case of the manufacturing industry, where supply chains are usually complex and sometimes difficult to trace. This paper presents the results of a study about the impact of the Internet and other information technologies to supply chain management, as perceived by managers in the field. Two identical surveys were carried out with 105 Brazilian manufacturing companies, three years apart from one another (Nov 2003/Feb 2004 and Nov 2006/Feb 2007), aiming to depict changes on managers' perceptions about the issue over time. In each of the two occasions, respondents were asked about changes in the level of integration of the supply chain and the extent the Internet and other IT were responsible for that. They were also questioned about the existence of information systems about their suppliers, and the suppliers of their suppliers (upstream) and about their customers and customers of their customers (downstream). Then, information was gathered on the technologies used to achieve such information integration along the supply chain, with special emphasis on EDI, bar coding, and VMI. Answers to the survey questions were organized and presented in bar graphs discriminating the time and size of the company. Several analyses were then possible, which helped to understand how the scenario evolved from 2003/2004 to 2006/2007 and to depict possible trends for

the future. The results many times support findings of previous research on the discussed issues. Other times, they raise new questions, which pose interesting questions for future research, as will be shown in the complete version of the paper.

TC402 Tuesday, 13:40-14:55 Track: Tutorial Chair: Hirofumi Matsuo
Room: W2-402 Session: Seven-Eleven Japan: SCM and Product Innovation

TC402 Seven-Eleven Japan: SCM and Product Innovation
Hirofumi Matsuo, Kobe University, Japan
Seven-Eleven Japan Co. Ltd. (SEJ) is the largest convenience store chain in Japan. Its total store sales in 2006 is 2,533 billion yen, and the number of stores is 11,735 as of February 28, 2007. Remarkably, SEJ generates, with the same floor space, 20% more customer traffic and 10% more spending per visit than Lawson, which is the closest convenience store competitor. This talk sheds light on why this difference exists from two angles. First, SEJ's supply chain is described with a particular attention on how fresh products can be sold within twenty four hours after their production while their supply chain costs are kept at the minimum. Then, SEJ's efforts in drawing customers into their stores are discussed. SEJ refreshes its store impression by continuously developing original products through collaboration with manufactures. The concept of sales process innovation and supply chain innovation is introduced to explain its innovative new product development that is difficult for competitors to imitate.

TC403 Tuesday, 13:40-14:55 Track: m-Logistics and Physical Distribution Chair: Kuancheng Huang
Room: W2-403 Session: Modeling: Distribution systems design

TC403 Modeling a Hybrid DEA Method for a Dynamic Multi-Commodity Capacitated Facility Location Problem
Reza Tavakkoli-Moghaddam, University of Tehran, Iran
Hooman Malekly, Islamic Azad University - South Tehran Branch, Iran
Saber Saati, Islamic Azad University - North Tehran Branch, Iran
Manufacturers need to satisfy consumer demands in order to compete in the real world. This requires the efficient operation of supply chain network. Substantial numbers of exact and heuristic solution methods have been proposed for solving facilities location problems. In this paper, we present a developed hybrid model that simultaneously uses a data envelopment analysis (DEA) method for an application of a location-allocation problem considering some aspects, such as multi-period, multi-product, capacity, inventory, and reverse logistic network. This is called a dynamic multi-commodity capacitated facility location problem.

The generality of model is allowed that each type of logistic elements such as producers, distribution centers, warehouses and customers, known as facility which interacts with the others periodically. This provides the optimal efficiency for spatial network in order to minimize the related costs with respect to the underlying criteria using mixed integer programming.

In term of decision making unit (DMU), say a linkage demand node (which itself is also a facility) served by other facility, in which given inputs are used to produce outputs at each facility. Based on this idea, the proposed model is to find the optimal efficiency for facilities in order to maximize the related efficient performances using fractional programming. In our opinion, solving simultaneously the DEA efficiency measure with other location modeling objectives provides a promising approach to multi-objective location problems.

Through an illustrative example, we offer insights on the solution model and how it can be implemented to solve the composite problem. The results obtained using the mentioned formulations demonstrate that the interactions between facility efficiencies may be substantial in some cases.

TC403 Determination of Distribution Center Locations for Thai Rubber in China
Karndee Prichanont, Thammasat University, Thailand
The implementation of ASEAN-China Free Trade Agreement (ACFTA) brings opportunities as well as threats to the Thai government and Thai exporters. ACFTA has created considerable market and business opportunities of tax rate reduction for imported and exported commodities. However, for Thai exporters, one of the most concerns is the logistics system and product distribution in China. Logistics system in China has found to be a very complicated system due to its extraordinary large demography and an inconsistency in regional management and regulations. The study, therefore, begins with an overview of logistics system in China as well as its development trend.

The detailed investigation focuses on a main Thai export product – natural rubber. In our preliminary study, it is found that there is a large number Thai rubber destination in China. Scattered distributing to too many areas in China leads to a significant overall transporting cost. As a consequence, the pricing competitiveness of Thai rubber has declined. Primary objective of this study is to provide the Thai government and Thai exporters the alternatives that improve the efficiency and the cost of logistics and distribution systems, specifically the determination of central distribution centers and port destinations for Thai exporters.

Data regarding volume and distribution of rubber demand in China, internal rubber supply, distance and cost of relevant logistics mode and regional regulations are gathered and analyzed. Using the primary and secondary data, distribution network design is performed. One of the recommended alternatives is that Thai government and exporters should mutually develop focused strategy and aim to export to major rubber demand areas in Jilin and Liaoning. The study also suggests that the most optimal distribution centers locations and port destination is Dalian Port in Liaoning.

TC403 Location Analysis of Distribution Centers: A Case Study of Kinmen Kaoliang Liquor Inc.
Kuancheng Huang, Ying-Hsuann Chen, National Chiao Tung University, Taiwan
Kinmen Kaoliang Liquor Inc. (KKL), once a non-profitable government agency of the off-shore island county, Kinmen, was corporatized in 1998. Cost reduction and profit maximization have become its most crucial goals. Over 90% of the liquor produced by KKL is sold in Taiwan. There exist two major channels: branch companies and sales agencies. KKL handles the logistics operations for the liquor sold by its branch companies. For the other channel, the sales agencies take care of the whole logistics operations from the factory in the off-shore island. Sales agencies help to simplify the operations, but at the same time KKL suffers from several drawbacks, such as reduction in profit and rise of potential competitors. KKL has been retrieving the amounts of sales

from the agencies and is planning to establish the distribution centers (DCs), in charge of the logistics operations and trade transactions in Taiwan. These DCs may be the forerunner of the marketing company that KKL may invest for the next stage.

There are very few domestic case studies regarding the location analysis of DCs, and this study aims to provide the decision support, especially from a quantitative aspect, for KKL's strategic plan for establishing the DCs in Taiwan. The classical fixed charge model is modified to take into consideration the inbound and outbound transportation costs associated with the DCs as well as the variable and fixed components of the DC facility costs. This study collects and estimates the values of the related parameters in the model. The results indicate that the total cost will be 110,786,400 NT dollars per year, and three DCs are to be established in Keelung, Changhua, and Kaohsiung. Sensitivity analysis shows that changes in fixed cost and demand level are the most influential factors for locating the DCs.

TC405 Tuesday, 13:40-14:55 Track: m-JIT & Lean Production Chair: Ali Ardalan
Room: W2-405 Session: Modeling: JIT

TC405 Managing an Assembly Production Process with Kanban, CONWIP or Base-stock
Yaghoub Khojasteh-Ghamari, Ryo Sato, University of Tsukuba, Japan
To control the production of parts in a production process, managers can choose a proper production control policy. In this paper, we study the performance of Kanban, CONWIP and Base-stock control systems in a business process making a single product. The performance measures are system throughput and WIP (Work-In-Process). Periodic behavior of a token transaction system is focused on. When the system behaves periodically, Little's law can be used to calculate the performance measures. We provide a performance comparison for these three production control policies in a tree-shaped production process. We compare the minimum WIP of the system for each policy, when the system attains maximum possible throughput. The results show that there is no general superiority between Kanban and CONWIP. Appropriate design of the whole system decides which one is superior in certain situations.

TC405 Analysis of an Adaptive Electronic Kanban System
Ilkka A. Kouri, Juha-Matti Lehtonen, Tampere University of Technology, Finland
The kanban controlled pull production is a key part of Just- In-Time (JIT) or Lean Production system. However, kanban applications are best suited for repetitive production flow with relative high and stable production volumes for the individual items. The efficient use of the kanban system is often exacerbated by the changing volumes and production mix, jumbled production flow, long setup times as well as quality problems.

The advance of ICT technologies and especially RFID technology enables an adaptive electronic kanban applications that can overcome some of the difficulties mentioned. The basic function of a kanban system can be realized by utilizing RFID tags that identify production batches, their status and location. The computer system can calculate system schedules and update kanban parameters based on the real time system status. An adaptive electronic kanban system based on simple planning rules enables a fast response on changing production environment, gives a production system transparency needed to control the value chain and reduces the effort the system maintenance requires in the changing conditions.

The motor vehicle manufactures have used for a long time electronic messages to rationalize the kanban system functions. However the principles and practical achievement of an adaptive electronic kanban system are not well documented in the literature.

In this article, we focus on studying the function and advantages of an electronic kanban system in real life context. The function of an adaptive kanban system is analysed utilizing a discrete-event simulation model of the production system studied. The kanban system logic is tested in conditions typical for the case company. The constant product ramp-ups and –downs, quality problems and machine breakdowns are included in simulation model to analyse the function of the kanban system planned.

The study suggests that an adaptive electronic kanban system can be used efficiently in production system otherwise unsuitable for pull production. The adaptive system can however absorb efficiently only limited amount of product mix changes, disturbances and volume variations.

TC405 A Heuristic to Enhance Performance of Kanban-Controlled JIT Job Shops
Ali Ardalan, Old Dominion University, U.S.A.
Rafael Diaz, Virginia Modeling and Analysis Simulation Center, U.S.A.
Lack of production linearity in JIT job shops poses a production sequencing challenge for production managers. Unlike the stable environments that JIT is designed for, job shops are characterized by dynamic demand for relatively small batches of different products. In the jumbled flow structure of a job shop, each workstation may function as both a supplier and a customer of other workstations for components of different products. By design, the application of a regular kanban-controlled JIT system would result in each workstation working to achieve its goal of filling its empty containers while being completely oblivious to the actual demand. It would be quite conceivable that a workstation would produce a component to fill some empty containers when there is no immediate demand for that component, and as a result postponing the production of some other components that have immediate demand. The challenge is to assign production priority to those components that have immediate demand.

This study presents a production sequencing heuristic that integrates real-time actual demand with the information provided by kanbans in each workstation. The combined information provides the workstation operators the necessary information to produce components that have current demand. We use simulation to compare performance of a kanban-controlled job shop that uses the proposed heuristic and one that does not. Several other independent variables such as the number of kanbans, length of withdrawal cycle, and FCFS and SPT priority rules are included in the model. Measures of performance are customer wait-time, total WIP, WIP in the input and output stock points of stations. The results indicate that the use of the proposed heuristic reduces both customer wait-time and total inventory, two commonly opposing objectives. The use of the heuristic in most cases reduces input and output stock point inventory of stations. These results illustrate that using the heuristic focuses production on components that are presently in demand. These components are used shortly after they are produced. Fewer units are made to only fill the containers in the output stock points of workstations and remain there for a relatively long period of time.

TC405 Capacity Efficiency of Domestic Airports in Taiwan Using Three-Stage DEA Approach
Ming-Miin Yu, Hui-Yi Wei, National Taiwan Ocean University, Taiwan

This paper modifies the Stage 1 DEA of the three-stage DEA approach developed in Fried et al. (2002) to allow for the fact that undesirable outputs like aircraft noise may not be freely disposable, and the efficiency measure of airport capacity use is modified to allow for an asymmetric treatment of desirable and undesirable outputs. A directional distance function introduced by Chung et al. (1997) was used to construct an output orientated DEA model with CRS assumption. Stage 3 DEA is a repetition of Stage 1 DEA with observed outputs adjusting to account for the effects of variation in the operating environment, variation in statistical noise, and variation in technical change obtained from Stage 2 SFA regression analysis. Results from the empirical analysis for the case of Taiwan's domestic airports strongly demonstrate that airport capacity efficiency performance turned out to be very sensitive to whether or not environmental impacts, stochastic noises, technical-change factor, and undesirable outputs were included.

TC501 Tuesday, 13:40-14:55 Track: Spanish Chair: Antonio Pelaez
Room: W2-501 Session: S-Service OM

TC501 Configurations and Strategic Choices in the Operations Strategy: An Application to the Hotel Industry
Tomas F. Espino Rodriguez, Victor Padron Robaina, University of Las Palmas de Gran Canaria, Spain

There are many works in the literature on operations management that analyze the taxonomy of operations strategies. However, no study has been made of the generic configurations of the operations strategy in the hotel sector and that lack represents a significant shortcoming. Hence, the purpose of this work is to identify a configuration of operations strategies from a series of competitive capabilities in the hotel sector (cost, flexibility, quality, service and environment). The second purpose is to explore the central theme in the operations strategy by determining how hotels of operations strategy groups typically define their strategies and operations choices. Moreover, the work analyzes the impact of the different strategies from a series of structural and infrastructural decisions on different competitive priorities that have traditionally been identified in the literature on operations management.

Two distinct types of hoteliers can be identified by the importance they place on competitive priorities. Moreover five strategies were identified from the structural and infrastructural decisions. These operations strategies are a combination of infrastructural and structural decisions. This knowledge of the operations strategy groups of the hotels and types of strategies can help managers understand how and why they can improve performance by aiming to adapt to a particular type of strategy. With regard to the operations strategies and their impact on the different competitive priorities, the results indicate that the different strategies exercise a positive influence on the development of competitive capabilities. Thus, strategies for quality system, alliances with suppliers, and improved customer attention service enable costs to be reduced. Moreover, the beta coefficients of the regressions indicate that most of the operations strategies influence the improvement of quality, the service and, to a lesser extent, flexibility and the protection of the environment.

This work is the first to analyze the operations strategy the hospitality sector on Gran Canaria, an important destination in world tourism, and enables hotel managers to identify a taxonomy of operations strategies and the strategies defined by the infrastructural and structural decisions that enhance the competitive capabilities.

TC501 Service Quality in Banking: The Spanish Case
Jose-Angel Miguel-Davila, Marcela Florez Romero, Constantino Garcia Ramos, University of Leon, Spain

The research has focused on determining the perceptions of quality that clients have concerning their banking entity. In order to achieve this goal, we have employed structural equations with partial least squares (known as PLS) to contrast the model, with the aim of analyzing the factors which determine the service quality as perceived by the customers of banking entities. Among these, we can mention (i) operational aspects, ii) physical appearance, iii) new technologies and, iv) human aspects. We proceeded to verify the three hypothesis of our research; i) the first hypothesis of the model examines each of the relationships of these factors with the service quality, stating the great influence of the operational aspects in the perception of quality; ii) the second hypothesis affirms that the service quality is an antecedent of the satisfaction of the customer; iii) finally, the third hypothesis verifies that the satisfaction of the customer greatly influence his loyalty towards the entity.

TC501 Quality Management Systems in Hospitality: An Empirical Analysis in Spanish Hotel Chains
M. Mar Alonso Almeida, José Miguel Rodríguez Antón, Luis Rubio Andrada, Autonomus University of Madrid, Spain

The Tourism sector has seen the need to adopt differentiation and quality strategies, already incorporated in industrial companies, such as the automotive industry, and the service sector, such as banks, or the hospital sector, in order to compete in a new setting marked by great changes, both in offer and demand. A myriad of empirical studies have appeared in the last few years, analysing quality in different tourist sub-sectors. Nonetheless, all of them have been focused on assessing customer satisfaction, or implementing models for Total Quality Management, but none of them has focused on an innovating aspect in the sector: quality assurance by implementing standardized quality management systems to do so.

Focusing on quality management in the Tourism sector, it is interesting to observe what is happening in the case of Spain. In the first place, this is undoubtedly one of the main worldwide tourist destinations, with 58.6 million incoming tourists in the year 2006, and is, without a doubt, one of the countries which has felt the impact of the emergence of new, more economical destinations in the international market, thereby having to focus more on the improvement of the quality of the products it offers. On the other hand, there is an extensive "culture" or tradition in quality management in Spain, not only in the tourist sector, but also in all the industries and service sector.

In this respect, Spain is the fifth country in the world in ISO 9000 certifications (ISO, 2006), only behind China, Italy, the United Kingdom and Japan. In addition, it is the fourth country in the European Union in certification intensity. However, the implementation of quality management systems stands out much more specifically in the tourist sector, taking into account that Spain is the first country in the world which has created, by means of the ICTE (Institute for Tourist Quality), and among other quality improvement schemes, some specific quality standards for each tourist sub-sector, in which process and service standards and quality system requirements are defined, as well as a certification system in which an independent third party guarantees that enterprises carry out these standards. The implementation of standardized quality management systems specific to each tourist sub-sector, a groundbreaking experience on a worldwide level, should undoubtedly be the object of analysis, and this current study focuses on this goal.

This research, of an exploratory nature as it is the first study of these characteristics, will analyse how the diffusion of these standards has taken place in the chain hotels in Spain, with the aim of gauging their real impact and forecasting their future

importance in their operations.

TC501 Managing Immigration at Port Operations: New Dynamic Method on the Application of M/M/S Waiting Lines
Antonio Pelaez, Jose Juan Nebro, Malaga University, Spain

This paper offers a new perspective of waiting lines theory and its applications on service management operations. The researchers were contacted from a south Spain harbour, where ferries to North Africa are based and sailing daily. These ferries are quite useful for immigration flows that often travel from Northern Europe to Morocco, Algeria or many more African countries, or coming back to their working countries. Normally demand and capacity of holds is balanced, nevertheless, at high season period (European holidays, Islamic celebrations, etc), the demand habitually saturates the ferry service, generating huge waiting lines, either of vehicles as people outside the controls desks. This problem is even worse considering that installations of the harbour has not space enough to manage a large number of people or vehicles between the controls and the ferries.

To manage the service and arrange the chaos found by the authors, and after reviewing the literature, a special model of waiting lines was developed, taking into account that the hypotheses to be tested were the following: The arrival rate of the travellers followed a Poisson probability distribution with parameter; The time of service at the controls (shipping companies, Police for passports, GC for customs) was distributed as an Exponential distribution of mean; The time to load a ferry was inversely linked to the entropy (chaos) of the service area surrounding the dock; To manage dynamically the parking area allows to board vehicles at hold faster, and also reduces the waiting lines. The method included a field work to measure variables like: Arrival rate; Service time; Vehicles or people waiting; Vehicles on the surroundings of the dock; Time of boarding for passengers; Time to load and store vehicles at ship's hold; Time of manoeuvre to leave the harbour once loaded.

The former models were M/M/S waiting lines models, but they became much more complex when the researching team considered a dynamic usage of the parking and waiting area. The conclusion of the application of the complex model probed that the dynamic procedure to use the parking areas allowed reducing the waiting lines, the time to load and the entropy of the system, but also found evidence of instability in terms of possible delays due to the complexity of the procedure.

TC503 Tuesday, 13:40-14:55 Track: m-Statistical Quality Control Chair: Xia Pan
Room: W2-503 Session: Modeling: SQC 2

TC503 The Effect of Gauge Measurement Errors on Multivariate Process Capability
Davood Shishebori, Ali Zeinal Hamadani, Isfahan University of Technology, Iran

Process capability indices are used to measure whether a process meets the specifications. Properties of the univariate capability indices have been investigated extensively, but are comparatively neglected for multivariate case where multiple dependent characteristics are involved in quality measurements. Since the quality of data on the process characteristics relies very much on the gauge measurement accuracy, therefore the capability indices of the process by ignoring the measurement errors would not be reliable. In this paper, we consider the multivariate process capability index (MCp) by adding the measurement error as a source of variation in the data and show that we obtain a better estimation of the (MCp) and the results are more accurate with respect to the case of ignoring the measurement error in the data collection.

TC503 Study of the Preventive Maintenance Scheduling Problem for Power Plants by Means of a Decomposition Technique: An Empirical Example of the Spanish Power System
Salvador Perez Canto, University of Malaga, Spain

The problem of power plant preventive maintenance scheduling is approached. The issue to be solved is how to determine the period for which generating units of an electric system should be taken off line for planned preventive maintenance over a specific time horizon. Its importance springs from the necessity to shut down power plants regularly and review the functioning. The main aim is to maintain efficiency. This is a highly complex problem. Different authors have focused their attention on this problem with different methodologies. It is frequently solved in industry via heuristic techniques. The efficiency is typically low.

Problem formulation and methodology: The problem under study is an optimization problem. It is framed like a 0/1 mixed integer linear programming problem. The general formulation is showed next: Minimize Cost subject to: - Maintenance constraints - Economic unit commitment constraints - Maintenance and connection constraints - Generating volume constraints. All these constraints are mathematically modeled and integrated into a global model. Benders' decomposition is the technique used to solve the problem. The original problem is decomposed into smaller problems, which makes the resolution easy. The algorithm is applied to a realistic power plant set, similar to the Spanish one.

Findings and practical implications: The results arrived at can be very useful. The specific maintenance scheduling is obtained. It is adequate for the modeled requirements, and minimizes the cost. The application to a realistic production system is used to check that the proposed procedure can be applied to a complex electric system. This study could be of interest to electric companies with production activity, due to its applicability. The cost is minimized. Moreover, the consideration of reliability in some of the constraints allows maintain a specific quality service level, increasing customer satisfaction.

Original contribution: The most relevant contributions of this work are the new model for the problem and the way to solve it. The new points of the formulation reached can be described as follows: - New constraints - Simultaneous use of different kind of variables - Integration of different set of constraints - Practical implications.

TC503 Planning Accelerated Life Tests under Interval Censoring with Random Removals
Chunyan Yang, City University of Hong Kong, Hong Kong
Aixia Fan, Yunnan University, China
Siu-Keung Tse, City University of Hong Kong, Hong Kong

In this paper, optimal accelerated life test (ALT) plans are investigated under progressive Type I interval censoring with random removals when lifetimes are lognormal distributed. The optimal ALT plans which minimize the asymptotic variance of the estimated qth quantile for different combinations of total number of inspections and removal probability are presented. For implementation convenience, the practical plans, which adopt the same optimality criterion but the inspection times are determined based on the ideas of equally spaced (ES) or equal probability (EP) scheme at each stress level, are also derived. Numerical studies are conducted to

evaluate the relative efficiency of a practical plan to the corresponding optimal ALT plan. Some suggestions are given to experimenters for selecting an appropriate practical plan in designing an ALT under the proposed censoring scheme.

TC503 Improved Quality Control Chart Construction by Efficient Simulation via the Golden Ratio Search

Xia Pan, Macau University of Science and Technology, Macau
Jeffrey E. Jarrett, University of Rhode Island, U.S.A.

This paper has two purposes: One is to indicate, by raising the consistency issue, that the factors for Shewhart control charts currently taught in various textbooks are inappropriate to be used because they are not consistent for average run length. The new challenging issue for SPC is to obtain the new, correct factors for control chart construction. We provide a table of new factors which improve upon those in current use. The second purpose of this paper is to show a new effective way to obtain the correct factors. We use the golden ratio search method to identify the correct control limit parameters of R and S control charts, consistent to the average run length of the corresponding Shewhart X-bar control chart. As other control limit settings may be also desired in practice, our golden ratio search method will help in obtaining the correct factors efficiently. And this is probably the first application report of using golden ratio search in SPC research.

WA202 Wednesday, 8:30-9:45 Track: JIT & Lean Production Chair: Nico J. Vandaele
Room: W2-202 Session: Lean concept

WA202 The Sustainability of Continuous Process Improvement in Local Public Administration: A study of Spanish Municipalities

Manuel Suarez-Barraza, Juan Ramis-Pujol, University Ramon Llull, Spain

Local governments have not escaped the sweeping changes in the global business world either (Farazmand 1999). Indeed, the logic of updating and improving public management by applying Continuous Process Improvement (CPI) and other Total Quality Management (TQM) models was acquired by certain Spanish Town Halls in the late 80s and early 90s, all in order to enhance their public service and operating processes (Prats and Catala 2004; Merino Estrada 2007).

On the basis of the foregoing context, the research question underpinning this study is: How to generate sustainable CPI in local administrations? Sustainability is here being understood as simply maintaining the improvements introduced by CPI efforts over the years. Sustainability has been studied from the standpoint of private-sector manufacturing organisations (Dale, Boaden et al. 1997; Bateman and David 2002; Bateman 2005; Palmberg and Garvare 2006). However, literature features very little research on this subject in the public sector (Loomba and Spencer 1997; Jones 2000; Pollit 2006).

In order to answer the research question posed, qualitative research was conducted using case studies as the research strategy (Yin 2003). Four Spanish Town Halls were selected and studied: three from a retrospective standpoint and one from a longitudinal approach in order to increase the reliability of the study. This research found that CPI sustainability can be achieved via a series of paths to sustainability which may take the form of a continuous, cyclical flow, a developing flow or a continuous batch flow, or may simply produce a free-moving flow or a path with an irreversible or frozen flow. Besides, sustainability of CPI arises thanks to series of continuous improvement stages that have been characterised in this study. Finally, we propose an emerging meta-theory for the sustainability of management approaches in the public sector.

WA202 Settlement Theory for Improving Productivity and Shortening Lead-Time

Yick Hin Hung, Leon Y. O. Li, T. C. E. Cheng, The Hong Kong Polytechnic University, Hong Kong

The Toyota Production System (TPS) has revealed that the basic rule for improving productivity is to reduce waste, and thus to increase the proportion of value-added work in any operation process. The rule is rooted in industry and well accepted by both practitioners and academics. Many manufacturing and business process improvement practices, such as Lean Manufacturing, Quick Response, Time-compressed Process and Business Process Reengineering are based on similar notions to develop their own doctrines. The implementation of this simple rule usually involves application of the examples of the famous “Seven Wastes” identified by TPS, or experience from other organizations. However, just following others’ empirical examples, imitators always put themselves under high risk and end up with poor results.

The reason why imitators fail to produce promising results is due to a dearth of theory to explain the concept of TPS. Therefore, even though a lot of different methods and tools have been invented with demonstrated value in searching for and eliminating wastes, they might not be repeatable to produce the same results. In fact, obstacles and resistance frequently occur during the improvement process.

This paper argues that there is in fact no waste but only value-added and non-value-added work in any running process. The “Settlement Theory” highlights that there are one or more constraints on every non-value-added work. Once the constraints are identified and removed, the non-value-added work will immediately become waste and should be eliminated. This theory can be applied to any business process and supply chain activity to improve productivity and shorten lead-time. We also show that this theory can either work independently or work together with any method or tool for productivity improvement. This is an important fundamental concept that will enable all the mentioned doctrines to further develop their own theory.

WA202 A Dynamic Theory of Lean Practice

Nico J. Vandaele, Inneke Van Nieuwenhuyse, Katholieke Universiteit Leuven, Belgium

Lean management is now recognized and widespread in industry. However, theoretical models that scientifically underscore the lean practice are scarce. We show how stochastic models of manufacturing systems and supply chains, based on queueing models, underpin the practice of Lean. First we explain two quantitative performance models which relate the system parameters with the system performance in terms of lead time and throughput. This leads to an exogenous (e.g. from the customer) definition of Lean. We show that the ideal level of both idle capacity and work-in-process are determined by the Lean level wanted. Moreover, it is shown that it is a dynamic concept. This means that if the external conditions for the definition of Lean change, the idle capacity and the work-in-process level will change. The latter stresses the need for a comprehensive, analytical and consistent approach. This quantitative approach will be illustrated with lead time and throughput models. Evidence from industrial practice will be provided, both from manufacturing and services.

WA301 Wednesday, 8:30-9:45 Track: Health care management Chair: Jaume S. Ribera
Room: W2-301 Session: Health care management 2

WA301 A Study of Co-Relationship between the KPI Performance and the Penetration by Using the Balanced Score Card in Medical Industry - A Case of Saiseikai Otaru Hospital -

Hajime Itoh, Otaru University of Commerce, Japan
Junichiro Fukuchi, Gakushuin University, Japan

The headquarters of Saiseikai in Tokyo requested staffs at operational level to conduct improving activities named “KAIZEN” five years ago. In the beginning, they used Saiseikai Kumamoto Hospital and Saiseikai Fukui Hospital as their benchmarks of improvement.

It is difficult to penetrate the BSC method into the lower operational level in Hospital. In order to overcome this difficulty, they created a facilitator position called “Leader of Strategy” to manage the activities of improvement at operational level.

Strategic leaders are responsible for the penetration of Kaizen at operational level by using BSC in each department in Saiseikai Hospital. (It may be better to point out which Saiseikai Hospital because you mentioned several Saiseikai Hospital in this

article.) The authors use questionnaire about Employee Satisfaction to measure the degree of penetration in each department. And also strategy leaders discuss the KPI as the business performance in monthly meeting. The authors measure the correlation between the KPI as the operational performance and the penetration which is from the ES survey. Hypothesis 1: In the department that the degree of penetration of BSC is high, the degree of the KPI as operational performance is high.

In order to accomplish the purpose of KAIZEN, the position of strategic leaders was setting as the matrices organization. We measured the correlation between medical staffs' evaluation of strategic leaders' activities and the KPI as the operational performance. Hypothesis 2: the strategic leaders contribute to accomplish the KPI. Numerical result will be given.

WA301 E-Commerce in Australia's Public Hospital Supply Chain: Exploring the Impacts on Buyer-Supplier Relationships

Peter O'Neill, Monash University, Australia
Annibal Jose Scavarda, Brigham Young University, U.S.A.
John Michael Hynes, Royal Melbourne Institute of Technology University, Australia

Large OECD markets have redesigned their hospital supply chains and developed supporting information communication technology (ICT) foundations for the introduction of e-commerce in an effort to curb the rising costs of providing health care to aging populations. Australian governments have also been driving the introduction of e-commerce practices across the healthcare sector in an effort to reduce costs and improve service levels. This situation is exemplified by the increase in Victorian state expenditure on health goods and services from $1.2 billion to $1.6 billion (33 per cent) from 2000-01 to 2003-04. Two frequently stated objectives of e-commerce supply chain initiatives are integration and coordination. Increased integration of systems and processes between each link of the supply chain facilitates coordination and transparency of information, products and services through the supply chain thus reducing cost and improving resource appropriation. The public imperative has been for hospitals to reduce costs by buying at lower prices, and improving process efficiencies in their supply chain. This has been achieved by buyers being enabled to collect, analyse and compare information about available suppliers and their products; effectively negotiating with suppliers procurement terms and prices; and efficiently placing their order fulfilments. Conversely, sellers are also enabled to gather and analyse customer's information about marketing and sales activities and thus develop more direct, personalised long-term relationships.

The purpose of this qualitative research was to explore the results from recent government-led supply chain initiatives within the Australian healthcare industry. The objective was to analyse the downstream supply chain between state hospitals and their suppliers, specifically examining how buyer-supplier relationships change as modern ICT reduces product and transaction costs. We find that the buyer-supplier relationship has shifted from an inefficient push/pull open ended system to one of strategic cooperative sustainable partnership. Outcomes of this shift are on the surface economic, but the reality has been substantial improvements in service levels, resource management and social equity.

WA301 Learning Points in the Process of Implementation of a Hospital Accreditation System in Catalonia (Spain)

Jaume S. Ribera, University of Navarra, Spain
Lluisa Lopez, Rafael Manzanera, Generalitat de Catalunya, Spain

The paper examines the experience of implementing a hospital accreditation system based on the efqm model for continuous improvement in Catalonia. The accreditation is a voluntary program, but it is required for hospitals to participate in the contracting with the national health service, a requirement that makes the program practically compulsory for most hospitals.

The original accreditation system, established in 1982 was one of the first systems in Europe. At the beginning of the XXI century, the administration decided it was time to overhaul it and launched a project, first to define a new model, and then to roll it out on all the region's hospitals. The authors have participated actively in this process from its beginning.

The study reported in this paper was designed as an observational investigation. A group of eight hospitals (later expanded to ten) were selected from the outset and have been closely followed in the implementation process. We held interviews with the managers in charge in each hospital at the beginning of the accreditation process questioning them about the organization, scope and personnel involvement. These initial interviews were followed by in-depth semi-structured extensive interviews to the hospital top managers and a group of involved staff during the process to assess the degree of Quality Improvement implementation and concluded with a third round of interviews after the submission of the accreditation application. The research showered very different initialquality cultures in the hospitals surveyed and covered a wide range of implementation arrangements, from a centralized approach involving only the top management team to a very decentralized one, from top-down to bottom up, from a closed format based on a questionnaire to open formats asking the different services and units to apply the model and report on the results, etc. Based on the knowledge collected, a framework for analyzing the success of the change process has been developed.

A questionnaire to all hospitals in the country is under way at the time of submitting this abstract and the results will be available in time to complete the paper. The research will shed some light into the most appropriate paths for implementation of accreditation processes in hospitals.

WA302 Wednesday, 8:30-9:45 Track: Manufacturing Strategy Chair: Peter Ralph Knittig
Room: W2-302 Session: Case research on manufacturing strategy 1

WA302 Modularity of Flat Panel Display TV and Operation Management Practices: A Case Study of LG Electronics

Youngwon Park, Junjiro Shintaku, Junichi Tomita, University of Tokyo, Japan
Paul Hong, University of Toledo, U.S.A.
Gyewan Moon, Kyungpook National University, Korea

With the rapidly growing global market demand for Flat Panel Display (FPD) TV, the research interest on such products is receiving increasing attention. FPD TV can be classified into three categories: Plasma Display Panel (PDP) TV, Liquid Crystal Display (LCD) TV and Organic Light Emitting Diode (OELD) TV. FDP TV has three levels of product architecture structures: (1) upstream product components; (2) middle level panels; (3) the downstream assembled TV. For the upstream component parts, the product architecture is still integral. On the other hand, for the downstream TV sold to the ultimate customers, product architecture is increasingly modular. Located in the middle levels of product architecture, PDP panel is fitting to use integral product architecture. However, LG Electronics has adopted modular product architecture to both PDP and LCD TV and implemented unique operational management practices that are critical in securing its globally competitive market position.

In this paper, we examine the trends of modularity and the effective operation management practices for PDP TV and LCD TV through a case study of LG Electronics.

WA302 Manufacturing Retention in High Cost Environments

Louis Brennan, Trinity College, Ireland

In their 1987 book "Manufacturing Matters", Cohen and Zysman argued the importance of mastery and control of manufacturing. Maintaining that manufacturing and manufacturing skills were crucial to competitiveness, they made the case that the loss of manufacturing entailed the loss of competitive edge high tech capabilities. Much has changed in the twenty years since the advancement of the above arguments. China and many other low cost countries have integrated into the global economy and offshoring of manufacturing from the developed world has accelerated. Yet notwithstanding the outward stampede of manufacturing operations from high cost environments, many companies and their managers, for a variety of motivations including pressure from their local communities and governments, seek to retain local manufacturing capabilities.

This paper addresses the challenge that operations managers face as they seek to embed their operations locally in the context of an increasingly disadvantageous cost environment and competitive pressures. With the environment in constant flux, operations managers have to identify the emerging risks posing a threat to the survival of the operation and the opportunities that can be leveraged to counter these risks and ensure the operation's ongoing viability. Responding to this challenge requires a redefinition and repositioning of the manufacturing facility.

This paper outlines in a chronological form the sequence of events affecting a manufacturing facility from its point of establishment up to mid 2007. The sequence follows the materialisation of the operation, through growth and up to its imminent demise due to changing worldwide economic conditions, difficulties in manufacturing in the local environment, pressures in the industry supply chain and lack of will in corporate management. The paper then follows the strategic need for change, the strategy developed and its implementation to best fit the operation for its retention in the local environment. Based on the learning derived from this real life case study extending over a seven year period, the paper offers a strategy for change and an implementation process to promote the ongoing embedding of manufacturing operations in high cost environments.

WA302 Strategic and Operational Effectiveness Considerations for the Extended Enterprise: A Multi-Case Approach

Christos Braziotis, James Tannock, Nottingham University Business School, United Kingdom

To offer a distinctive and innovative value proposition to the final customer and to compete more effectively on a global scale has increased the need for upstream and downstream members of a Supply Chain to work collaboratively in terms of aligning their production processes, as well as their strategies. Close Supply Chain relationships and collaboration among suppliers, manufacturers, logistics providers and customers, appears in the literature and current research as the key for successful value creation, resulting in significant cost benefits and competitive gains. Consequently, integrating Supply Chain partners on both the upstream and the downstream sides is attracting considerable interest in the manufacturing industries. The term Extended Enterprise (EE), a result of a recent Supply Chain paradigm shift, has been introduced to identify the concept of an innovative, close and strategic Supply Chain collaboration form. In many industries the nature of competition itself evolves increasingly towards competition between extended manufacturing enterprises

The EE paradigm has been widely applied within the global civil aerospace industry to engage SC partners in effective forms of collaboration and product innovation. This is a three-case company study paper, with all of the companies taking part in an EE form of collaboration. The main case company is a leading Original Equipment Manufacturer (OEM) in the aerospace industry and it was chosen because it is operating under the EE paradigm principles on both the upstream and downstream side of its Supply Chain. Through incorporating in the analysis the other two case companies, this paper aims to develop a more complete understanding of how sharing risks and rewards may result in efficiencies and deficiencies in the collaboration among partners within the EE (i.e. suppliers and final customer), but also effect on both the strategic decision making and the operational effectiveness for a manufacturer. Using established strategic frameworks and operational effectiveness assessment factors in the case analysis, the paper assesses the effectiveness of the EE paradigm in terms of strategic potential and operational applicability.

WA302 The Possibility of Reinvention and Becoming a Global Player for the Russian Automobile Industry

Peter Ralph Knittig, Shinji Shimizu, Sophia University, Japan

This paper evaluates the possibility that the Russian automobile industry will reinvent itself and offset its weaknesses to become a major global player. At the outset, the recent history of the Russian automobile industry is highlighted showing that the main focus of the Russian automobile manufacturers until very recently was to rely mostly on their own industry and to keep foreign automobile manufacturers and suppliers away. As a second step, the current market, manufacturing and development conditions characterising the Russian automobile industry are analysed. This evaluation shows that the Russian automobile market belongs to one of the fastest growing markets in the world but on the other hand has to deal with outdated technologies and equipment, poor product development and quality and ineffective management strategies. Furthermore, the automobile market faces major impediments relating to its political and legal environment such as contradictory legislation, lack of law enforcement, widespread corruption unpredictable political environment and barter transactions in the OEM market. In addition, the Russian automobile industry faces more and more competition as major global automobile manufacturers such as General Motors, Toyota, and Nissan are increasingly establishing production locations in Russia attracting other automobile producers and their suppliers. Consequently, the possibility of the Russian automobile industry to offset these obstacles are assessed illustrating that the automobile industry in Russia has to focus on four key points: (1) To upgrade parts suppliers inside Russia to meet global standards, (2) to set up channels to source parts from suppliers in Central and Eastern Europe, (3) to improve the Russian production technology, and finally (4) to advance the Russian quality and safety technology. However, due to the time lead of the global automobile industry, the Russian automobile industry may only be successful globally by focusing on becoming the leanest producer of automobiles by offering low-cost vehicles with reasonable quality.

WA303 Wednesday, 8:30-9:45 Track: Sustainable Management Chair: Linda C. Angell
Room: W2-303 Session: Sustainability and social responsibility

WA303 A Study of Supply Chain Sustainability in the Apparel Sector

Kamrul Ahsan, Auckland University of Technology, New Zealand
Abdullahil Azeem, Bangladesh University of Engineering and Technology, Bangladesh

The main issues in attaining sustainability in the Bangladesh apparel sector are about identifying problematic economic, social, environmental and health and safety issues, assessing their impacts and risks, and striving for continuous improvement. The apparel value chain system needs to satisfy a range of local and international expectations and should follow various institutional controls related to quality and sustainability. The sector is working hard towards attaining sustainability in the export supply chain by creating economic, ecological and social values in their business. More research and empirical study is necessary to analyze the supply chain issues of the sector. The sector needs leadership to show the direction to attain sustainability. Considering the importance of the garments sector and its contribution to the global and local economy, this research looks at the supply chain issues of the apparel industry, particularly attaining the sustainability of the garments industry of Bangladesh in the new global apparel business environment. The research question is to learn "how to attain supply chain sustainability in the Bangladesh garments sector." Overall objectives of the research are: -A general analysis of the Bangladesh apparel industry and related supply chain issues; -To identify the most important supply chain factors affecting the industry (to gain orders, manufacture products and thereby fulfil customer requirements); -To analyse the important factors/drivers for attaining sustainability in the global apparel supply chain; -To set some strategies and guidelines and offer recommendations to attain sustainability on supply chain activities of the garments sector and to synchronise with major buyers or retailers from the US, UK, other EU countries, etc.

To fulfill the other objectives a questionnaire survey has been conducted among the garments manufacturers of Bangladesh. The research will benefit the apparel sector to understand the current supply chain and logistics practices and will offer some recommendations to attain sustainability. The anticipated benefit for the future of the country's main export sector is to develop the industry through local, relevant and up-to-date research.

WA303 Sustainability Risk vs. Manufacturing Excellence: Managing Future Risk under Complex Conditions

Jayantha P. Liyanage, University of Stavanger, Norway

The manufacturing industry worldwide has been in a continuous change process for over a number of years. The ongoing transformations are often been attributed to technologically-aggressive, customer-oriented, and market-intensive strategies, where profit margins often remains at the centre of focus of business operations. With the current concerns on more global scale and complex operational conditions, the conventional wisdom on drivers of competitive advantage has largely been challenged. Besides, network-based knowledge-intensive societies and partnership-based cooperative economies, have already re-defined Manufacturing excellence. This implies that the excellence relies heavily on a different set of attributes of manufacturing business, and demands global manufacturing sectors to be of more cautious about novel set of risks in making business decisions. In fact 'now' is the time to break the tradition and to plan for the future to mitigate hidden business risks in a complex, vulnerable, and a rapidly changing environment. The questions are then, what are the hidden risks, what issues are critical for manufacturing sectors to mitigate those hidden risks, how to prepare for the future through risk-aversive value-creating roadmap, how to operationalize forward-looking actions, and what can be learnt from the best players in other industries to secure long-term growth while being good at profitability. Some of the good indications in this context, about the future of Business activities are already set by for instance 'Global compact', 'Dow Jones Sustainability Index', 'Socially Responsible Investments', etc., giving signals of emerging aggressive demands for so called 'Sustainable practice'.

This paper brings these issues into discussion in detail through various examples, challenging and setting a road-map for Manufacturing sectors to identify the hidden risks and to capitalize on value-potential associated with economical, environmental, and societal implications of complex business activities. This is an attempt to integrate timely sensitive 'sustainable practices' into global manufacturing operations, which as of today is not just 'sufficient' but undoubtedly is 'necessary' and 'essential', to reduce the adverse impact of emerging risks and to enhance business value-creation.

WA303 Well-being and Operational Competitiveness

Linda C. Angell, American University of Sharjah, U.A.E.

The Academy of Management's theme this year was 'Doing Well by Doing Good', considering how firms can successfully enhance the wellbeing of their full range of stakeholders. This discussion illustrates the long journey the management discipline has taken from early days when the goal of a manufacturing organization was 'to make money' (Goldratt & Cox, 1984, p. 41). These days, we expect management to consider the impact of its decisions on 'the triple bottom line', including financial, social and environmental wellbeing (Makower, 1994; Roome, 1998; Savitz & Weber, 2006).

A recent law in New Zealand, for example, requires local government to work closely with all constituents (including local firms) to: 1) identify measurable objectives for the community's economic, social, environmental and cultural wellbeing, and 2) develop a ten-year plan to achieve these objectives. Consequently, organization's find themselves in the challenging position of demonstrating their civic responsibilities and good citizenship by spending limited resources addressing community goals seemingly outside of their normal business agendas.

According to Heizer and Render (2006), operations managers (OMs) are expected to play a key role in contributing to wellbeing, yet we know little about how the often conflicting requirements of various stakeholders influence the ability of OMs to achieve competitive cost, quality, service, flexibility (Hayes & Wheelwright, 1984) and speed to market (Fine, 1998) performance.

This paper explores the relationship between stakeholder demands for economic, social, environmental and cultural wellbeing and these key aspects of operational competitiveness. A conceptual framework of management for sustainable wellbeing considers the interaction and tradeoffs between wellbeing and operational competitiveness (Fine, 1998; Hayes and Wheelwright, 1984). The paper concludes with propositions to guide future research.

WA305 Wednesday, 8:30-9:45 Track: Cost Management Chair: Patcharaporn Yanpirat
Room: W2-305 Session: Cost management 1

WA305 The Effect of Competitive Strategy, Task Uncertainty, and Organization Structure on the Performance of Management Accounting System (MAS) of Manufacturing Industry

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Shaio Yan Huang, Feng Chia University, Taiwan

Cheng Tsung Lu, Wen Lin Young, Providence University, U.S.A,

In the era of knowledge economics, the application of management mechanisms will be the crucial factor in sustaining profitable businesses and consolidating a leading position. Hence, management accounting system (MAS) is a management mechanism providing not only decision analysis and performance measurement, but also control management. However, MAS still suffers a lack of consistent opinions in the design and planning, and we suggest that this issue deserves for us to explore and investigate.

This study takes a view of the responsibility center to examine the effect of competitive strategy, organizational structure and task uncertainty on the usefulness of MAS information and MAS performance. The research sample of this study includes 700 production departments of the manufacturing industry as listed on Taiwan's Stock Exchange Market and 138 valid questionnaires are collected. SEM analysis has been used to test the hypothesis of this research.

The major findings of this study are: (1) there is a significant relation between competitive strategy and the perceived usefulness of MAS information, and there is a significant positive relationship between the perceived usefulness of MAS information and MAS performance; (2) when manufacturing departments adopt differentiation strategy, they face higher task uncertainty that would takes shape of decentralization organization structure, and there is also a significant positive relationship between decentralization and the perceived usefulness of MAS information.

WA305 Customer Delight - at What Cost?

K. Venkata Subramanian, Sachin S. Vernekar, Bharti Vidyiapeeth's Institute of Management and Research, India

Today, in the intensely competitive market, every manufacturer talks about customer delight. The customer delight occurs when the customers expect certain value in the products or services and when they get more than what they expected, they are delighted. Every company who would like to create customer delight also has to think about the cost that it has to incur on achieving customer delight. To add any new feature in a product has implications in the cost of production. This would mean increasing the market prices of the products. Does the cost really increase, when a company wants to achieve customer delight? This requires an in-depth analysis of what delights the customer and how much does it really cost to the manufacturer.

The research may even reveal certain facts not known to the manufacturer. This is because the customer thinks differently from the manufacturer. The process of reviewing what the customer expects at what cost, and the process by which the manufacturer achieves the expectations of the customer and even go beyond it, have been also known as value engineering. But the value engineering as a concept has been more confined to the research and product development department. Given the marketing angle to the term value engineering, throws new light on the use of this technique for customer delight. Achieving customer delight requires the joint effort of both the Marketing and the product development department, forgetting their individual department goals and working towards the ultimate goal, customer delight. This article brings out some instances where the customer delight was achieved by multi functional teams interacting with the customer to provide value to the customer.

WA305 Model for Simultaneous Measurement of Production Costs at the Highly Automated Lines

Slavko Dolinsek, Matjaz Novak, University of Primorska, Slovenia
Sasa Sokolic, Metronik d.o.o.

The broader research focus of the paper is the problem related to efficient production costs management, which is one of the central activities of product management within the enterprise. The efficiency of the production can be improved in several manners; too often reallocation of production plants is used to economies with inexpensive labor costs. Due to this fact the European and Slovenian processing industry has been losing traditional competitive advantages, which significantly reduces the potential for long-term economic growth. A much better alternative, which can potentially solve this problem, is to switch to a production using highly automated, flexible production lines (knowledge based lean production).

The methodology, which enables us to master the production efficiency on highly automated production lines in a structural manner, is the so-called total productivity management (TPM). Production efficiency can be directly measured by the parameter, defined as overall equipment effectiveness (OEE). An application of this methodology has been developed and successfully applied for specific industrial branches by the company Metronik. By such industrial application technical management of production efficiency has been solved.

However, these data can not give the management sufficient relevant information for decision-making (i.e. investment in the new facilities and equipment, to open new sales channels). For this purpose the initial data need to be supplemented by additional estimates on the impact of technical inefficiency on the production costs. The traditionally used cost model, based on the application of average production and cost functions, provides inaccurate information on cost aspects in the production. In economic theory therefore a model of production and costs frontiers or marginal production and cost functions is used, which overcome the main disadvantages of averaging.

For the estimation of production frontiers special econometric software is required, therefore those models are rarely used in spite of the essential advantages compared to the common used practices of analyzing and measurement of cost functions. From the theoretical point of view the model is not new, but its practical application is new and unrealized until now. The central point of the paper is: to use a theoretical developed model of production frontiers for the application of simultaneous measurement of cost efficiency of production at highly automated production lines. Practical application will upgrade the existing, by information technology supported, TPM methodology.

WA305 Enhancing Product Costing by Service Cost Reciprocal Flows Consideration in the Activity-Based Costing System

Patcharaporn Yanpirat, Sansanee Supapa, Wijittra Puatatsanon, Kasetsart University, Thailand

In order to reduce the distortion in product costing, the activity-based costing (ABC) is an answer. In the ABC system, overhead costs are allocated to products/service more accurately than traditional cost systems. It focuses on the activities performed to produce products/services and assigns resource costs to them based on activities performed. The procedures are to identify resource costs and activities, to assign resource costs to activities, and to assign activity costs to products/services, respectively. Since there are several procedures to allocate overhead costs in the cost assignments, however, it is important to realize that allocation does not affect the total cost but the amounts of cost assigned to the products can be affected by the allocation procedure chosen. There are two types of activities; producing activities and support activities. The nature of support activities is to service producing activities, therefore the overhead costs of the support activities cannot assigned directly to the units produced. The overhead costs will be assigned from support activities to producing activities and to individual products, respectively. Typically, the direct allocation is the most widely

used due to its simplicity with low cost and less time-consume. However, it ignores the reciprocal flows which represent the movement of service back and forth between service activities. This paper is aimed at to propose a case application of allocating service cost of the support activities in the activity-based costing system. The allocation procedure with reciprocal flows consideration is employed to enhance product costing.

WA401	Wednesday, 8:30-9:45	Track: Information Systems and e-Operations	Chair: Rakesh Narain
	Room: W2-401	Session: e-commerce 1	

WA401 Electronic Markets, Data Access and Collaboration: Relative Value to Performance in Firm Operations

Damien James Power, Prakash Singh, Victoria Hanna, Samson Daniel, University of Melbourne, Australia

In this paper, a model is proposed that establishes direct and indirect effects of the use of e-markets, access to online data and trading partner collaboration on operational performance. This model was tested with survey data from 233 Australian members of CIPSA (Chartered Institute of Purchasing and Supply Australia). Structural equation modeling analysis results show that whilst all three direct effects are non-significant, when the indirect effects are taken into account, the total effects are significant and moderate in strength. This suggests that use of e-markets, access to online data and collaboration with trading partners, when taken in isolation, are not as effective as could be expected. However, when these factors are implemented together their value and impact becomes significant. The study is limited to Australian firms. The results highlight that taking a holistic view of investment in technology by combining use of web-based applications with effective data sharing and collaboration is likely to produce significant improvements in operations. While e-markets may have been viewed as a mechanism for reducing the costs of inputs and/or as a new demand channel, it would appear that more value can be extracted when this technology is viewed and exploited in a more strategic manner. E-markets should be used in concert with access to data and with trading partners who are able to exploit the opportunities for mutual benefit.

WA401 e-Procurement in the Mnaufacturing Industry: Perceptions of Brazilian Managers

Alexandre Reis Graeml, Centro Universitario Positivo, Brazil
Marie Anne Macadar, Universidade Estadual do Rio Grande do Sul, Brazil
Joao Mario Csillag, Escola de Administracao de Empresas de Sao Paulo, Brazil

The possibility of using the Internet to source suppliers and to carry out corporate purchases has caught the attention of the IT industry and procurement departments of many organizations. Its enthusiasts say that, in addition to reducing cycle times, e-procurement provides substantial cost reductions. This paper presents a few possible ways of using the Internet for such purposes, based on the literature. Then, it discusses the results of two surveys with 105 Brazilian manufacturing companies about the use of the Internet for corporate purchases. The questionnaires used in each of the two surveys were almost identical and they were applied in two different moments (Nov 2003/Feb 2004 and Nov 2006/Feb 2007) with the purpose of identifying changes on managers'; perceptions about the issue over time. Respondents were asked if the Internet had caused any changes to the way their organizations performed corporate purchases of direct and indirect materials, over the last three years. They were also inquired about the use (or intention to use in the near future) of reverse auctions, electronic exchanges and/or the company's extranet in order to buy materials or services.

The results support findings of other research reported in the literature. For example, organizations tend to use e-procurement to purchase indirect materials more often than they do for direct materials. The results also show that larger companies use the Internet more extensively than smaller ones for procurement purposes. By revealing the current level of use of the Internet for corporate purchases and for the interaction with suppliers and potential suppliers, this paper broadens the discussion on the issue, which is extremely relevant to manufacturing companies and to organizations from many other industries alike.

WA401 The Development of Manufactuirng Information Portal for SMEs in Traditional Industries

Jukka Hemila, VTT Technical Research Centre of Finland, Finland
Sebastien Kicin, CAS Software AG

Markets offer today a variety of the enterprise information systems. Small and medium sized manufacturing companies (SME) could have today different operational tools for product design (CAD/CAM), materials management (Material Requirement Planning) and resource management (Enterprise Resource Planning). SMEs could have then other managerial solution for Customer Relationship Management and Supply Chain Management. For the internal knowledge and information sharing, SMEs could have different Groupware and Intranet solutions. These mentioned systems are in many cases independent solutions without any communication links between. Manufacturing SMEs are today taking part also on globally competing supply chains. In global business, the requirements for information sharing rises, and information should be seamlessly available 24/7 for overall enterprise and to individual employees needs. SMEs are facing the challenge that they need a common ICT solution for supporting their business functions. In most cases, such applications in markets are too heavy for SME purposes and every kind of tailor-made solution likes to be too expensive for SMEs.

That challenge has been a motivation for the research and development project ESKALE (Trans-European Sustainable Knowledge-Based MAnufacturing for SmalL and Medium Sized Enterprises in Traditional Industries). ESKALE aims to develop a supply-chain oriented production management platform for manufacturing SMEs. The new innovative platform is called Manufacturing Information Portal (MIP). MIP will act as an integrative environment to interface and interconnect different units of the manufacturing SMEs and related existing operative systems in order to make information available for every business functions of SME. This paper is about the requirements and end-user analysis phases of the project. The result of the paper is the analysis of the challenges and opportunities manufacturing SMEs have in their every day life at the global supply chains. The analysed challenges and opportunities are turned on the both business and technological requirements for the MIP to be developed. The research is based on the multiple case studies methodology. Results are conducted from the case studies and state of the art literature survey about information system environments.

WA401 A Survey on Status of E-Procurement in Small and Medium Enterprises of India

Rakesh Narain, Abdul Samee P., MNNIT, India

This paper reports the findings of a Web Based survey carried out in Small and Medium Enterprises (SMEs) of India to access the status of e-procurement and also to glean the difficulties prevailing in adoption of e-procurement technologies. Data has been obtained from 24 organizations.

The findings of the survey suggest that at present the use of e-procurement in SMEs of India is very less. These organizations use e-procurement systems mainly for sourcing i.e. for searching suppliers, evaluating suppliers, RFP/RFQ and selecting suppliers. The main barriers to the adoption of e-procurement are suppliers not supporting these technologies, lack of adequate solutions, costs and benefits uncertainties, inadequate training facilities, access to financing, security, vendor solution offerings (Products), lack of skilled people to implement e-procurement and too sophisticated systems. The suppliers do not support e-procurement because of the difficulties in financing and supporting. It is indeed ironical to observe that though India is a strong provider of IT solutions to the world, its own SMEs are suffering due to the lack of availability of low cost adequate IT solutions for e-procurement.

The most important reason to justify the adoption of e-procurement has been found to be “Competitivenes”. The response to yet another question revealed “Price” as the most important criteria in the selection of e-procurement solutions. Technical support, ease of installation, system flexibility and adaptability and vendors reputation has been found to be the other important criteria for the selection of e-procurement solutions. The most significant improvements observed after implementing EP are; improved decision making, better production scheduling, inventory management and supplier relationships management.

The government of India is giving a lot of opportunity to business partners to enhance their business with e-procurement and e-business burgeons. Besides developing electronic infrastructure in the country through effective telecom policy measures, the government of India has also taken measures to provide necessary legal infrastructure and also to take care of entrepreneurial education and training to encourage SMEs to use IT.

WA402 Wednesday, 8:30-9:45 Track: Supply Chain Management Chair: Soumen Ghosh
Room: W2-402 Session: Empirical research on SCM 3

WA402 The Right Supply Chain Strategy Can Still Make the Difference: How Italian Textile Apparel SMEs Quest for Competitiveness

Laura Benedetti, Societa per gli Studi di Settore, Italy
Arnaldo Camuffo, Bocconi University, Italy
Roberto Pozzana, Andrea Vinelli, University of Padova, Italy

The Textile and Apparel (TA) sector is vanishing in most European and North American Regions. Intense competition from low cost countries especially jeopardizes SME’s across the whole supply chain. This trend hits even countries with a strong and long tradition in the industry like Italy, with a significant reduction in terms of revenue, export, value added, investments, number of employees and firms. However, this negative trend does not involve homogeneously all the firms belonging to this industry. Financial and market performance vary greatly across firms, product categories and segments of supply chain. Firms’ performance is eventually determined by strategic choices and configurations of activities along all the supply chain. Some business models associated with specific supply chain configurations can lead to success, whereas others to decline.

This study identifies and validates, for the Italian TA SMEs, a number of business models and the related supply chain and product configurations that are likely to be associated with success or decline within the global competitive arena. The business models are initially hypothesized on the basis of existing data and knowledge of the industry. Using data from the annual survey of the Italian Ministry Economy (Studi di Settore), which gathers - at the firm level - a wide array of operations and supply chain data and information, but also financial, technical and market one, we associated each business model with a set of indicators, that are able to depict specific supply chain strategies. Applying correspondence and cluster analysis to the sample of over 30.000 Italian TA SME’s, we then validated the above identified business models. The study provides a methodology to predict competitiveness within an industry on the basis of actual strategy and operations and supply chain choices and configurations. The findings can help SMEs remaining competitive in a mature and global industry, indicating avenues of strategic innovation, and suggesting benchmarks and ways to selectively direct industrial policies. Similar applications could also be made to other mature and low tech industries like mechanic, footwear, and eyewear.

WA402 Supply Chain Capability as a Determinant of Foreign Direct Investment

Arshad Alam, Prabir K. Bagchi, George Washington University, U.S.A.

International plant location decisions have acquired relevance in a globalized economy and casual evidence suggests that the overall production environment would have a bearing on international plant location decisions. The choice of location is determined not only by firm-specific variables that define the motive of FDI but is also determined by variables that define locational aspects.

This study attempts to analyze the impact of the production environment on the flow of FDI. The paper introduces the concept of supply chain capability of countries and posits that the supply chain capability of a country is a determinant of foreign direct investment (FDI) flows. The notion of supply chain capability of a country offers a new conceptual framework for understanding the flow of FDI. Supply chain capability is defined as a function of infrastructure, absorptive capacity, and supplier environment. The above country factors facilitate the flow of material and information, enhance the productivity of a firm’s conversion process and along with governance determine the overall environment in which firms operate.

The utility of taking the concept of supply chain and projecting it to the country level is that it helps address the issues that have been identified in the new paradigm of international investment. A new model to explain FDI must take into account the changing nature of FDI (more influenced by production and capability building variables than market related determinants), and the focus on competitiveness. The concept of supply chain capability does that. Additionally, it is fully consistent with the process view of organizations. Supply chain management is but an application of the process view and just as a process view enhances the efficiency of an organization, a supply chain focus helps organizations in improving the overall efficiency and effectiveness of the entire supply chain as a whole. The study presents an empirical model; measures to operationalize the variables are suggested and data sources identified to conduct an empirical study. Analysis is carried out to arrive at Supply Chain Capability score. Hypotheses are proposed and regression results are presented which validate the basic theoretical proposition of Supply Chain Capability of a country being a determinant of FDI.

WA402 Evaluating the Congruence between the Competitive Priorities of a Firm and its Outsourcing Drivers

Soumen Ghosh, Georgia Institute of Technology, U.S.A.
James Kroes, University of Rhode Island, U.S.A.

It is abundantly evident that outsourcing is a key business trend that has become increasingly important in recent years. Today's hyper-competitive environment, characterized by constant change, market unpredictability, and relentless pressure to reduce costs and cycle times, coupled with the globalization trend, has provided further impetus to the growth of outsourcing. Consistent with this rapidly rising outsourcing trend, a firm's supply chain has now also become a growing area of outsourcing activity. Increasingly, manufacturing firms are now outsourcing activities and even complete processes related to its supply chain, including research and design, product development activities, product component manufacturing, product assembly, and distribution and logistics functions.

This research study is motivated by the question that while there are clearly important economic and competitive benefits from this ever-increasing outsourcing trend, it is not clear whether the supply chain related outsourcing decisions of firms are always strategically aligned with their competitive priorities. This requires that the strategic outsourcing drivers are synergistically aligned with the strategic goals and priorities of the firm, particularly since the competitive priorities of a firm are the direct manifestation of the firm's competitive capabilities and competencies.

Using empirical data collected from manufacturing industries, we investigate the relationship between manufacturing strategy configurations and the impact of alignment between the competitive priorities of a firm with its outsourcing drivers on performance. Using manufacturing strategy configurations empirically developed using cluster analysis procedure, we find significant positive relationship between the competitive priorities stressed by the different manufacturing strategy configurations and the primary outsourcing drivers used by each strategy cluster. In addition, we also investigate the impact of this alignment on both supply chain as well as business performance, and find that high alignment has a positive impact on performance.

WA403 Wednesday, 8:30-9:45 Track: m-Supply Chain Management Chair: Albert Y. Ha
Room: W2-403 Session: Modeling: Sharing risk and return in SCM 1

WA403 Development of Negotiation Process for Bargaining Contract between Maker and Retailer Using Game-Theoretical Approach

Seung-Jin Ryu, Takuto Sunouchi, Kagehisa Nakayama, Hisashi Onari, Waseda University, Japan

Negotiation on bargaining contract determining quantity, price and delivery between maker and retailer is one of the most important activities which determine the performance of the supply chain. Also, the bargaining contract has a great effect on individual efficiency of both maker and retailer, because it is very closely related with the maker's production plan and retailer's sales plan. If there are no partnerships which can align the different objectives of maker and retailer, the production efficiency of maker and utilization of retailer might decline badly. Moreover, the negotiation of bargaining contract tends to be uncooperative competition arguing for each player's own profits.

In this research, we adopt game-theoretical approach to guarantee that profits form the negotiation process fairly distributed between maker and retailer under minimum information sharing by achieving 'Nash bargaining solution'. The objectives of the research are to develop the negotiation process for bargaining contract between maker and retailer using game-theoretical approach under minimum information sharing and to evaluate the robustness and effectiveness of the proposed model. We modeled four axioms, 'Invariant to affine transformations', 'Pareto optimality', 'Independence from Irrelevant Alternatives' and 'Symmetry' into negotiation process to achieve the 'Nash bargaining solution' for the bargaining contract between maker and retailer. We demonstrated the robustness of the proposed model by mathematical verification and simulation. Also, we showed the proposed model excelled the previous negotiation process with uncooperative characteristics. Finally, we verified the effect to the solutions from the negotiation process with the degree of amount of shared information.

WA403 Channel Coordination and Volume Discounts with VMI

Wen li Wang, Haiyan Wang, Southeast University, China

The paper considers volume discounts as a coordination mechanism in a system consisting of a supplier who carries out VMI and a buyer (or a group of identical buyers). The problem is analyzed as a Stackelberg game in which the supplier acts as the leader by announcing its pricing policy to the buyer in advance and the buyer acts as the follower by determining his unit selling price and thus annual sales volume is determined. The VMI models implemented by supplier with volume discounts and the one without volume discounts are established respectively. Numerical simulation indicates that appropriate volume discounts guarantee the increased profit of buyer is more than the one of supplier and the system's profit maximizes. The result of research contributes to extensive application of volume discounts under the supplier implementing VMI.

WA403 Managing Supply Chain: VMI and Option Contract

Alejandra Gomez-Padilla, University of Guadalajara, Mexico
Tsutomu Mishina, Akita Prefectural University, Japan

This paper compares the supply chain performance under a simple pricing scheme with a vendor managed inventory (VMI) system and an option contract. A main issue in supply chain management is how to cope with demand variation and uncertainty. In the literature we find two main approaches: inventory management and contract design. During the last years, it has become an alternative for supply chain performance improvement. With a VMI system, the supplier is responsible of the decisions concerning the inventory to be hold by the retailer. Two situations may exist: the retailer assumes the inventory cost or the inventory cost is assumed by the supplier. By introducing a VMI system, information lead time is reduced and the supplier receives demand information faster. In this way the supplier can replenish the inventory and diminish the probability of the retailer of not satisfying demand or, in other words, having stock breakout. Concerning contract design, several works exist that are oriented to establish contract parameters that will incite the retailer to hold a bigger stock. These parameters are mainly based on inventory holding risk share within supplier and retailer.

In this paper, we are interested in an option contract. An option contract is one where the retailer orders a quantity of units and has a right to modify his order in any sense (it may be bigger or smaller than the initial order) without restrictions by buying an option premium in advance from the supplier. We consider the situation of one retailer and several suppliers and we compare the

results for the chain for two cases: when a simple pricing scheme exists under VMI and when one of the suppliers offers an option contract.

WA403 Revenue Sharing Contracts in a Supply Chain with Uncontractible Actions
Albert Y. Ha, Shilu Tong, Hong Kong University of Science and Technology, Hong Kong
We consider a supplier-customer relationship where the customer faces a typical Newsvendor problem of determining perishable capacity to meet uncertain demand. The customer outsources a critical, demand-enhancing service to an outside supplier, who receives a fixed share of the revenue from the customer. Given such a linear sharing contract, the customer chooses capacity and the service supplier chooses service effort level before demand is realized. We consider the two cases when these decisions are made simultaneously (simultaneous game) or sequentially (sequential game). For each game, we analyze how the equilibrium solutions vary with the parameters of the problem. We show that in the equilibrium, it is possible that either the customer's capacity increases or the service supplier's effort level decreases when the supplier receives a larger share of the revenue. We also show that given the same sharing contract, the sequential game always induces a higher capacity and more effort. For the case of additive effort effect and uniform demand distribution, we consider the customer's problem of designing the optimal contract with or without a fixed payment in the contract, and obtain sensitivity results on how the optimal contract depends on the problem parameters. For the case of fixed payment, it is optimal to allocate more revenue to the supplier to induce more service effort when the profit margin is higher, the cost of effort is lower, effort is more effective in stimulating demand, the variability of demand is smaller or the supplier makes the first move in the sequential game. For the case of no fixed payment, however, it is optimal to allocate more revenue to the supplier when the variability of demand is larger or its mean is smaller. Numerical examples are analyzed to validate the sensitivity results for the case of normal demand distribution and to provide more managerial insights.

WA405 Wednesday, 8:30-9:45 Track: m-Scheduling Chair: Jirarat Teeravaraprug
Room: W2-405 Session: Modeling: New scheduling model 1

WA405 Cross-Training Workers in Dual Resource Constrained Systems with Heterogeneous Processing Times
Gerard Gaalman, University of Groningen, Netherlands
In this paper, we explore the effect of cross-training workers in Dual Resource Constrained (DRC) systems with machines having different mean processing times. By means of queuing and simulation analysis, we show that the detrimental effects of pooling (cross-training) previously found in heterogeneous single resource constrained (SRC) systems are also apparent in heterogeneous DRC systems. Fully cross-training workers in heterogeneous DRC systems is only beneficial if the differences between mean processing times are not too large, otherwise cross-training should be pursued within homogeneous subgroups of machines. Due to the limited machine availability, DRC systems are unable to use some of the potential assignment flexibility from cross-trained workers (pooled servers) that can be used in SRC systems. However, it appears that this restriction in the DRC system improves the system mean flow time performance compared to the SRC system and hence results in a somewhat less detrimental effect of pooling (cross-training) in a heterogeneous environment. Finally, in multiple server queuing systems, restricting the assignment flexibility by means of a commonly used labour assignment rule also seems to improve the mean flow time performance under processing time differences.

WA405 The Effects of Safety Buffers and Schedule Optimization against Supply Uncertainties
Tomohiro Azuma, Kanto Gakuen University, Japan
This research updates agile production planning and control system (APPCS), which generates a feasible schedule, with a more realistic product data model and incorporates a genetic algorithm with minimal-generation-gap and demand-crossover (MDGA) in APPCS to optimize the schedules. APPCS, proposed by Sato and Tsai (2004), is an advanced planning system (APS) that generates a feasible schedule for a set of customer orders according to some priority dispatching rules in a make-to-order environment. This research also extends the work of APPCS to compare the effects of safety buffers against supply uncertainties. An uncertainty caused by changes in the promised supply date and/or quantity may invalidate a previously-scheduled and possibly well-executing schedule. Safety buffers are usually considered in a schedule to prevent production systems from uncertainties. The result indicates that the schedule optimization is the most important factor in protecting production system against supply uncertainties.

WA405 Hospital Admission Planning to Optimize Major Resources Utilization under Uncertainty
Nico Dellaert, Eindhoven University of Technology, Netherlands
Jully Jeunet, Universite Paris Dauphine, France
Admission policies for elective inpatient services mainly result in the management of a single resource: the operating theatre as it is commonly considered as the most critical and expensive resource in a hospital. However, other bottleneck resources may lead to surgery cancellations, such as bed capacity and nursing staff in Intensive Care (IC) units and bed occupancy in wards or medium care (MC) services. Our incentive is therefore to determine a master schedule of a given number of patients that are divided in several homogeneous categories in terms of the utilization of each resource: operating theatre, IC beds, IC nursing hours and MC beds. The objective is to minimize the weighted deviations of the resource use from their targets, and the probabilistic length of stay in each unit (IC and MC) is considered. We use a Mixed Integer Program model to determine the best admission policy. The resulting admission policy is a tactical plan, as it is based upon an average number of patients with average characteristics. For the operational planning we will consider several options to create feasibility: overplanning, flexibility in patient group and periodic rescheduling. In this paper, we want to establish which combination of overplanning, patient flexibility and rescheduling leads to the best results in terms of waiting times for patients, in terms of violating the targets and in terms of schedule uncertainty for the operating specialists. The results show that creating a good cyclic master schedule turns out to have a big influence on the performance.

WA405 Part Family Determination: A Case Study of a Paper Manufacturing Company
Jirarat Teeravaraprug, Anchiree Jariyatharasit, Thammasat University, Thailand
In today's fierce competitive environment, any organizations give an attempt to reduce their operating costs. One of the operating costs is inventory cost. Normally, an organization tries to keep the inventory as low as possible while maintaining the stable level of manufacturing. In order to keep the low inventory, an organization may combine parts or components into part family or component

family. The problem is that how to combine the parts or components into part family or component family. This paper uses the case study of a paper manufacturing company. One of the company parts or components is paper core. The size of paper core normally depends on the paper size that is required by the customer. The company may keep all core sizes based on the customer demand. In that case, the inventory cost would be high and it requires a lot of inventory management. Decreasing the type of core sizes would reduce inventory cost and less require in inventory management, but would increase in waste due to mapping the available core size to demanded core size. This paper gives an attempt to solve the problem. A mathematical model is given, and a case example is utilized to demonstrate the problem.

WA501 Wednesday, 8:30-9:45 Track: Spanish Chair: Cesar Humberto Ortega Jimenez
Room: W2-501 Session: S-Manufacturing technology

WA501 Examining the Effects of Integrated Manufacturing on Job Characteristics

Alberto Bayo–Moriones, Alejandro Bello–Pintado, Javier Merino-Diaz de Cerio, Public University of Navarra, Spain

Integrated Manufacturing, what includes Advanced Manufacturing Technologies, Total Quality Management and Just in Time, has become one of the most important paradigms in operations management. Although in the literature there has been a wide debate about the consequences of Integrated Manufacturing for employees, work and job characteristics, a conclusion has not been reached so far. The critics of Integrated Manufacturing say that it does not lead to any substantial change for employees comparing to traditional manufacturing, their jobs remaining simple and repetitive. On the other hand, the proponents state that this manufacturing paradigm requires the active involvement of workers and an increase in their skills in order to achieve the goal of flexibility.

This paper analyzes the effects of the adoption of the three elements of Integrated Manufacturing on four characteristics of the tasks performed by production workers: job variety, job autonomy, job interdependence and job complexity. Moreover, it examines whether the effect of Integrated Manufacturing on job complexity is mediated by the other three job characteristics considered. Information from a sample of 203 Spanish plants employing at least twenty workers in all manufacturing sectors is used in the empirical analysis. The models have been estimated by Partial Least Squares (PLS). This is an appropriate technique for the analysis, since both reflective and formative indicators are used to measure the intervening variables.

The results of the paper show that the three components of Integrated Manufacturing have a positive effect on job variety, job autonomy, job interdependence and job complexity. This last effect is shown to be mostly mediated by the other three job characteristics. No direct effect of Advanced Manufacturing Technologies and Total Quality Management on job complexity is found.

WA501 A Look at Technology and Manufacturing Strategy in the Automotive Supplier Sector

Cesar Humberto Ortega Jimenez, Universidad Nacional Autonoma de Honduras, Honduras
Jose Antonio Dominguez Machuca, Pedro Garrido Vega, Jose Luis Perez Diez de Rios, Universidad de Sevilla, Spain

The objective of this paper is to investigate how manufacturing plants make use of manufacturing strategy and technology, aiming to increase the understanding of Production and Operations Management (POM). This is done by individually testing the effectiveness of both manufacturing practices by using some of their aspects, with the ultimate goal of enhancing operational performance. In keeping with the overall objective of this research, two areas are identified as being of particular interest: (i) whether manufacturing strategy influences operational performance and (ii) whether technology impacts on operational performance.

This paper uses some of the data of the third round of the High Performance Manufacturing (HPM) Project as its empirical basis. This round of the HPM project is an international study of manufacturing plants involving ten countries and three industries. However, this research only focuses on one of these industries: the automotive component sector. Therefore, due to contingency, this specific sector becomes this paper's third area of interest. The results seem to suggest that there are only minor differences between the levels of technology being implemented by high and standard performers, which may be the reason why this manufacturing practice does not show significant differences in performance between these two types of plant. On the other hand, there are somewhat greater differences in manufacturing strategy levels than in technology in both types of plant, leading to bigger differences in performance.

WA501 Offsetting Low Performance by Appropriate Levels of Interaction between Technology and Manufacturing Strategy

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Pedro Garrido Vega, Jose Antonio Dominguez Machuca, Universidad de Sevilla, Spain

The advantage of aligning different manufacturing practices (MPs) is an important concept that has been a focal point of research in recent years. Likewise, it is intuitive to understand that the link between manufacturing strategy and technology has a positive impact on performance and is thus an important theoretical proposition in Production and Operations Management (POM). Despite this, empirical support given to this hypothesis, both inside and outside the HPM project, is far from widespread. In this respect, the interaction models based on the notion of finding a fit between manufacturing strategy and technology promises excellent results. Pursuing this line of research, this paper examines one bivariate perspective that allows any possible relationships in the link between these two practices and operational performance to be validated: difference (also known as matching). These relationships have been analyzed using the international HPM project third round automotive component supplier sector database. The multiple regression equation in the deviation score analysis shows that such interaction has no significant impact on performance. However, in order to identify small differences between high and standard performers in the interaction being studied, a sub group analysis was also carried out. The results of this would seem to illustrate that two different designs of states of interaction with different levels of implementation (high and standard performer sub groups) may perform equally well. This last method has allowed us to get round the restrictions of the former regression method and thus provide a more complete view of the interrelationship between both practices in HPM, where the above-mentioned interaction seems to be widespread in the sector analyzed.

WA503 Wednesday, 8:30-9:45 Track: m-Quality Management and Six Sigma Chair: Richard Mark Greenough
Room: W2-503 Session: Modeling: New approaches to QM and maintenance 1

WA503 Establishment of Bolt Tightening Simulation System for Automotive Industry: Application of the Highly Reliable CAE Model

Toshiya Ueno, Manabu Yamaji, Aoyama Gakuin University, Japan
Hiroe Tsubaki, University of Tsukuba, Japan
Kakuro Amasaka, Aoyama Gakuin University, Japan

The automotive industry is engaging in a “global production strategy for simultaneous achievement of QCD in an effort to prevail and survive in the “worldwide quality competition”. In an effort to realize this, the authors have proposed the high quality assurance system for simultaneous achievement of QCD by a change to super short period development designing, the “Highly Reliable CAE Model” and demonstrated its effectiveness. To realize this, the rational integration of overall optimality and partial optimality needs to be achieved through the process of “problem – theory – algorithm – modeling – calculator” as a technical requirement to be included in “Bolt Tightening Simulation System”. To realize this, the authors developed the “Bolt Tightening Simulation System”, and applied it to CAE analysis for automobile bolt tightening. They achieved the desired results.

WA503 Intelectualization and Accuracy Improvement for the Development of Highly Reliable CAE Software

Takahito Tanabe, Mathematical Systems Inc., Japan
Toshiharu Mitsuhashi, Advancesoft Inc., Japan
Manabu Yamaji, Kakuro Amasaka, Aoyama Gakuin University, Japan

The authors have investigated the technical elements that realize high quality assurance CAE models, expected to boost the automobile development design process. The authors have abstracted the five technical elements (problem setting, modeling, algorithm, theory, and computer) by studying the wide variety of CAE development projects. And the authors realized that the success of CAE models results from the "synergy" of appropriate combination of the technical elements. And the authors emphasize the importance of the feedback-loop process to elaborate the element itself and their combination, based upon deep technical insights and techniques to improve the accuracy. The authors define the process "Intellectualization" and "Accuracy Improvement" of CAE.

WA503 Optimal Pit Strategy of How Many Stops To Make and When To Make Them for a Formula 1 Team

Ilkay Gultas, Istanbul Kultur University, Turkey

In a Formula 1 race, pit stops are where a racing car stops in the pits during a race for refueling, new tires, repairs, mechanical adjustments, or any combination of the above. Making pit stops let cars can carry less fuel, and therefore be lighter and faster, and use softer tires that wear faster but provide more grip. Teams usually plan for their cars to pit following a planned schedule, the number of stops determined by the fuel capacity of the car, tire lifespan, and tradeoff of time lost in the pits versus how much time may be gained on the race track through the benefits of pit stops. It is also important to take competitors’ strategies into account when planning, to avoid being “held up” behind other cars and unable to overtake them. An unscheduled or extended stop can be very costly for a driver’s chance of win, because while the car is stopped for service, remaining cars on the track can rapidly gain distance on the stopped car.

What is asked, is the best possible combination of placements of a pit stop (what time, how often) by taking into account factors such as rate of fuel consumption, weight of fuel, cornering speed with each available tire compound, rate of tire wear, the effect of tire wear on cornering speed, the length of pit road and the track’s pit road speed limit, and even expected changes in weather and lighting conditions. In this paper, the optimal pit stop strategy problem is approached using mathematical programming. The applied model results in a decrease in the time needed for the deciding of the pit stop time.

WA503 State-of-the-art in Integrated Vehicle Health Management

Ornella Benedettini, University of Bari, Italy
Timothy S. Baines, Howard W. Lightfoot, Richard Mark Greenough, Cranfield University, United Kingdom

Integrated Vehicle Health Management (IVHM) is the collection of data relevant to the present and future performance of a vehicle system and its transformation into information that can be used to support operational decisions. This design and operation concept embraces an integration of sensors, communication technologies and artificial intelligence in order to provide vehicle-wide abilities to diagnose problems and recommend solutions. This paper aims to report the state-of-the-art of IVHM research by presenting a systematic review of the literature. Literature from different sources is collated and analysed, and the major emerging themes are presented. On this basis, the paper describes the IVHM concept and its evolution, discusses configurations and existing applications along with potential benefits and barriers to adoption, summarises design guidelines and available methods, and identifies future research challenges. Nine major findings emerge from the literature that confirm the potential of IVHM for improving safety and cost-effectiveness of new and legacy vehicles by linking maintenance, operations, and logistics to the present and future health of the vehicle. However the cost and complexity of the technology are potential inhibitors to widespread adoption. The principal issues concern the lack of consolidated tools and methodologies to guide the assessment of potential IVHM applications.

WB202 Wednesday, 10:05-11:20 Track: JIT & Lean Production Chair: Norman Faull
Room: W2-202 Session: Lean perspectives

WB202 Thoughts on Kaizen and its Evolution: Three Different Perspectives
Manuel Suarez-Barraza, Juan Ramis-Pujol, University Ramon Llull, Spain
Laoucine Kerbache, HEC Paris, France
Since Masaaki Imai coined the term Kaizen in the mid eighties it has been regarded as a key element in the competitiveness of Japanese companies (Imai 1986; Brunet 2000). However, even though Kaizen was defined by the author who created the term, the literature on this subject is still rather ambiguous and inconsistent about how Kaizen is conveyed.

It has been seen sometimes as one of the basic pillars of Total Quality Management, as a concept immersed in this management approach (Lillrank 1995), whilst others see it as the philosophy encompassing all Japanese practices (Imai 1986; Imai 1997; Brunet and New 2003), and in the West it is still regarded as merely the application of a Continuous Organisational or Process Improvement technique. This is the case of the "Kaizen Blitz" as it is known, or the "Kaizen Office", "the Gemba-Kaizen Week", "Improvements via Small improvement Groups", and "Kaizen Teian", amongst others (Asociacion de Relaciones Humanas del Japon 1992; Sheridan 1997; Lareau 2003; Montabon 2005; Vonk 2005).

Given this wide variety of practical, academic literature about Kaizen, it is highly likely that the confusion and inconsistency about this concept is present in the literature. This article is an attempt to summarise the evolution of the Kaizen approach, from its possible roots in the work of the Japanese companies who pioneered continuous improvement to the most recent trends and paths Kaizen has evolved along. The conclusions of this article reveal that this approach can be analyzed from three different perspectives. First as a "Management Philosophy" and, therefore, it could be seen as an umbrella covering many other management approaches. Second Kaizen can be seen as one of the principles of quality management. And third, from a practical perspective, Kaizen appears as a series of tools and techniques oriented to eliminate waste (Mudas).

WB202 Proposal and Demonstration of V-MICS-VM through the Development of Intelligence Operators
Hirohisa Sakai, Toyota Motor Corporation, Japan
Kakuro Amasaka, Aoyama Gakuin University, Japan
To achieve simultaneous, worldwide high quality assurance and other global production developments, today's task is to maintain high reliability in production facilities. In response to the increasing expansion of overseas plants, it is necessary to improve and maintain highly accurate production equipment through the development of intelligence operators. The authors have clarified Advanced TPS as a global production technology and management model designed to realize high quality assurance in global production. Furthermore, the authors propose V-MICS-VM (Virtual - Maintenance Innovated Computer System - utilizing Visual Manual) as a new people-centered principle that contributes to Advanced TPS utilizing a visual manual that consists of three elements, (i) fundamental skill acquisition (-FSA), (ii) equipment knowledge acquisition (-EKA) and (iii) preventive maintenance acquisition (-PMA). Specifically, the authors have developed a visual manual that can be simultaneously distributed and used throughout the world. The effectiveness of this system has been verified at the domestic and overseas Toyota plants.

WB202 Evolution of TPS Fundamentals Utilizing New JIT Strategy - Proposal and Validity of Advanced TPS at Toyota -
Kakuro Amasaka, Aoyama Gakuin University, Japan
Hirohisa Sakai, Toyota Motor Corporation, Japan
The author has developed a new management technology principle "New JIT", which contains "TMS, TDS, TPS, and TQM-S" as the next generation technical principles into a management strategy. In this paper, the author is working on the further evolution of TPS Fundamentals, called "Toyota's Simultaneous Realization of QCD Fulfillment Models. The author has verified substantial contribution through an application example at Toyota Motor Corporation.

WB202 Scheduling with the Glenday Sieve
Norman Faull, University of Cape Town, South Africa
The Glenday Sieve is a relatively new phenomenon. Developed by Ian Glenday of the UK, it is an approach to identifying common groups of procedures or activities and relating them to the total demand on the resources available.

The approach looks initially like nothing more than an elaborated Pareto analysis. But this is to miss the point. The Glenday Sieve is the front-end to identifying a range of improvement opportunities, touching layout and scheduling. A key objective is to achieve 'economies of repetition.' Instead of producing products in occasional large batches, they are produced frequently in small batches according to a stable, fixed schedule; inventories are allowed to fluctuate in response to the fluctuating demand. This is in contrast with the usual wisdom of fluctuating production to keep inventories reasonably stable in the face of demand fluctuations.

The Glenday Sieve is initially used as a tool in allocating products to 'families' and then re-grouping resources to match them to the families. This is somewhat akin to the 'plant-within-a-plant' approach, and uses the current state and future state mapping approach in a modified procedure. The families of products are then scheduled on the regrouped resources to achieve 'economies of repetition.' Dramatic results are claimed, in settings as diverse as paper production and healthcare. The paper reports a range of these claims.

Finally, the paper reports the initial efforts of the author to apply the Glenday Sieve approach in two factories: producing socks in one and thermo-formed packaging in the other. The challenges to managers pioneering this somewhat counter-intuitive approach are reported.

WB301 Wednesday, 10:05-11:20 Track: Invited Chair: Philip Andrew Smart and Harry Maddern
Room: W2-301 Session: Service OM 1

WB301 Seeking Balance: Designing High-Quality Service Supply Chain
Henk Akkermans, Tilburg University, Netherlands
Paulo Gonçalvez, M.I.T., U.S.A.
Willem van Oppen, KPN BV

The service sector is notorious for its low quality and low customer satisfaction. Why is this? In this paper, the argument is made that this is due to the complex interaction between instability in service supply chains and the large installed base of customers that are affected by it. How can this be improved? In this paper, an approach that makes extensive use of system-dynamics based root cause analysis and management flight simulators is outlined. This approach is currently being applied and further developed in a variety of service supply chain settings at KPN, the leading mobile and fixed Telco in the Netherlands.

First, we specify a number of reasons why designing stable and robust supply chains is inherently different and more difficult for service supply chains than for manufacturing settings. These reasons have to do with disproportionate effect of error rates on capacity requirements in automated service processes, the susceptibility of the installed base to poor quality and the direct access that customers and their queries have to every part of the chain also make service supply chain design especially complex. All these destabilizing effects are aggregated by a dynamic phenomenon, known as the rework cycle: more work to be done in a process leads to higher workload, which leads to more errors, leading to more rework, leading to even higher workloads

Next, we introduce our field setting, KPN Telecom. KPN is the leading telco in the Netherlands, serving customers with wireline and wireless telephony-, internet- and TV services. In its markets in the Netherlands, Germany and Belgium, KPN is faced with a decline in its traditional voice and data services and as such is seeking new business opportunities through offering bundled services to consumers and firms. For the service supply chains that deliver these services, speed is of the essence (Given the fierce competition with cable) All of them are or will be crucial to KPN's survival in the coming years. ability to deliver to promise. Some of these service supply chains are relatively mature, and ramped-up to volume. Others are still very much ramping up, Some do not yet even exist.

Thirdly, we describe the approach that we have developed to enable high-quality design of service supply chains within KPN. Here we use a combination of brainstorming workshops, causal loop diagramming and system dynamics simulation to arrive at a superior design, and a sales & operations planning process to keep performance of that design stable through periods of great volatility. The paper provides examples of how this approach was used in mature, green-field and fast-growing supply chain settings.

WB301 Quality Perceptions and Practices in Logistics Services

Wolfgang Kersten, Jan Koch, Hamburg University of Technology, Germany

Logistics service providers have long been subject to strong cost-based competition. Today, prices have fallen to such low levels that further cost reductions are not a viable proposition to increase competitiveness. With the rising interest in supply-chain-wide quality management and seamless interorganizational processes, logistics service customers are beginning to see a high quality of logistics services as an essential requirement. Realizing this, logistics service providers are starting to pursue quality initiatives in order to raise logistics quality levels and gain a competitive advantage. Despite many claims to the contrary, one important element of quality management in manufacturing is still sorting out defects through final inspection. Because of a partial simultaneity of production and consumption of logistics services, service providers cannot use final inspection as a method to ensure quality towards their customers. Thus they need to "produce quality" as opposed to "inspecting quality". However, the use of advanced quality tools such as Failure Mode and Effects Analysis, Quality Function Deployment or Design of Experiments is still in its infancy in services.

This paper proposes a framework for the use of quality management tools by logistics service providers. For this purpose, we draw information from the literature covering the introduction of quality practices in other service industries such as banking and health care. Of course, quality criteria for logistics services are different, so another source of information is the body of research about logistics quality. This shows that logistics quality is mostly judged by the outcomes of service production (e.g. lead times and delivery accuracy), whereas in other services the process dimension (e.g. handling of complaints and employee attitude) is considered at least equally important. In this paper, a set of criteria from both outcome and process quality is used. In order to ensure the relevance of these criteria to logistics service customers and find out which quality tools are already in use, a short survey was conducted among purchasing managers in Northern Germany.

WB301 A Framework for Assessing the Impacts of Customer Contributions in Service Delivery

Marlene Amorim, Alejandro Lago, Philip Moscoso, University of Navarra, Spain

In this paper we develop a comprehensive framework to support the decisions regarding customer involvement in service delivery. It has been acknowledged that services always require some customer inputs and involvement throughout the production process. Some operations need to be done in customer presence, or at least they involve some form of interaction with service employees. Additionally, in some circumstances, customers can perform some of the operations themselves, by means of some self-service technology. Furthermore, recent technology developments, particularly in ICT, have amplified the ways in which customers can interact with service firms, enabling the diversification of service delivery channels, and expanding the scope for service operations to be transferred to the customer. Therefore in a service process, customer contributions are likely to be diversified, and driven by different reasons.

We argue that although this issue of customer involvement in service production has been widely acknowledged, we still lack a comprehensive approach to deal with the decisions about the optimal extent of customer participation on service operations. In the paper we address customer participation from an integrated process perspective, by elaborating on both inputs and outcomes, and reviewing the particular nature of service processes. A first contribution is to propose a pragmatic classification for the potential customer contributions, labelling them according to their nature and purpose in the process, and distinguishing the ones that are required by the own nature of the service from those others that firm can decide to invite the customer to provide. We then formulate the decision about customer participation as a choice among alternative service process designs, which differ in terms of their technical performance and the value they deliver to the customer.

We organize the paper in three parts. We start by identifying the characteristics of services that are relevant from an operations point of view and we focus on the consequences of the involvement of customer inputs, and other contributions, in service production and delivery processes. In the second part we characterize service delivery alternatives in what concerns their requirements for customer contributions and effort. Finally in the third part we identify the main decision variables that will be involved in the evaluation of the different customer participation alternatives.

WB302 Wednesday, 10:05-11:20 Track: Manufacturing Strategy Chair: Alan Friis
Room: W2-302 Session: Case research on manufacturing strategy 2

WB302 Manufacturing Strategy Implementation: Findings from Multiple Case Studies Analysis

Tritos Laosirihongthong, Thammasat University, Thailand
Lynn Lim, Roehampton University, United Kingdom
Pongsvas Svasti, Thammasat University, Thailand

This paper presents findings based on an extensive survey of the Thai automobile manufacturing industry. Then, three companies have been selected for detailed case studies analysis. Their experiences in the manufacturing strategy implementation process are also demonstrated. Although the companies represented diversity in terms of sales volume, product range, and geographic location, they shared several commonalties including use of new manufacturing technologies and other improvement activities such as material resources planning, just-in-time production system, and total quality management. Competitive strength was sustained through quality, process innovation and delivery speed. The process of manufacturing strategy formulation seems to be in line with corporate strategy, though the companies followed a traditional top down approach in formulation of manufacturing strategy under the umbrella of corporate strategy. Competitive priorities, order winners and enabling factors are identified for these companies after rigorous discussions with the middle to top managers. Finally, a framework for implementing of manufacturing strategy is also proposed based on the results of empirical study and experiences of these case studies.

WB302 An Integrated Framework for Servitized Operation Strategy

Essam M. Shehab, *Tim Baines, Howard Lightfoot, Ashutosh Tiwari, Mark Johnson, Joe Peppard, Cranfield University, United Kingdom

Servitization is the innovation of organisation's capabilities and processes to better create mutual value through a shift from selling product to selling Product-Service Systems. There is growing interest in the servitization of manufacturing firms as a research area and business model by academia, practitioners and government agencies in developed economies. Many western manufacturing companies are seeking to shift their focus towards a competitive strategy of servitization as product- and process-based competitive advantage is easily imitated by manufacturers in lower cost economies. Hence manufacturing organisations urgently need new and alternative operations frameworks and business models that are critical to the success of developing and delivering servitized-led manufacturers.

The main aim of this paper is to propose an integrated framework for the servitization of manufacturing organisations. This framework comprises a set of operational principles, structures and processes. Furthermore a comparison between the servitized organisations and those for traditional product manufacture is presented. The development of this framework has passed through four main phases. Firstly, a familiarisation phase has been conducted through extensive literature review to establish the key definitions of servitization and product-service systems (PSS). Secondly, the theoretical framework that categorises the principal characteristics for servitization of manufacturing firms has been developed. Thirdly, the framework has been populated with evidence and arguments offered in the wider literature. Finally, through a case study with a FTSE 500 manufacturing organization, the researchers have been able to bridge the gaps in the literature, and gain initial indications about the validity of the framework. The major contribution of the framework is to capture the key operations principles, structures and processes for competitive delivery of servitization in manufacturing firms. The framework differs from those previously reported in the PSS literature as it focuses on the value proposition to the customer rather than the physical features of the offering.

WB302 Theory Building: Relating Variation, Uncertainty, Buffering Mechanisms and Trade-Offs

Roy Stratton, Nottingham Trent University, United Kingdom

Major developments in operations management (OM) practice have largely been led by practitioners in the field, as in the case of TQM lean and TOC. However, the competitive environment encourages a superficial understanding of how these and other developments (such as agility, mass-customisation and postponement) relate to the wider body of knowledge. A major role, therefore, of the academic community is to derive underlying theory that cuts across these approaches at a more fundamental level. However, developing such theory proves elusive and the operations field is still perceived to be short on theory that is both useful and parsimonious (Handfield and Melnyk, 1998).

This paper reports on research aimed at clarifying underlying conceptual relationships regarding these OM developments, in an attempt to contribute to theory. This theory-building research is multiple-case study based, comprising six companies and nine delivery systems across the automotive, apparel and grocery sectors. The focus of all the cases is a transition in variation and uncertainty and the trade-off relationship with the choice of strategic buffers. The cross-case analyse has been used to identify propositions, hypotheses and three fundamental strategies. These three strategies are allied with distinct means of managing variation and uncertainty, comprising variation and uncertainty reduction, conflict separation and buffering through forward load, inventory or capacity.

The paper evaluates the above OM developments in relation to these underlying strategies in an attempt to clarify the underlying distinctions with a common reference. Practical means of developing the utility of these underlying strategies are explored.

Finally, the theoretical framework is compared to existing theory (e.g. Schmenner & Swink, 1998) with regard to both parsimony and utility.

WB302 Low-Volume/High-Mix Electronic Manufacturing Service Provision: Challenges for Implementation and Performance Measurement

Alan Friis, Technical University of Denmark, Denmark
Kristian Voldby Olsen, Fritz Hansen
Lasse Lindbjerg, Kromann Reumert
Lars Thielsen, Radio Frequency Systems
Zoran Perunovic, Technical University of Denmark, Denmark

The challenges for Electronic Manufacturing Service (EMS) companies concerning shifting focus from traditional High-Volume / Low-Mix (HVLM) production to take opportunity of the more lucrative business opportunities lying in Low-Volume / High-Mix (LVHM) production are rather scarcely described in the scientific literature.

The paper which is based on an empirical single case study addresses the central criteria for an EMS to perform well in LVHM production and the challenges in moving from HVLM into LVHM production. The main challenges are that the number of

product variations and combinations increases in all internal operations and that every operation must be performed in significantly short cycle times. A successful LVHM provider will be accustomed to frequent changes, an intense customer interface and a high number of rapid performance cycles (plan, build, ship). Theoretically the basis is online synchronisation provided by an ERP system which covers all processes in production and supply chain. The foundation is a central database which is continuously synchronised and a fine tuned new product introduction process allowing for speedy introduction and production of new products. The level of systems integration and speedy decision making are paramount and must be based on data synchronisation and integration. This should be supported by a dedicated management program and distributed responsibility amongst employees. The complexity of Low-Volume production must be considered to identify a proper set of key performance indices which supports continuous overview of the contribution margin from the production. The rationale is that the definition of LVHM has a theoretical and a practical side. In theory, LV is as few as one board but in reality the lower limit depends on the development of production plant and in turn on the skills of the staff.

WB303 Wednesday, 10:05-11:20 Track: Environmental Management Chair: Mihalis Giannakis
Room: W2-303 Session: Environment and suppliers

WB303 A Study of Environmental Purchasing Practices in Electronics Industries
Xue Shi, Anh Chi Phan, Ayman Bahjat Abdallah, Yoshiki Matsui, Yokohama National University, Japan
Increasingly stringent regulations and widely expressed public concern calls for integrating environmental management with on-going supply chain management efforts in a sustainable environment. This research aims to attempt to explore proactive approach towards incorporating environmental considerations into standard purchasing practices through lessons from electronics industries.

WB303 Environmental SCM: Extending Sustainable Practices to Suppliers
Cristina Gimenez, Universitat Ramon, Spain
Rudolf O. Large, Stuttgart University, Germany
Enric Segarra, Universitat Ramon Llull, Spain
Environmental performance is a concern for managers due to reasons ranging from regulatory and contractual compliance, to public perception and competitive advantage (Theyel, 2001). Green or Environmental SCM is a concept that is gaining popularity. Many realize that customers and other stakeholders do not always distinguish between a company and its suppliers. Stakeholders often hold the lead company in a particular supply chain responsible for the adverse environmental impacts of all organisations within its supply chain (Rao and Holt, 2005).

In the literature many of the existing studies focus either on the impact of supply collaborative practices on environmental performance (Florida, 1996; Handfield et al., 1997; Walton et al, 1998; Geffen and Rothenberg, 2000), either on the evaluative practices, such as supplier assessment and certification (Krut and Karasin, 1999). Among the few that consider both simultaneously, we have to point out Lamming and Hampson (1996) and Klassen and Vachon (2003).

Organizations have used a range of supplier relationship management styles to improve production processes or introduce new technologies into the supply chain (Dyer and Chu, 2003). A small but growing body of research has more recently explored the influence of a customer's relationship with its suppliers in regard to the extension of sustainability-based goals (Simpson et al, 2007). Simpson et al (2007) point out that the inclusion of environmental performance standards in supply requirements is marching ahead with only limited theory on the managerial implications of this type of inter-organisational action. "Many additional questions still remain surrounding the relationship factors that may support, influence or degrade any customer or supplier-driven program of supply greening" (Simpson et al, 2007). Klassen and Vachon (2003) also point out the need to examine in greater detail the implications of individual interorganizational supply chain activities.

The aim of this paper is to analyse how companies are extending their green practices to other supply chain members: Are firms using a controlling and/or a collaborative approach? What are the contextual factors that explain when one approach is more suitable than the other? What are the environmental results of each approach?

WB303 Sustainable Competitiveness in Multinational Supply Chains
Mihalis Giannakis, Warwick University, United Kingdom
The definition of sustainability is evolving. For many firms and organizations, sustainability refers primarily to environmental conscience. For other groups, sustainability primarily focuses on actions related to social responsibility. Many of the works on the concept of sustainability in the past have avoided much focus on the operational portion of sustainability and concentrated on the environment and social responsibility. In this paper, the focus is on how supply chains, and the firms that make up those supply chains, can be long lasting.

This paper examines the development of sustainable and socially responsible strategies in multinational companies and their suppliers. Its aim is to launch and facilitate buyer-supplier partnerships for sustainable competitiveness with the development and adoption of good practice models. The concept of sustainability in supply chain management is conceptualised as a process that links scientific development, political theory and policy making, and corporate and operations management models.

Two in depth case studies are currently conducted in two large manufacturing organisations in Europe that explore: the effect of sustainable supply chain management practices and mentoring initiatives on the participating suppliers; the development of strategies for establishing successful supply chain partnerships across different industry and supply chain contexts; how these firms and their supply chains can most likely achieve long lasting success even if their operating environment becomes hostile.

Preliminary findings indicate that there is significant underestimation first and foremost of the competitive advantage that sustainable supply chain management practices may yield. This is partly due to the lack of a political and governance framework that translates new technology into managerial and entrepreneurial action, but also due to the short-sightedness of management that is driven by short term accounting austerity

WB305 Wednesday, 10:05-11:20 Track: Cost Management Chair: Hirokazu Kono
Room: W2-305 Session: Cost management 2

WB305 Lean Accounting System Design for a Real Life Cellular Manufacturing Environment

Serdar Baysan, Mehmet Bulent Durmusoglu, Istanbul Technical University, Turkey

Lean manufacturing is maintained to be a popular manufacturing and management philosophy, which attracts attention from both academy and industry. Even though a vast amount of literature has been published in this field, the number of studies about the accounting practices supporting Lean Manufacturing is relatively small. Study aims to present principles, practices and tools of lean accounting through a real life cellular manufacturing (CM) case study. Lean Accounting principles, practices and tools are presented through four tenets of accounting which are materiality, conservatism, consistency and matching. In addition, effects of accounting practice on decisions are discussed.

Presented system is illustrated through cell manufacturing system in an energy distribution system manufacturer. The previous state of the firm is described and motivation of conversion from functional to CM system is discussed. Value Stream Mapping (VSM) and layout configuration studies are given to provide complete understanding of the conversion process. Mainly focusing on the pilot cell for Cable Tray Value stream, Current State VSM, Future State VDM and related analysis are given. After the physical layout is changed and necessary resource assignments are completed, The Value Stream Performance Measures are set and values are calculated. In order to provide necessary product cost information, Features and Characteristics Costing (FCC) method of Lean Accounting is applied. The average product family cost is calculated. Then available capacity is analyzed and the primary bottleneck is identified. How product features and characteristics affect the use of bottleneck is analyzed and the conversion cost is calculated.

In conclusion, this study presents a real life application of Lean Accounting in CM. Principles, practices and tools of lean accounting are first explained than illustrated through the case study. The case study provides a complete overview of lean manufacturing implementation process along with Lean Accounting application. As a future research, different product costing methods will also be applied to the same system to exemplify the degree of distortion of product cost information. Also, a simulation based decision support system will be designed to facilitate make/buy and pricing decisions.

WB305 Cost-Time Analysis for 3-D Microstructure Fabrication Using Multi-Film Thickness Mask and Current Techniques

Nithi Atthi, National Electronics and Computer Technology Center, Thailand
Chuckaphun Aramphongphun, Patcharaporn Yanpirat, Peerayuth Charnsetthikul, Kasetsart University, Thailand
Jirawat Jantawong, Wutthinan Jeamsaksiri, Charndet Hruanun, Amporn Poyai, National Electronics and Computer Technology Center, Thailand

This paper presents a 3D microstructure forming technique by developing a new photomask making process. This new mask is called Multi-Film Thickness mask (MFT mask). The paper also includes some experimental results of other two 3D microstructure forming techniques: (i) Multi-Exposure dose lithography (ME) using Binary Intensity Mask (BIM) and (ii) Gray Scale Lithography mask (GSL mask). In addition, this paper studies the cost and time analysis of MEMS fabrication with vertical sidewalls from 1 to 5 lithography steps by going through a cycle of the lithography step and the etching step using six different photolithography techniques. These techniques, which depend on types of light exposure tools and photomasks used, include: (1) BIM-Single Layer Reticle (BIM-SLR), (2) BIM-Multi Layer Reticle (BIM-MLR), (3) ME-BIM-MLR, (4) GSL mask, (5) Multi-Film Thickness mask (MFT mask), and (6) Vary Dose MFT mask (VD-MFT mask).

Based on the most advanced lithography tool, Extreme Ultraviolet Lithography (EUVL), a cost model - in which the cost driver for Cost of Ownership ($ per wafer) is comprised of mask blank cost, mask patterning cost, bare silicon wafer cost and wafer patterning cost - was developed. The process cost can be divided into three categories, which are direct materials cost, direct labor cost and overhead cost. In the overhead cost, it consists of machine cost, maintenance cost, and depreciation time. Moreover, the calculation had to include production throughput, machine yield, machine utilization and number of wafers fabricated per mask. It was found that the VD-MFT mask offers the lowest cost and shortest fabrication time for the multiple lithography steps while the GSL mask is not suitable for one lithography step due to the highest cost as shown in Tables 1 and 2. The MFT mask is then proved to be economical for the lithography process of 3D microstructure forming, which is typically applicable to the making of Micro Electro Mechanical Systems (MEMS). A limitation of the MFT mask is that only 3D microstructures with vertical sidewall profiles can be made.

WB305 Optimizing Permanent and Temporary Workforce under a Budget Constraint

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Jully Jeunet, Universite Paris Dauphine, France
Gergely Mincsovics, Eindhoven University of Technology, Netherlands

Permanent labor force implies a fixed production capacity that can be extended by hiring temporary workers in response to demand fluctuations. Related research considers the problem of deciding how many regular workers and contingent workers to hire so as to minimize the personnel costs while meeting a varying demand. In many companies, fixed yearly budgets are allocated to the heads of production units to cover their labor expenses during the year. We therefore address the problem of determining a mix of permanent and contingent workers so as to minimize the labor costs and the costs of capacity shortages under a budget constraint. Capacity shortages occur when demand exceeds the available capacity of production which is limited by the number of temporary workers the company can afford. We will consider both a linear and a non-linear “penalty” function associated to shortages. The objective is to minimize the shortage function subject to the budget constraint. Under the assumption of lost sales in which periodic capacities of production are therefore independent of one another, we show there exists an optimal solution to the problem when the shortage function is linear. We will also consider a non-linear capacity shortage function and show the managerial insights derived from our results.

WB305 Profit and Safety Analysis of Multiple Product Alternatives

Tadahiro Mizumachi, Seikei University, Japan
Hirokazu Kono, Keio University, Japan

The problem to be investigated in this paper is related to profit and safety analysis of product alternatives, whose market conditions, as well as manufacturing cost structure, differ product to product. Market condition is given by unit sales price, sales price, sales

volume, and product life, whereas cost structure is represented by unit variable cost and annual fixed cost. The problem to be solved is to clarify which product is most profitable and safe against unexpected change in both market conditions and cost structure.

As an example, one type of product will boom up soon after launch, though the life is expected to be short. Another type of product is stable in demand, whose life is longer. The former type is variable cost dependent, while the latter is fixed cost dependent. Those factors as unit sales price, demand, unit variable cost, fixed cost, as well as market life are somehow uncertain. Which type of product is worth dedicating manufacturing and sales resources? In solving such a problem, profit plus safety analysis plays an important role.

The paper first presents a model of analysis, then proposes a two-axis domain, which can visually represent profit and safety against change toward worse in each factor under consideration. As a result of mathematical analysis on the proposed domain, a systematic procedure for quantitatively evaluating safety of each alternative is clarified. Thus, the procedure to select the best product alternative from the viewpoints of profitability and safety is proposed at the end.

WB401 Wednesday, 10:05-11:20 Track: Information Systems and e-Operations Chair: Amiya K. Chakravarty
Room: W2-401 Session: e-commerce 2

WB401 How Retailers' Reputation will Change if They cannot Set the Price in the Internet Market: The Regression Analysis about the Relationship between Real Estate Agencies' Reputation and the Appeal of Advertisements in the Real Estate Market

Hisashi Yamada, Niigata University of International and Information Studies, Japan

Several researchers argued whether the internet market will be close to the perfect competition so far. They found that the price dispersion is large in the internet as well as the traditional market (Scholten & Smith, 2002; Brynjolfsson & Smith, 2000). The reason why the large price dispersion is observed seems that retailers' reputation is also dispersed in the internet market (Smith et al., 2000). Hence, retailers' reputation seems to affect marketing variables such as price in the internet market, too.

In the internet markets analyzed by the researchers, however, retailers can set the price. On the other hand, the relationship between the reputation and the marketing tools was not analyzed about the internet market, in which retailers cannot set the price. Therefore, the purpose of this research is to argue the significance of retailers' reputation in the internet market, in which retailers cannot set the price, by clarifying the relationship. To do so, we will observe the real estate market, in which the agencies cannot set the price, and discuss the relationship between their reputation and the appeal of their advertisements. Moreover, the appeal and the relationship will be compared between the traditional and the internet market.

We obtained three findings: 1. The real estate agencies whose ages are short and numbers of advertisements are large tend to be low in terms of appeal of advertisements. 2. The real estates which are advertised not only in the internet but also in the magazine are higher in terms of appeal of advertisements than those which are advertised only in the internet. 3. The real estates which are advertised not only in the internet but also in the magazine are higher in terms of the effect of real estates' reputation to appeal of advertisements than those which are advertised only in the internet.

Judging from these results, we can conclude that the significance of the retailers' reputation to marketing tools can be shrinking in the internet market, in which retailers cannot set the price.

WB401 A Framework for the Design and Control of Multi-Channel Services

Rui Sousa, Catholic University of Portugal, Portugal

In recent years, the emergence of new technologies has led to a strong growth of services provided through multiple channels. Multi-channel services combine the emerging new channels of service delivery, such as the Internet, interactive TV and mobile devices, with traditional channels, such as the phone or physical facilities. For example, most banking services today are offered through a range of channels such as physical branches, the internet, phone, ATMs, mobile phones, etc.

Frequently, the channel structure of such services tends to evolve over time in a disorganized fashion, driven internally by the ad hoc profusion of individual channels. There is still little research addressing the effective design and control of multi-channel service delivery systems that could provide guidance for these processes.

We argue that a multi-channel setting introduces a set of complexities that call for the development of new theoretical frameworks that explicitly recognize the multi-channel nature of these services. A key issue that existing (single-channel) frameworks do not address is the need for a tight integration between the design and control of the several channels of service delivery.

This paper presents a conceptual framework for supporting the understanding of multi-channel service delivery systems. Specifically, the framework attempts to achieve the following objectives: i) understanding what is truly new in multi-channel service environments and that departs from traditional single-channel services; ii) identifying the elements that should make up a design specification for multi-channel service delivery systems (i.e., elements, including a blueprint, that allow for the design of a pilot service); iii) providing insights as to how these specifications might differ across different channels (e.g., the elements of a specification for a service component delivered through the internet might be different from those for a service component delivered by phone). The implications of the framework for the design and control of multi-channel services are discussed.

WB401 Dissemination Motive and the Effect of Electronic Word-of-Mouth: Internet Book Reviews

Yun Kuei Huang, Shin-Yin Hsieh, Takming University of Science and Technology, Taiwan

In recent years, discussions on electronic word-of-mouth (eWOM) have drawn more attention, and more and more enterprises utilize eWOM communication to achieve their marketing and sales objectives (Tsang and Zhou 2005). In addition, consumers can obtain information about products or services from close friends, colleagues, or even strangers through this kind of communication. At the same time, they can also share with others their own consumption experiences, opinions and relevant knowledge through Webpage (Ratchford, Talukdar and Lee 2001).

In the numerous eWOM communication examples, Internet book review is one of the most widely knows. About some famous Internet bookstores, the Amazon (www.amazon.com) or the books.com.tw (www.books.com.tw) also have provided the Internet book reviews to serve the reader and promote books. The related research also pointed out that the Internet book reviews will have the remarkable influence to consumer purchase intention and the book sale volume (Lin, Huang and Yang 2007; Chevalier and Mayzlin 2006). However, reviewing the past literature, related Internet book review research is still not complete. The newest finding

is the motives for and consequences of reading Internet book reviews (Huang and Yang 2008). Dissemination motive and the effect of Internet book reviews for consumers is still lacking until now. Therefore, this study plans to apply focus group interview and online depth interview to explore and develop a clearer concept. Later to propose a thesis according to interview results and then to find out relevant variables, define these variables clearly, and develop hypothesis and reliable measure for verification. Then use the quantification method to forecast influence of these motives on dissemination behavior. This study hopes that these discussions may provide some references for Internet bookstores in book review management and establishment of marketing strategies.

WB401 Supplier Aggregation in an Online Marketplace

Amiya K. Chakravarty, Northeastern University, U.S.A.
Geoffrey Parker, Tulane University, U.S.A.

With the rise of the world wide web in the mid and late 1990s, over a thousand firms entered the market to provide business to business exchange services. Although most of the entrants exited, many remain and have built significant transaction volumes. The major business concepts to be implemented are aggregators and integrators. The business proposition of aggregators is to add value and liquidity by grouping a large number of suppliers (and buyers). Integrators, on the other hand, emphasize transaction efficiency by integrating business processes across all suppliers (and buyers). Typical decision variables in aggregator and integrator marketplaces include what should be charged for services, and how much to invest in context services that enhance its attractiveness.

In this paper we focus on a public market that matches buyers and suppliers in order to study the subscription (or transaction) fee and the context-service investment that determine the viability of the marketplace. Although others have studied the basic business-to-business exchange investment problem, this paper is novel because it characterizes optimal exchange investments in the context of heterogeneous complementary externalities between sellers who come to an exchange. When suppliers are heterogeneous, it can be optimal for the exchange operator to set fees such that not all suppliers are willing to join. We present models for the optimal fee structure, and the optimal number of vendors on the e-market platform. Using a database of transactions in a marketplace for information goods, we compare the actual fee structure the company is using with the optimal.

WB402 Wednesday, 10:05-11:20 Track: Supply Chain Management Chair: Raj Selladurai
Room: W2-402 Session: SCM framework

WB402 Core Supply Chain Management Business Processes - A Literature-Based Framework Proposition

Rodrigo Cambiaghi Azevedo, Sophie D'Amours, Universite Laval, Canada
Mikael Ronnqvist, Norwegian School of Economics and Business Administration, Norway

The proposed article aims at contributing on how the supply chain management (SCM) concept can be structured within and across organizations. SCM has been characterized as one of the most significant paradigm changes in business management over the last decades. Authors such as Stadtler & Kilger (2005) define SCM as a management philosophy where the coordination and optimization of material, information and financial flows happens not within a business unit, but among the involved parts of a value network. At the center of SCM philosophy lays the concept of business process which is responsible to link the elements of a supply chain towards value proposition in terms of products and services to ultimate customers. This fact explains why academia and practitioners intensively debate the most suitable collection of processes when implementing SCM. Nowadays, two frameworks are most recognized for defining the core SCM processes: SCOR (Supply Chain Operations Reference) and GSCF (Global Supply Chain Forum). While SCOR recognizes five processes (plan, source, make, delivery and return), GSCF identifies eight core processes for SCM philosophy (customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, supplier relationship management, product development and commercialization, and returns management). Common elements between both frameworks rest on the methodology used during their developments; both models were developed based on group consensus using SCM practitioners which intended to guarantee face validity to the models. However, in addition to the frameworks, the literature concerning SCM processes has also intensively evolved in recent years. Considering publications in five major SCM journals between 1996 and 2007, 52 different business process definitions were identified. Therefore, the objective of this article is twofold: firstly, we apply a content analysis over 184 articles in order to measure the adherence of the processes identified in the literature around key elements of a core SCM process. Such analysis will allow us to propose a core SCM business process framework which, in compliment to the face validity justified for the SCOR and GSCF frameworks, pursues scientific enlightenment for framework construction.

WB402 A Mean of Supply Chain

Seiji Kurosu, Waseda University, Japan

What is putting supply chain together? And why do you put supply chain together? In this paper, they are stated. The first purposes of putting supply chain are (1) securing of goods, and (2) decreasing of the amount of stock. It is good that the exchange of the demand information and the stock information is done. In other words, it is to do the cooperation of the information exchange. This is that “A chain is put together.” of the initial stage. There are various forms in supply chain. Kanban system is a supply chain of pull type. On the other hand, there is a supply chain of push type, too. And, there is VMI (vendor management inventory) of form which have both good points for. When supply chain proceeds, the cooperation relations related to the human element, the cooperation of the transport work can be thought to come to be done, too.

WB402 Network Marketing Strategy and Supply Chain Management for Effective Operations Management

Raj Selladurai, Indiana University, U.S.A.

This paper would focus on the use of network marketing strategy by an organization as a distribution tool in its supply chain management activities leading toward effective operations management. The paper would look at the traditional corporate business paradigm and the “new” network marketing paradigm, and analyze some implications of both strategies in operations management. The network marketing paradigm has been greatly enhanced by the growth and popularity of the internet, which provides a powerful impetus to the whole concept of effective supply chain management. The study will also discuss a few specific manufacturing companies and other types of organizations that are implementing the network marketing strategy model in some form; and it would analyze the supply chain management activities used by these organizations to achieve unprecedented success in their respective

industries. Then, this study will attempt to develop an effective supply chain management model that uses network marketing as a key strategy in its operations management.

WB403 Wednesday, 10:05-11:20 Track: m-Supply Chain Management Chair: De-bi Cao
Room: W2-403 Session: Modeling: Sharing risk and return in SCM 2

WB403 An Option Optimization Model for Apparel Supply Contract
Yuki Kumakiri, De-bi Cao, Keio University, Japan

With the quick and radical changes in fashion today, it is becoming difficult to match demand with a proper supply in the apparel industry. A supply contract optimization model is analyzed based on an existing option model, in which the model argues that it performs better compared to newsvendor in all condition. However, we found that in some conditions, the newsvendor model performs better than the option model, and this provide us with an indication that when we introduce new business model, all the possible condition should be considered rather than considering average performance only.

In this research, we compared the newsvendor model with our model generating one by one demand distribution along with the possible parameter settings, and then examined the period of parameters that the option model can provide better performance. Furthermore, we found that the inferior performance is caused by the expense of purchasing options. Finally, we learned the important factors that play a major role in decision-making with the option model for fashion products.

WB403 Research towards Risk Sharing in Supply Chain Management
Yongfeng Pan, Lindu Zhao, Southeast University, China

To use the characteristics and status quo of the supply chain as the starting point, the article analyzes the uncertain factors, the risk types and their sources in the supply chain management. It discusses both a way to reduce and prevent the risks of supply chain and the principle of risk-sharing. In combination with the basic principles of risk sharing, we establish a model which is based on single manufacturer, a retailer's multi-period model of risk-sharing, and a model of the distributors' interests, so that the risk sharing becomes more effective and rational.

WB403 The Agency Cost in Early Supplier Involvement and its Effect on Development Lead Time
Sarah J. Wu, Worawat Margsiri, Fordham University, U.S.A.

While early supplier involvement (ESI) has been adopted in many industries as an important way to facilitate product innovation, its impact on new product development performance is mixed. This study makes the first attempt to model the dynamic interaction between the purchasing firm and the supplier in ESI using agency theory. We clearly differentiate the agency cost on different stages of collaboration and model the impact of the agency cost on the development stage on development lead time. We demonstrate the inefficiency created by using the outsiders for product innovation and propose cost sharing as an effective way to alleviate the agency problem. The findings improve our understanding of the inter-firm collaboration for new product development by arguing that the success or failure of ESI depends on the magnitude of synergistic benefit from the resource perspective and the magnitude of cost associated with using suppliers without having the perfect alignment of interest. More importantly, the findings help bring the attention of the management team of the purchasing firm to the key supplier involvement decisions – whether to involve suppliers; who to work with; and to what extent suppliers should be involved – from the agency theory perspective. All of these factors form a crucial force in explaining the successful implementation of ESI.

WB405 Wednesday, 10:05-11:20 Track: m-Scheduling Chair: Joanna Krawczyk
Room: W2-405 Session: Modeling: New scheduling model 2

WB405 Developing an Implementation Strategy for Workload Control: An Action Research Project
Mark Stevenson, Yuan Huang, Linda C. Hendry, Lancaster University, United Kingdom

Workload Control (WLC) is a method of Manufacturing Planning and Control (MPC) which, when commenced at the customer enquiry stage, has particular relevance to producers of highly customised products. Research to date has concluded that WLC has the potential to significantly improve the operating performance of the Make-To-Order sector; however, few successful case studies have been reported. To facilitate more widespread use, Hendry et al. (2007) investigated WLC implementation issues through comparative case study analysis. The study identified 17 implementation issues under 5 headings: market-related, primary manufacturing process, WLC system requirements, information flow and organisational embedding. The paper provides a starting point for a detailed WLC implementation strategy but concludes that the implementation requirements of WLC should be explored in additional case study settings.

This paper describes an ongoing case study implementation of WLC in a small precision engineering company which seeks to apply and extend the implementation ideas described in Hendry et al. (2007). The study has two core objectives: firstly, to assess whether implementation strategies for embedding WLC can be applied to this case; secondly, to explore the impact of WLC on performance. This paper focuses on the first objective. Three issues have emerged as being of particular significance: (1) diagnosing the MPC needs of the organisation, based on market-related and manufacturing process/product characteristics; (2) developing knowledge of, and support for, WLC within the organization; and (3) aligning current business processes and information flows with the WLC system.

The research involves greater participation than is evident in previous attempts to implement WLC and hence is labelled: "action research". Progress to date has confirmed the relevance of many of the issues identified in Hendry et al. (2007) to an additional case study setting; the paper contributes to developing a deeper understanding of the implementation issues, towards a more detailed implementation strategy for successfully embedding WLC within an organisation and includes broader issues relevant to the implementation of other MPC concepts. Future research will pursue the second objective: to explore the impact of WLC on performance.

WB405 A Fundamental Study on the Efficiency of Production Scheduling in Mixed Products Production
Osamu Ichikizaki, Hiroyoshi Fujioka, Tomoaki Yamazaki, Takashi Kanazawa, Keio University, Japan

Recently, a situation of manufacturing industry is changing; kinds of products are increasing for varieties of customer's needs and to supply products in the timing when their customer demands is strongly requested. To adjust to the situation, many industries in Japan try to decrease unnecessary inventories by improvement activities such as SCM and make a lot of paper works more efficient and share information from acceptance of order, production to shipping by installing IT such as ERP. Improvement activities of supply chain and production processes are performed, but the number of Japanese manufacturing companies that obtain good performance is not large.

A production scheduling is one of the most important operations. In the past days when the kinds of production is small and quantity of demand is less changing, the schedule should be planned about every a month and is not changed frequently. But recently, kinds of products are increasing, demand quantity and delivery date is changed abundantly and the load of scheduling operations is increasing.

There are many studies to find the optimum quantity by using mathematical models. But in real situations, the conditions that are bases of these study's models is often changing and, in many cases, it is rather important to get a comfortable solution by using easy-to-use way than to get the best solution by using precise method. For these reasons, the knowledge from these studies is not adopted enough.

In this study, a manufacturing company that is installed IT is selected and a production sucheduling oparation in this company is researched and analyzed. The causes that many revisions of schedule that burden the operator are occuring flequently are summarized. And the objective of this study is to present the fundermental knowredge about promotion of efficiency and improvement of production scheduling operations that is matched the actual situation.

WB405 A Manufacturing Operation Classification System to Support the Organisational Design of Production Planning

Jane E. Guinery, University of Nottingham, United Kingdom

Many manufacturing businesses face difficulties in the implementation of effective production planning and control (PP&C) processes. The performance of PP&C is important to businesses, particularly in the existing business environment where reliable and responsive delivery performance can provide significant competitive advantage. Whilst emphasis has often been placed on the selection and implementation of 'suitable' PP&C systems many applications have been unsuccessful. Empirical studies indicate that PP&C needs to be viewed more holistically in relation to all constituent elements; people, formal and informal processes, and organisational structure, as well as PP&C systems.

This paper describes how a classification schema has been developed to determine appropriate options for the organisation and management of PP&C (in relation to process, systems and people) based on the attributes of manufacturing operations. The schema has been developed by combining existing theory with empirical findings from industrial case studies. The theory is drawn from the fields of operations management, production system design and organisational design. In empirical studies, attributes of production operations and associated PP&C practice have been identified to establish the coordination requirements of the operation applying coordination theory (Malone and Crowston, 1994), and then the associated forms of PP&C organisation that support it. Significant attributes used to classify the operation include: the configuration of production resources, operations and planning policies, performance metrics and demand characteristics.

The classification schema will be valuable both in generating recommendations for individual businesses and in identifying production operations with similar PP&C requirements to support cross sector transfer of best practice.

WB405 A Case Study into the Implementation of a Manual Production Planning and Control System in a Complex Manufacturing Environment

Joanna Krawczyk, David J. Evans, Cranfield University, United Kingdom

While the importance and methods of the control of manufacturing cells is well discussed within the academic literature, there has been little in the way of research that examines the implementation and associated benefits and issues of particularly manual control systems within a case organization. Much of the extant literature on control systems focuses on the design of the tool as opposed to the people issues inherent within their implementation. Conversely, academics and practitioners dealing with people issues focus on the values and ideologies of organisational behaviours, whereas organisational change management usually concentrates on technical issues. The control system co-design and implementation with users is paramount to successful implementation. Therefore the managers need to be prepared to deal with the details of change.

This research adopted an action-research methodology to implement working control mechanism within a manufacturing cell in a UK aerospace company. These control methods were then standardised and as a best practice developed further for further deployment across other cells within the company's plant.

The findings of the research indicate that implementing control systems in individual cells is non-optimal due to the material inputs and outputs, processes being shared and understanding of supplier vs. customer relationships at different levels. Further sub-optimisation occurs due to shared information flows and the interdependent, relational nature of modern manufacturing.

The results of the research also suggest that the unit of analysis needs to be broader regardless of the element of the Supply Chain in which the control system is implemented. People issues are often ignored and the focus moves away from the design of the system towards its implementation. Furthermore, the objectives of the individual and organisational unit need to be aligned at the start of the implementation process. Misalignment can result in poor functional performance and non-adherence with the new control system. These issues increase the risk of having poor project progress and, eventually, overall poor leadership of the change required to implement the system. These issues could be resolved by involvement of system/process users and stakeholders from the outset.

WB501 Wednesday, 10:05-11:20 Track: Spanish Chair: Jose A. D. Machuca
Room: W2-501 Session: S-SCM 1

WB501 Supply Chain Organization as a Source of Competitive Advantages: A multisectorial Study in Spain

Jesus Garcia-Arca, Ana M. Mejias-Sacaluga, Jose Carlos Prado-Prado, University of Vigo, Spain

Integration and coordination along the supply chain (both internally and externally) is a topic of interest and importance among logistics managers and researchers because it has been considered a source of competitive advantage. The objective of this paper is to establish a management model that allows the evaluation of whether the relationships adopted by the companies are adequate

(internally as well as externally with other collectives of the supply chain), with the object to identify opportunities of improvement that contribute to achieving competitive advantages. The study will be complemented and justified on the basis of recent scientific literature's contribution, including a strategic approach of the sector that enables the description and comprehension of the specific key aspects of the supply chain management.

To validate and illustrate the model, its application will be presented in 36 Spanish companies located on Galicia (Northwest Spain) that belong to four sectors: food (7 frozen products companies and 5 canned fish companies), fashion (9 companies), kitchen furniture (9 companies) and granite (5 companies). Likewise, to place the strategic conditions of each sector, the international leading companies of each sector will also be analysed (4 companies in the food sector, 3 companies in the fashion sector, 1 company of kitchen furniture and 1 company in the stone sector). The basic technique for collecting data was a personal interview in companies, aided by a structured questionnaire (with open and closed questions). The study developed by the authors differs from others studies in three aspects: - The different treatment of each sector in its strategic context (which allows the measurement of the differences between sectors); - The comparative analysis within each sector between the majority of the companies and the leading companies; - The level of detail used in the description of the internal and external relationships. These three aspects adopted in the investigation represent a novel approach of utility, both in the scientific and the business area.

WB501 A Tool for Researching and Teaching on the Bullwhip Effect through Web-Based Simulation

Jose A. D. Machuca, Rafael Pozo-Baraja, University of Sevilla, Spain

One of our GIDEAO Research Group's aims is to create simulators that help the complexity of the business system and of supply chains to be understood. In this way, we hope to improve teaching and decision-making by both students and company managers. Following this line of research, a few years ago we created a web-version of the Beer Game ((Machuca y Del Pozo, 1997)) which we subsequently used in both teaching and research (Machuca and Del Pozo, 2004). One of the outcomes of the way this application has evolved and the twinned research has been the creation of a new computer application programmed in C++ which allows the behaviour of a number of supply chains which might or might not interract with each other to be emulated. This web-based Simulator (for teaching and research) allows the way actions designed to eliminate or mitigate some of the causes of the bullwhip effect, such as, information-sharing and lead time reductions (Sterman, 1989; Lee et al. 1997), impact on it to be studied. The simulator also allows: a) the part of the bullwhip effect that can be attributed to a specific cause to be identified, and b) the effect of a specific action aimed at its reduction to be measured. This is important because this filtering is practically impossible in the real world. This allows controlled experiments to be carried out in which the values of the variable(s) are manipulated. A laboratory environment of this kind provides a methodology for supply chain research that otherwise might not be addressed. This is important as it is very difficult for most managers to think "beyond their own factory gate" (Holweg and Bichero, 2002) and they are frequently reticent to undertake actions that might be expensive and/or entail major changes in the way the company works. Supply chain simulators of the kind proposed can help persuade companies that the best state-of-affairs for their own business can only be determined by considering the supply chain as a whole.

WB501 A Roadmap for Future Research on the Specification of Business Services in Supply Chain Management: The Quest for Synergy between Software Engineering and Service Operations Management Fields

Joaquin Pena-Siles, Jose A. D. Machuca, Maria del Mar Gonzalez-Zamora, University of Sevilla, Spain

Great efforts have been made in Supply Chain (SC) research to analyze how goods are managed and delivered, but a great deal less has been directed at research into services (see Machuca et al., 2007). The service transaction between supplier and customer takes place during the service encounter, one of the SOM areas that most requires research (Chase (1996) and Johnston (1999 and 2005), especially into SC, where the management and delivery of service are between companies (Business Services-BS-Wynstra et al., 2006). In this process it is essential that the service which the transaction is for is clearly specified but this is not an easy task, above all in services. The specification of services is, in fact, considered one of the riskiest tasks (Smeltzer and Ogden, 2002).

In the Software Engineering field (SE) there is a good deal of research effort focused on specifying the functionality that software displays from a business point-of-view that could be reused in the BS field. With this in mind, we survey the main subfields in SE that could help to develop specifications that cover the properties that, according to our criteria, BS specifications must have. These include being as unambiguous as possible and being adaptable to the needs of each BS consumer. In addition, a BS specification must provide information about: 1) the process to be followed by each party when using a BS; 2) the legal, ethical and financial terms of the transaction; 3) the goals of the parties; 4) the quality of service agreement.

The subfields mentioned are: Business Process Engineering (BPE), Service-Oriented Computing (SOC) and Agent-Oriented-Software Engineering (AOSE). In this paper, we will provide a conceptual framework that integrates ideas on approaches coming from the SE field aimed at synergy with Business Services SOM's subfield.

WB503 Wednesday, 10:05-11:20 Track: m-Quality Management and Six Sigma Chair: Wen-Pai Wang
Room: W2-503 Session: Modeling: New approaches to QM and maintenance 2

WB503 Understanding Customer-Defined Quality through Quantitative Analysis of Kano's Model

Ting Wang, Ping Ji, Hong Kong Polytechnic University, Hong Kong

Quality in products and services has become a primary concern for companies who compete in the global market. Generally companies agree that the most critical criterion for achieving quality is meeting customer requirements. Thus, the issue of translating customer requirements into customer satisfaction in product design has aroused the interest of both researchers and practitioners. Kano's model is a useful tool to understand customer needs and their impact on customer satisfaction. It categorizes customer requirements into different groups and depicts three main types of relationships between customer requirements and customer satisfaction, namely must-be, one-dimensional and attractive. The main contribution of Kano's model is that it recognizes the diverse relationships, especially the nonlinear relationships between customer requirements and customer satisfaction. However, Kano's original model focuses only on the classification method and the qualitative descriptions of various relationship curves. There is a lack of quantitative analysis of the relationships between customer requirements and customer satisfaction in the model. Therefore in this paper, a novel approach is proposed to quantify Kano's model by identifying the customer satisfaction relationship functions for three main categories of customer requirements. The proposed approach improves the original model by understanding customer-defined quality in a more accurate manner

WB503 Ranking of Customer Requirements in Quality Function Deployment by a Fuzzy Method

Esmaeil Mehdizadeh, Islamic Azad University, Qazvin Branch, Iran
Farshid Rajabi, Mohammad Reza Masoomi, Islamic Azad University, Abhar Branch, Iran

Quality function deployment (QFD) has been widely used to translate customer requirements to a product's technical attributes. A typical QFD system consists of four phases: Phase 1 translates customer needs into technical measures (also called product design specifications); Phase 2 translates important technical measures into parts characteristics; Phase 3 translates important parts characteristics into process operations; and Phase 4 translates key process operations into day-today production requirements. Phase 1, also called house of quality (HOQ), is of fundamental importance in QFD. To facilitate applications, the HOQ process divided into nine steps: Step 1 customer needs (WHATs); Step 2 relative importance ratings; Step 3 competitive analysis; Step 4 final importance ratings; Step 5 technical measures (HOWs); Step 6 relationship between WHATs and HOWs; Step 7 technical ratings; Step 8 technical comparison and Step 9 final technical ratings.

In this paper, we focus on the first four steps of HOQ, which are essentially the customer inputs in QFD. Correctly rating the importance of every customer requirement is essential to the QFD process because it will largely affect the final target value of a product's technical attributes. Based on these ratings, a company can purposefully design and develop a product to achieve higher customer satisfaction and thus more competitive advantages. Various methods have been developed to rate and rank customer needs, however a few methods considered the competitive environment. In real applications, fuzzy mathematics is usually more appropriate than crisp models to capture the true customer requirements.

The aim of this study is to present a new approach based on fuzzy environment to ranking customer requirements with competition consideration. First we give an applicable qualitative description and the corresponding quantitative presentation of the first four steps in HOQ; then the fuzzy method is used to convert the customers' linguistic assessments to fuzzy numbers, and the proposed method is applied to the final importance ratings of the customer needs. An example for showing the performance of the proposed method is presented.

WB503 Identifying Downs Syndrome Fetuses Using Taguchi's Approach: Selecting the Most Appropriate Detection Method

Shuki Dror, Rachel Ravid, Emil Bashkansky, ORT Braude College, Israel

Today, responsible healthcare management is always customer focused. To be successful, this orientation requires cooperation between the medical system and the patient. Such cooperation is part of the overall customer-organization relationship. Health care quality management is different from other areas where quality management is part of the business equation. In modern health care, when weighing up alternative treatments, the patient's point of view also constitutes a factor in the decision making process. This situation means that the patient must be provided with an explicit explanation regarding the risk analysis of his or her condition and the existing options for improving, ameliorating, stabilizing or remedying it.

In this research, we analyzed, in collaboration with the Israeli Gynecological Association, the problem of risk analysis in testing pregnant women at risk of carrying a Downs Syndrome fetus. In most cases, the main criterion in the decision about which detection method to be used is the patient's medical condition. The authors recently developed measures for evaluating the effectiveness of a sorting station. It takes into account the availability of prior information about incoming probabilities, sorting errors rates, and losses due to faulty decisions. In the case of Downs Syndrome fetus detection, the loss incurred when aborting a healthy fetus and the loss related to delivery of a Downs Syndrome baby are influenced by factors related to the family's/mother's social situation, i.e. economic level, the number of children, religious and cultural values. In this research we extend our initial model to the example of Downs Syndrome cases. The analytical hierarchy process (AHP) method is used for scaling the subjective scores of the above mentioned losses. A case study demonstrates an application of the model developed.

WB503 Safety Design for Artificial Marble Products

Wen-Pai Wang, National Chin-Yi University of Technology, Taiwan
Chung-Shang Chang, Chienkuo Technology University, Taiwan
Yu-Jen Chang, Tunghai University, Taiwan

The artificial marble products are rife with the life of mankind. This paper is designed to solve the cracked problems of the artificial marble products abruptly. The Taguchi method, a robust experimental design, is applied to regulate and determine stuff ratios of the artificial marble for enhancing the product safety. An L18 (21×37) orthogonal array is employed to evaluate the effects of parameters in the specified anti-shattered experiment. From the signal-to-noise (S/N) ratio and the analysis of the test results, the effective parameters to assure the hardness and brittleness of properties of artificial marble products are obtained. The most significant factors contain resin ratio, time of roast and temperature of roast, respectively. The proposed methodology confirms stability of optimal combination, and a 40.9% improvement rate accomplished the significant amelioration.

WC202 Wednesday, 13:40-14:55 Track: Quality Management and Six Sigma Chair: Ben Clegg
Room: W2-202 Session: Empirical research on quality management 1

WC202 Quality Management Practices and Competitive Performance: Empirical Evidence from Japanese Manufacturing Plants

Anh Chi Phan, Ayman Bahjat Abdallah, Yoshiki Matsui, Yokohama National University, Japan

Purpose: This paper presents how the Japanese manufacturing plants maintained and improved their competitive position during 1990's and 2000's by their focusing on quality management.

Methodology/Approach: Statistical techniques such as analysis of variance, correlation analysis, and regression were used to analyze data gathering from two surveys including the common sample of twenty-seven Japanese manufacturing plants conducted in 1990's and 2000's.

Findings: This study indicates the industry-effect and time-effect on ten quality management practices including top management support, process management, information analysis, and customer and supplier relationship; and their significant impacts on quality, cost, delivery, and flexibility performance.

Research limitations/implications: The study relies on the use of perceptual data gathered from relative small Japanese sample size.

Practical implications: The findings suggest the need to focus on process management, human resource management, and leadership commitment to attain excellent quality, which could be used as platform to strengthen other aspects of competitive performance.

Originality/value of paper: This study reveals the robustness and stability of implementation of quality improvement activities and their significant contribution to the improvement of the competitive performance in Japanese manufacturing plants during 1990's and 2000's.

WC202 The Impact of TQM and TPM on Business Performance – An Empirical Analysis of a Simultaneous Implementation

Philipp Alexander Konecny, Jorn-Henrik Thun, Peter M. Milling, University of Mannheim, Germany

Total Quality Management (TQM) and Total Productive Maintenance (TPM) have been widely recognized as instruments to gain a competitive advantage for a firm's success. Research on TQM and TPM generally investigates the implementation and effectiveness of these manufacturing programs in isolation. However, it is argued conceptionally that potential synergies can be achieved if both programs are implemented simultaneously. Nevertheless, there has been less empirical evidence of the appliance of common and unique practices associated with these programs.

The purpose of this paper is to investigate the comparative contributions of TQM and TPM to improve firm performance. Moreover, a framework for TQM and TPM is developed and a synergetic effect of TQM and TPM is examined. The data used for the analysis is taken from the international empirical research project "High Performance Manufacturing" which consists of data from over 230 plants. The instruments of TQM and TPM are operationalized using factor analysis. By means of cluster analysis, companies with a high degree of implementation of TQM and TPM are differed from companies with a low degree of implementation. Based on this cluster analysis, a comparison of means gives insights on the performance concerning the achievement of efficiency and economic goals. In the consequence, the most promising practices and strategies with regard to a simultaneous implementation of TQM and TPM can be identified and recommendations for manufacturing companies can be derived from the results of the empirical analysis.

WC202 A Survey to Understanding What Makes 6 Sigma Training Effective

Ben Clegg, Aston Business School, United Kingdom
Chris Rees, Mike Titchen, SigmaPro, United Kingdom

The purpose of this research survey was to understand which tools and success factors are considered important and effective for training. This is to aid the effective deployment of 6-Sigma programmes within organisations.

The methodology used a web-based questionnaire. It consisted of 238 questions which included 77 different tools and 30 success factor statements. These were derived from leading academic and practitioner sources. The survey had 200 usable responses. The data was analysed using statistical tools and further validation workshops were held with experts to produce some guidelines for trainers and practitioners.

The findings showed that in general most of the critical success factor statements are agreed as being important, although not all are thought to be well implemented. The findings also showed that in general many of the tools are not understood; but once understood many of the tools can have a positive impact.

The research is limited by the size of the sample. Nevertheless, the survey has important implications for organisations currently implementing or planning to implement 6-sigma training, training organisations revising their syllabi and academic institutions teaching 6-sigma theory.

Recent similar surveys about 6-sigma practice have not been so comprehensive in their question set or application of statistical tools. Also there have not been any recent surveys specifically focused on improving the impact of training. As the use of the 6-sigma methodology and tools are growing quickly, researching its success factors is important to make sure that 6-sigma is not misused and continues to have a high positive impact.

WC301 Wednesday, 13:40-14:55 Track: Invited Chair: Philip Andrew Smart and Harry Maddern
Room: W2-301 Session: Service OM 2

WC301 Value Moves in Service Delivery and Asset Management: A Segmentation Tool for OEMs Going Downstream to Services

Jan B. Holmstrom, Helsinki University of Technology, Finland

Value moves change the value that that different economic actors deliver and receive from each other, often prompted by technological innovation or regulatory change. In industry today we frequently see two types of value moves. Firstly, companies

focus on their core competencies and outsource non-core activities such as maintenance. Secondly, manufacturing companies attempt to expand their revenue base from selling original equipment to maintaining and operating equipment. This is known as Original Equipment Manufacturers (OEMs) "going downstream" (Wise and Baumgartner, 1999).

These value moves are not independent. When an OEM goes downstream it makes it easier for its customers to outsource maintenance service and asset management operations. But also, the OEM and its customers must successfully align service requirements and the supplier's delivery capabilities (Cohen et al., 2006). The OEM needs to adjust its operations to different customers, while each customer needs to understand what information the OEM requires (Sampson and Froehle, 2006).

The demand-supply chain (Holmström et al, 2000) is a management tool helping supply chain managers to balance visibility of demand and the supplier response. The tool was initially developed for the consumer packaged goods supply chain. The tool has later been used to identify the right way to work with different customers in project delivery and to identify missing supplier capabilities in spare parts delivery. However, it has not been purposefully re-designed to support an OEM going downstream to services to segment its delivery capabilities according to the requirements of the OEM customer. The purpose of this paper is to propose such a re-design. The paper describes how to segment value movements in service operations using a common representation scheme for the outsourcing moves of the customer and for the downstream moves to more services of the OEM.

WC301 Mapping Service Processes in Manufacturing Companies

Sabine Biege, Gunter Lay, Fraunhofer Institute for Systems and Innovation Research, Germany
Daniela Buschak, Fraunhofer Institute for Systems and Innovation Research / University of Erlangen-Nuernberg, Germany

For more than one decade, examples of manufacturing companies revising their business model towards the offer of value added services in the form of new business concepts have been reported in literature. Product Service Systems (PSS) is a synonym for this trend of servitization, which intends to strengthen manufacturers' competitiveness in a changing business environment with toughened conditions and rising market power of Asian business rivals.

This evolution from the traditional business concept of designing and selling machines to offering PSS implicates the creation of a service delivery system and subsequently the redesign of the value chain so that it is capable to deliver the proposed added value to the customer. One of the main challenges is to integrate the customer more intensively into the process compared to previous business concepts. Consequently, customers and third parties, if necessary, need to be considered in addition to the internal divisions of the manufacturer. Since these tasks are novel for manufacturers and given the huge complexity of process modeling in general, a supporting tool can be of use.

Hence, an instrument based on the "Service Blueprinting" method developed by Shostack in the 1980s, was created to assist manufacturers in realizing the adequate configuration of the value chain by cross-functional modeling of these solution delivery processes. It provides a methodology to identify the appropriate value chain including end user customers and further partners and to tap hidden value. Therefore, it helps to assure service quality and to implement a highly effective service delivery system.

The paper will introduce this tool and present an example of application. The case study is conducted with a machine tool building company in the context of the Sixth Framework Programme project "NEXT – Next Generation Production Machines".

WC301 The Partnership Table as an Organisational Tool for Improving Customer-Provider Relationship: A Case Study in Facility Management

Alberto Felice De Toni, Mattia Montagner, University of Udine, Italy

This paper describes a successful experience of Partnership Table (PT) implementation in a Facility Management (FM) contract case study.
The PT is one of the tools of the Open Facility Management model which we proposed in consequence of an action research about an Italian FM contract. The case is a multi-services contract signed by Azienda per i Servizi Sanitari n.1 in Trieste (ASS1, customer), a medical service authority, and Consorzio Nazionale Servizi (CNS, provider), Italian FM service provider leader.

The PT, made up of recurring meetings, is a discussion place where information about services, service levels and the technical, managerial and organizational contract issues is exchanged. It allows the customer and the provider to analyze the contract, to highlight the problems and to share the solutions. The partnership table is fully implemented in the contract case between ASS1 and CNS (March 22nd, 2006).
The aim of this paper is to describe the partnership table implemented in the case study. In particular, we give an in-depth description of the purposes of PT implementation, its organizational structure, its working and the benefits from the PT implementation. As regards the benefits, we have adopted the following performance indicators: (a) problem solving effectiveness, (b) problem solving quickness, (c) openness to new challenges and ideas and (d) overall satisfaction of the costumer's and provider's managers in charge of the contract.

Findings from the PT benefits evaluation have highlighted that the PT fosters cooperation between the customer and the provider, looking for profitable results for both contractors. Moreover, the PT allows the parties to have constructive discussions. Indeed, the results of the research put out that the table is a useful tool for an effective and quick problem solving and it facilitates the customer-provider relationship improvement.

WC302 Wednesday, 13:40-14:55 Track: Manufacturing Strategy Chair: Attila Chikan
Room: W2-302 Session: Manufacturing strategy framework

WC302 Strategy Deployment: Linking Business Objectives to Action Plans

Shuki Dror, Ort Braude College, Israel, United Kingdom

Selection of appropriate business action plans is an essential, but complex task as it requires an understanding of their implications for the strategic objectives in a given industrial situation. This work utilized the Quality Function Deployment (QFD) method as an instrument for ranking action plans of an individual organization in terms of its business objectives. Through QFD matrices, connections between strategic needs and operation decisions are established. The QFD matrices ensure that every business objective defined by the enterprise strategy is linked to a set of action plans in the relevant area of operation that may eventually influence its future results. This QFD matrices warrant that proposed action plans are consistent with eventual business objectives.

Two methodological stages are suggested. In the first stage, a House of Strategy (HOS) matrix translates the improvement needs of a company's objectives into a list of competitive priority measures ranked according to their relative importance. A Mean

Square Error (MSE) criterion supporting the selection of vital competitive priorities to be improved is employed. In the second stage, each vital competitive priority is broken down into its relevant processes and an operation matrix is constructed to translate the desired improvement in the processes into a list of action plans ranked by importance. Again, the MSE criterion supporting the selection of vital action plans is used.

The paper describes the implementation of the above methodology in a furniture company. The HOS has shown that the vital competitive priorities, 'stable product quality', 'fast delivery' and 'reliable delivery', were the drivers of the company's business objectives, 'marginal profit' and 'market share'. An operation matrix constructed to improve the 'stable product quality' selected previously by the HOS as a vital competitive priority. The operation matrix extracts relevant processes and translates the desired improvement in failure costs, by processes, into the relative importance of the quality system action plans. Future research may focus on constructing operation matrices for deploying other competitive priorities such as 'reliable delivery' and 'new products'.

WC302 Implications of Cellular Production System to Managements of Machine Tool Builders

Fumihiko Nakazawa, J-Phoenix Research Inc., Japan
Michiya Morita, Gakushuin University, Japan

The objectives of the paper are to explore into the possibility of cellular production system and its management implications in the machine tool industry business. The cellular production system, being a contrast to the flow line production system, has features such as, 1) being flexible to fluctuation of demand and product mix changes (small lot size requirement); 2) improving motivation of workers by enriching their jobs with multi-functional requirement, by shifting toward more effective incentives systems with clear responsibility and reward and by introducing competitive environment; 3) enhancing the capability of workers to communicate with people in charge of development of product and process; 4) contributing to realization of lean in production facility deployment.

Those features are mostly extracted from the application cases of the cellular production system in the home electronics appliance and office equipment industries where the design concept of modular is relatively easy in product configuration. But there have been little researches on the application of the system in the machine tool industry in Japan where the concept of modular configuration is rare and required skill level for workers is high.

The machine tool builders in Japan used to adopt a decentralized autonomous production system where high skilled workers assemble machines in a fixed production area. This production system is considered inferior in efficiency under the widely changeable demand environment. They do not call this as the cellular production system. The reason is that the process there involves many irregularities defying standardization. Delivery of parts is sometimes unreliable due to the limitation of suppliers' capacities when the surge of demand prevails in the industry. Also works require workers to exercise their skills to assemble parts containing small distortion within allowance to make a finished product with high precision and durability. In Japan, they do not adopt the strict modular design concept in order to sustain high quality and uniqueness for such machineries of high value added.

This research studies strategic conditions and requirements for implementing the cell production concept and draws implications to the machine tool business based on a case of the leading Japanese machine tool builders.

WC302 Competitiveness of Operations Management

Alejandra Gomez-Padilla, Victor Hugo Ortiz-Muro, University of Guadalajara, Mexico

This document presents a model to analyse competitiveness of operations management. During the litterature review it was realized that most of the existent research refer to competitiveness helped by a serie of elements which are called competitive advantages. The competitive advantages identified by several authors are analyzed in this document. Competitiveness is then defined by the sum of competitive advantages. A model to analyse competitiveness of operations management is proposed. This model is intended to be robust enough to be applied in very diverse sectors. In order to test the effectiveness of the model, it is applied to measure competitiveness of two different operation management situations: a supply chain and an electric net. The robustness and applicability of the model is discussed.

WC302 Graphical Languages for Manufacturing Operations

Charlotta Johnsson, Lund University, Sweden

The international standard IEC 62264, also known as ISA95, deals with Enterprise-Control System integration and Manufacturing Operations Management. The standard contains, among other things, a description of what Manufacturing Operations means. The description states that "The activities of manufacturing operations management are those activities of a manufacturing facility that coordinate the personnel, equipment, material, and energy in the conversion of raw materials and/or parts into products. Manufacturing operations management includes activities that may be performed by physical equipment, human effort, and information systems". A model for the activities involved in Manufacturing Operations is presented in the standard. As global competition in manufacturing has increased, trends within industry have been to increase the level and amount of control and automation. This means that the activities involved in the manufacturing operations management needs to be well synchronized, coordinated and integrated with each other. This can be assured via different means, for example by the usage of a graphical language. The graphical language lets the user specify what activities that should be performed and in what order etc. Even though the standard presents a model for the activities involved in Manufacturing Operations it does not speak about how the synchronization and coordination between the activities should be done.

This paper will describe why a graphical language would be suitable for this task, what requirements the graphical language should fulfill in order to be successful, and what advantages this could bring to its user.

WC302 Operations Management Fads and Fashions: A Product Life Cycle Approach to Seeking Truth

Attila Chikan, Corvinus University of Budapest, Hungary
Linda Sprague, Rollins College, U.S.A.

The field of Operations Management has a substantial history in management fads or, if you prefer, enthusiasms…Scientific Management, the Economic Order Quantity, MRP (and its derivatives), Just-In-Time, Lean Manufacturing, Total Quality Management, Total Preventive Maintenance…; the list goes on. Lessons from these initiatives often persist as each is followed by The Next Big Thing. For example, today's focus on Supply Chain Management often skips over the fact that excellent warehouse management and dull (but vital) inventory accuracy programs are expected to be in place while more "modern" approaches are introduced. Our experience suggests that new management tools can benefit from understanding the essence of preceding

management tools which can serve to support new methodologies and techniques. Examination of selected older management initiatives from a product life cycle perspective can help prevent throwing the baby out with the bathwater. Such study can also serve to enhance the good aspects of a new scheme while helping avoid at least some of the inevitable dangers and pitfalls. Our suggestion is the development of a product life cycle approach to the analyses of old programs seeking what aspects of these attacks on operations problems are worth saving. This results in a new "look" to the product life cycle as pieces of one program migrate to the next thereby extending one cycle while providing a head start for the next. This analysis uses The MRP Crusade and Physical Distribution Systems as examples of earlier states-of-the-art which offer lessons which, if not heeded, can interfere with the success of a new approach, and/or permit the identification of exactly what is new about The Next Big Thing.

WC303 Wednesday, 13:40-14:55 Track: Environmental Management Chair: Charles J. Corbett
Room: W2-303 Session: Green operations

WC303 An Integrated BSC Model for the Performance Evaluation of Public Organizations
Toraj Mojibi, Mojtaba Tabari, Islamic Azad University, Iran
Reza Tavakkoli-Moghaddam, University of Tehran, Iran
An Integrated BSC Model for the Performance Evaluation of Public Organizations Abstract This paper proposes an integrated model based on the Balance Score Card (BSC) to evaluate the performance of public organizations. The novelty of this proposed model is to integrate the original BSC model with the social responsibility aspect. This proposed BSC model focus on organization strategies and considers a performance evaluation as a main role in the success of any organization. This study is a practical research with regard to the type and objective of research as well as the view point trying to achieve functional and tangible results. From the different point of view, it is a descriptive study because it aims at describing some of the current variables as they are. In addition, from the methodology point of view, it is a field study. The statistical population of this study is 155 consisting of all the managers and vice presidents of public organizations in Mazandaran Province located in the north of Iran. Among comprehensive models of performance evaluations, the BSC model is recognized as one of the most appropriate research model for the performance evaluation of public organizations. After studying the theoretical aspects and observing interviews, social responsibility is added to the BSC model as a new perspective. Also, intended measures are identified in finance perspective, citizen perspective, and internal processes of learning and growth. In this proposed BSC model, the importance rate or the weight of perspectives and measures are determined. Then, the research hypotheses are tested and verified. Finally, according to the results obtained, the proposed BSC model is applied to evaluate the performance of public organizations.

WC303 Green Operations: Diagnosing Environmental Initiatives in the Automotive Industry
Breno Nunes, David Bennett, Aston University, United Kingdom
This paper has two objectives. First it suggests a classification for green operations, and second it reports preliminary results of empirical research focused on investigating the environmental initiatives of an automotive company. The classification comprises three types of green operations: (1) those that create a positive impact on the environment, (2) those that make the company greener than its direct competitors, and (3) operations involving innovations that change radically the company's products and processes, or create new ones that eliminate others. The automobile industry has made remarkable contributions to the world economy and people's mobility; but also, its products and processes are a significant source of environmental impacts. For this reason most companies in the sector would probably be classified as having "type 2" green operations.

The preliminary research results reported in this paper relate to the diagnosis of environmental initiatives in an automobile manufacturer. A semi-structured questionnaire was used to collect data through personal interviews. The main results revealed the use of creative solutions that are aim at matching profitability and sustainability goals as well as managing the complexity of taking decisions regarding process and product improvement. Through this research the paper aims to provide a better understand of green operations management, particularly in the automobile industry.

WC303 Adoption of Voluntary Environmental Standards: The Role of Signaling and Intrinsic Benefits in the Diffusion of the LEED Green Building Standards
Charles J. Corbett, Suresh Muthulingam, University of California, Los Angeles, U.S.A.
We examine the role of signaling and of intrinsic benefits in the adoption of the individual elements of the voluntary LEED (Leadership in Energy and Environmental Design) standards for green buildings. We use goodness-of-fit tests on data for all 442 LEED certified buildings and find that neither signaling nor pursuit of intrinsic benefits can independently explain the observed adoption pattern, but that a combination of the two factors can. We also find tentative evidence that the adoption decision is made sequentially: organizations first choose a level of certification (consistent with signaling), and then choose how many LEED elements to adopt given their chosen level of certification (consistent with pursuing intrinsic benefits). We relate our findings to some open questions in the literature on diffusion of technology and draw implications for the design and the future development of similar voluntary standards and eco-labels.

WC305 Wednesday, 13:40-14:55 Track: Performance measurement Chair: Angel R. Martinez-Lorente
Room: W2-305 Session: Performance measurement

WC305 Forward Performance Measurement and Management Integrated Frameworks
Paolo Taticchi, University of Perugia, Italy
Kashi Balachandran, New York University, U.S.A.
In recent years, performance measurement and management (PMM) has received much attention from researchers and practitioners. Despite the growing use of PMM systems, different problems cause companies to experience difficulty in implementing such systems, with consequent risk of partial benefits or total goal failure. The literature on PMM is nowadays quite vast, but only a ten of models addresses the problem in its entirety, while many other works focus on specific issues related to PMM.

The purpose of this article is to analyze the state of the art of PMM models and it proposes an integrated framework as a base for performance measurement and management design. Staring from the analysis of PMM models and frameworks developed in

the last twenty years, the evolution of the literature is highlighted. Further, the characteristics raised in the literature are merged so as to identify the milestones of an integrated performance measurement and management system. Based on it, an integrated framework is proposed as a base for future PMM design. The framework proposed integrates five systems: a performance system, a cost system, a capability evaluation system, a benchmarking system and a planning system. The framework is based on the belief that PMM is based on a deep business comprehension, which relies first on the analysis of company activities and related drivers. Therefore, the framework proposed defines "which" information should be analyzed, "how" they should be processed and "how" they could be integrated for generating valuable information for managers decision-making processes. The framework proposed is a starting point for performance measurement and management design, but it provides important guidelines for successful implementations of PMM initiatives inside companies. The final section of the paper focuses on the findings of the literature review and it explores how the framework proposed might be implemented and improved.

WC305 Enabling Performance Management in SMEs: a Study into What SMEs Need to Measure and How They Should Manage Performance

Hakon Fauske, SINTEF Technology and Science, Norway
Marco Busi, Carisma r.c.t. Ltd., Norway
Erlend Alfnes, Norwegian University of Technology and Science, Norway

This paper proposes and validates a set of requirements specifications for a performance measurement system that would support the adoption of performance management best practices within Small and Medium sized Enterprises. The literature review concludes that characteristics of performance measurement practices currently in use, limit their adoption within an SME environment. In addition, an in-depth multiple case studies create an understanding of the actual state and desired future state of performance measurement practices within SMEs. Based on the literature review and case studies, a conceptual model for an ICT enabled performance measurement system was proposed.

WC305 Reliability and Validity of Operations Management Measurement Models

Angel R. Martinez-Lorente, Polytechnic University of Cartagena, Spain
Miguel Hernandez-Espallardo, University of Murcia, Spain

The present work analyses the methodology used to measure reliability and validity of measurement scales in operations management. The paper comments the fact that the literature has admitted as reflective scales to measure constructs that have been, in fact, measured by means of formative indicators. Finally, different options to be applied for formative scales are discussed.

Assessment of the reliability and the validity of the scales used to measure constructs in operations management is a necessity in current state of the art in the academia. Specifically, in the area of operations management, the use of scales to measure the degree of application of different management theories in companies is widespread. These scales have been considered and treated as reflective scales, that is to say, the observed variables (i.e., the answers to the items of the questionnaire) are analysed as reflective indicators of a latent variable. In other words, it is assumed that it is the variation of the latent variable what generates the variation in the observed variables. However, we consider that this is not appropriate. The type of indicators used to measure the degree of application of management theories in the field of operations management should have led researchers to consider the scales as formative. In the case of formative scales the observed variables generate the latent variable, i.e., the latent variable is created by the addition of the observed variables. This paper has, therefore, two aims: first, the explanation of the reasons for recommending the use of formative scales for measuring operations management theories; and second, the explanation of the consequences for the estimation of reliability and validity.

WC401 Wednesday, 13:40-14:55 Track: Tutorial Chair: Vinod Singhal
Room: W2-401 Session: Using secondary data in OM Research

WC401 A Tutorial on Using Secondary Data in Operations Management (OM) Research: Overview and Research Opportunities

Vinod Singhal, Georgia Institute of Technology, U.S.A.

Operations Management (OM) researchers have started using secondary data to link operations decisions to shareholder value and operating performance. This tutorial will provide an overview of how to use secondary data in OM research. It will discuss data sources that are available, the research methods and statistics for use with secondary data, and an approach for carrying out this research. Basics of the event study methodology will be discussed. An application that uses this approach will also be discussed.

WC402 Wednesday, 13:40-14:55 Track: Supply Chain Management Chair: Jan Ola Strandhagen
Room: W2-402 Session: Case research on SCM 1

WC402 Marketing Distribution Channels in the Chinese Market: An Exploratory Study of Distribution Centre Performance in Fujian Province

Peter O'Neill, Monash University, Australia
Annibal J. Scavarda, Royal Melbourne Institute of Technology University, Australia

Chinese industry is in general isolated from competition and quite bureaucratic such that effective supply chains solutions are difficult to implement. Similarly most corporations are subsets of government departments with CEOs having the status of a regional governor. Despite this, many Chinese corporates have launched 'standardisation' programs in marketing and distributing channels. The main goal of the 'standardisation' program has been creating an efficient supply chain system to be able to control the flow of information, capital, product and other resources. In Fujian Province under the 'standard', all functions in marketing and distributing are measured by KPI, under an evaluation key. The Chinese acknowledge that with free market competition, some traditionally forbidden logistics activities such as cross docking would be allowed by in order to reduce operational costs in distribution.

This research undertakes a comparative study of Chinese distribution centres with UK distribution centres in order to explore the relationship between the supply chain, the logistics and marketing functions, and the gap between the countries. The method used in this research was quantitative. Questionnaires were posted to 27 Chinese distribution centres with additional

quantitative information sought through telephone-interview. We analysed the collected data for inventory level, order lead times, customer segmentation, value-added activities, and floor areas utilisation with respect to a comparative UK study. We find the main differences between Chinese and UK distribution centres, are that the Chinese; hold less inventory (creating stock-out problems), longer order lead times (low transportation efficiency), and larger floor space for added value activities (2.5 times more).

WC402 The Impact of Product Mix on Supply Network Configurations

Nan Wang, Yongjiang Shi, University of Cambridge, United Kingdom

Faced with the unprecedented product variety and shortened product life cycle, companies have to organize their supply networks in a responsive and efficient way so as to design, produce and deliver right products to customers' hands. The ability to response quickly and accurately has become a competitive advantage in marketplace. To cope with the very demanding customer requirements, companies need redesign and reengineer their supply networks.

The success or failure of a company in competition depends on market acceptance and satisfaction of product offerings. Understanding of product characteristics and having a right product portfolio are important to be considered when companies build or design their supply networks. The strategy of product mix plays a dominant role in determining the nature of supply chain networks.

This research investigates the linkage between product category and supply network configurations through case study in the textile and clothing industry. In-depth case studies are conducted in the last two years as a key research method. The international clothing companies with good performance are targeted in the case studies.

This paper, however, just introduces two most representative cases in order to highlight interesting findings. The two cases demonstrate that not only the matching mechanism between products and supply network configurations is critical but also it is more complex than the general common sense - there are other determinants impacting on the supply network design. Although two companies stand at the same position in the supply network, they adopt distinct approaches to collaborate with other supply network numbers to meet customer satisfaction with their products. Based on the comparison between these two typical supply networks, the research highlights the alternative supply network configurations to support different product categories. A scenario is developed as output of the research, which summarizes the factors and processes identified from cross case analysis.

Finally, further work should be extended to do cross-sector case study. The output of this research could be also widely used in other industries, since textile and clothing chain is regarded as most complex and dynamic supply chain in a rapidly changing environment.

WC402 Successful Supplier Integration in China: A Case Study Approach

Martin Lockstrom, Supply Management Institute SMI – China, China
Roger Moser, Supply Management Institute SMI – India, India
Joachim Michael Schadel, Supply Management Institute SMI – China, China

Both anecdotal and empirical evidence indicate that many Western firms are experiencing difficulties in sourcing strategic supplies from domestic suppliers in China. The difficulties seem to be more frequent in industries characterized by high requirements on quality, delivery and intellectual property protection, such as the automotive industry. Hence, many Western firms have often relied on relocation of incumbent first-tier suppliers when setting up production in China. Such an approach can be both lengthy and risky, as incumbent suppliers might lack experience and knowledge to successfully operate at early stages of market entry.

This paper seeks to develop a theoretical lens for supplier integration in China, by identifying facilitators and inhibitors through a literature review combined with case study research conducted at Western manufacturers with operations in China. Through the research, a relatively large number of influencing factors were identified: Firstly, Western manufacturers might be new to the Chinese market themselves, and hence there might be a lack of knowledge on how to deal and work with domestic suppliers. Especially the reliance on Western-style power dependency vis-a-vis Chinese-style guanxi concept of in-group and out-group membership was also indicated to play a significant role. Secondly, Western manufacturers also often have to help relocating many of their first- and second-tier suppliers, which adds to the complexity. Thirdly, internal resistance was indicated as one of the main obstacles. Thus, organizational rigidity hindered the Western firms to adequately adapt to the Chinese environment. Thirdly, a quest for short-term profit among the domestic suppliers was pointed out as a cause, which ultimately has a detrimental effect on strategic collaboration efforts. Finally, the incompatibility of management processes, IT systems and other hard factors were identified as inhibitors for successful strategic buyer-supplier collaboration.

WC402 Intelligent and Demand Driven Manufacturing Network Control Concepts

Ragnhild Bjartnes, SINTEF Technology and Society, Norway
Jan Ola Strandhagen, Heidi C. Dreyer, Kristian Solem, NTNU, Norway

The trend in manufacturing is optimisation of the total network which leads to a complex operations and control situation (Stevens et al. 2001; Lee et al. 2007). Thus advanced and intelligent control concepts enabled by ICT and data capturing technology should be developed, in order to create flexibility and responsiveness. Intelligence can be embedded by the use of analytical and processing techniques as data mining, expert systems and advanced planning systems (with optimization).

In this paper we address the questions of the elements in intelligent and demand driven control concepts for manufacturing networks: Which new control models and principles will have to be developed, and characteristics of the new control environment. The following areas will be important: New control principles based on access to real time information and different from the lead time calculations in today´s MRP-logic; Integrated automated and intelligent control logic and principles; New ICT architectures allowing true integration of systems; The visual integrated model of product, production and logistic; Concepts contributing to information sharing and cooperation also on a tactical and strategic level, i.e. decision support integrated in the control system; New roles and areas of responsibility between actors; Unified and shared general control model for the entire network.

The theoretical framework will lead to an analytical reference model, which will be used to analyze the empirical case data material. The empirical information in the paper will be collected from a case study in the food industry. The case study is from a supply chain research project consisting of a retailer, wholesaler, manufacturer and supplier of reusable packaging. The actors work together in order to investigate the possibilities and gains for implementing and using RFID technology for track and trace reasons, and how this could be utilized to improve the logistical supply chain system.

WC403 Wednesday, 13:40-14:55 Track: m-Logistics and Physical Distribution Chair: Rene B.M. de Koster
Room: W2-403 Session: Modeling: Evaluation of port/terminal operations

WC403 A Study on Specification of Terminal Traffic Estimation System on Geographic Information Systems
Yoichi Shimakawa, Taro Kasahara, Salesian Polytechnic, Japan
Nobuyuki Iwaki, Kazuaki Taniguchi, FACE.com Inc., Japan
The aim of this study is to make a method estimating "Terminal Traffic" and formulation it as a system. Traffic between station and home/working region by foot and bicycle are called "Terminal Traffic". Statistical data of terminal traffic need to be accurate and detailed for risk reduction of area marketing for commercial facility and traffic safety measure in local area. However, the survey of the traffic is hard to carry out because of its expensive cost. The statistical data by sample surveys is not accurate enough to use by the fact of personal information protection in recent years. Therefore, it is not an exaggeration to say that to make a prediction by several spatial statistical data is the demands of the present age.

In this paper, we propose a method estimating demand of terminal traffic using spatial statistical data on Geographic Information Systems (GIS). Using the demand, route flow is calculated to get link flow in local street area by solving a shortest path problem. Then we report to develop the pilot-system equipped these function. The system is made up of three parts, road network extract sub-system, terminal traffic demand forecasting sub-system and route decision sub-system. Especially, we explain the problems of the spatial statistical data and digital map to use on this system. Using this pilot-system, we calculate the terminal traffic flow around JR Akabane station in Tokyo Kita-ku where most inhabitants work at central part of Tokyo. We compare the flow calculated by the pilot-system with the observed flow, and the effectiveness of the system is proved. Then we study accuracy and characteristics of the estimated flow. In conclusion section, we sort out problems about a specification of the terminal traffic flow estimating system of working-level and the outline of the system is explained. At last, we summarize the future problems.

WC403 Fuzzy Data Envelopment Analytic Hierarchy Process: A Possibility Approach
Varathorn Punyangarm, Srinakharinwirot University, Thailand
Patcharaporn Yanpirat, Kasetsart University, Thailand
Data envelopment analytic hierarchy process (DEAHP) is a multiple criteria decision making tool, which was built based on concept of data envelopment analysis (DEA) and analytical hierarchy process (AHP). The conventional DEAHP requires exact (refer to as crisp in fuzzy terminology) judgments to obtain local and final weights from pair-wise comparison matrices. However, due to the fuzzily imprecise uncertainty from decision maker, it is sometimes impossible to acquire crisp judgments. In this paper, the possibility approach is used to solve DEAHP with this uncertainty (called fuzzy DEAHP or FDEAHP). The approach transforms FDEAHP into equivalent crisp DEAHP (CDEAHP) by using possibility measures of fuzzy constraints. A numerical example is provided to illustrate the effectiveness of the proposed method.

WC403 Sense and Nonsense of Container Terminal Benchmarking
Rene B. M. de Koster, Bert Balk, RSM Erasmus University, Netherlands
Many papers have appeared recently on container terminal benchmarking, based on public data. Data envelopment analysis (DEA) is a commonly accepted benchmarking tool relating multiple outputs to multiple inputs. As container trade is growing rapidly and handling capacity is scarce, an obvious need for efficiency exists in operations. Different container terminal types exist: import/export oriented and transshipment terminals. The major difference is in processes and material handling systems used. Published container benchmarking results are usually based on annual container throughput, the number and type of material handling systems used (straddle carriers, AGVs, tow trains and stacking cranes of various types), the land space used, and the quay length. Although in practice many other input and output variables play a role, like the turnaround time of different vessel types, the response time of vessels, the number of staff, and safety and security aspects, these are not publicly available.

This paper compares some of the recent benchmarking studies, compares them with own results based on primary data on large terminals obtained from APM and PSA terminals and shows results differ strongly. There are several causes for these differences: (1) inaccuracy of the public data used, (2) in studies in literature different terminal types are compared, (3) terminals of different scale are compared, and (3) the exclusion of vital input data influencing performance. In practice, companies use mainly ratio scales as DEA leads only to partial insight and does not really help to improve performance. We conclude DEA may be appropriate for container terminal benchmarking, but only if better quality and additional input and output data can be obtained. In its application, the analysis should be controlled for terminal types.

WC405 Wednesday, 13:40-14:55 Track: m-Scheduling Chair: Reza Tavakkoli-Mogahddam
Room: W2-405 Session: Modeling: Scheduling algorithms

WC405 Memetic Algorithm for Non-Identical Parallel Machines Scheduling Problem with Earliness and Tardiness Penalties
Wisut Supithak, Karn Plongon, Kasetsart University, Thailand
We consider the problem of determining the production schedule of n jobs on m non-identical parallel machines so that the sum of earliness and tardiness penalties is minimized. In the problem, each job has its own due date, earliness penalty and tardiness penalty. In order to reduce the size of possible solution set, the problem is reduced to the job sequencing problem. The evolutionary procedures are developed, as the search in the global optimization phase, to properly assign jobs to each machine and determine job sequence. In the local optimization phase, the optimal timing algorithm is applied to determine the best schedule for each job sequence. The performance of the MA is evaluated by comparison to two heuristics, EDDOPT and RNDOPT, at different levels of problem sizes and ratios of earliness to tardiness penalties. The results show that the MA outperforms both heuristics al all levels of each factor.

WC405 A Scheduling Model for a Knitting Planning Problem
Carina Oliveira Pimentel, Filipe Pinto Cunha Alvelos, University of Minho, Portugal
Antonio Duarte, Polytechnic Institute of Braganca, Portugal

Jose Manuel Valerio de Carvalho, University of Minho, Portugal

In this work, we present an algorithm to assist the knitting section planning of a multinational fully fashion textile industry. The company is composed by four productive sections: knitting, linking, dyeing and finishing. The knitting section produces the main components of the final product and is divided in several subsections. Our work deals with the cotton knitting subsection, where the garment parts are produced. This subsection presents the tightest capacity and requires a very good planning.

We aim to solve simultaneously the lot sizing (or lot splitting) and scheduling problem of the cotton subsection. In the solution process, the quantities to produce by product/component/size are splitted among smaller lots of variable size, the machines in which those lots will be produced are determined, as well as the order in which they will be produced. Each lot can be independently produced at any time in one or more of the suitable machines.

The problem we are solving considers: sets of identical parallel machines, arbitrary demands and due dates for each final product, unit production times, a compatibility matrix between machines and components, release dates of machines, sequence dependent setup times and lot splitting.

The solution objectives to reach are: (1) minimize total tardiness and (2) minimize the deviation between the conclusion time of a component and the conclusion time of all the other components that belong to the same final product.

We develop a mixed integer programming model that considers all the above mentioned aspects. This is a complex model for which exact solutions can not be easily obtained. It is worth mention that this is a huge real-life problem, where solution times are a very important aspect. Being so, we also devised a heuristic approach, based on solving iteratively minimum cost flow problems associated with scheduling of the different sets of components.

WC405 Multislot Just-in-Time Scheduling in Single Machine Environment

Shao-Chin Sung, Aoyama Gakuin University, Japan
Ondrej Cepek, Charles University, Czech Republic
Kunihiko Hiraishi, Japan Advanced Institute of Science and Technology, Japan

Multislot just-in time scheduling deals with processing a set of jobs in an environment with cyclically repeating due dates, where the length of the period between two consecutive due dates is the same for all jobs. Every job must be completed exactly at one of its due dates (just-in-time), and the objective is to minimize the number of cyclical periods (slots) in which all jobs can be scheduled, so that no two jobs scheduled on the same machine overlap in time. In this paper, we present a polynomial time algorithm for the single machine problem.

WC405 Solving a Bi-Objective No-Wait Flow Shop Scheduling Problem by a Fuzzy Goal Programming Approach

Reza Tavakkoli-Moghaddam, University of Tehran, Iran
Babak Javadi, University of Science and Technology, Iran

This paper presents a fuzzy goal programming approach to solve a bi-objective no-wait flow shop scheduling problem (FSSP) that simultaneously minimizes the weighted mean completion time and weighted mean tardiness. This approach is constructed based on the desirability of the decision maker (DM) and tolerances considered on goal values. To illustrate the behavior of the proposed model, a number of small to medium-sized instances are solved optimally. Finally, the related computational results are reported and discusses.

WC501 Wednesday, 13:40-14:55 Track: Spanish Chair: Juan Ramis-Pujol
Room: W2-501 Session: S-SCM 2

WC501 Agile Supply Chain: Difficulties for Implementation in Spanish Fashion Industry

Jesus Garcia-Arca, Ana M. Mejias-Sacaluga, Jose Carlos Prado-Prado, University of Vigo, Spain

Companies must face the challenges of new product innovations, decreasing product lifecycles and product proliferation in markets, calling for a wider range of products, with good quality, lower prices and a high level of service. This has resulted in markets that can be characterised as increasingly turbulent and volatile and has caused many organisations to seek to improve their supply chain management through agile strategy. Agile strategy talks about the ability to match supply and demand in turbulent, volatile and unpredictable markets. The “agility” concept is especially applicable to sectors such as the fashion retail sector characterized by the short life cycle of the product, high volatility, low predictability and a high rate of compulsive buying with no consumer loyalty to a particular brand. Thus, although there are studies about the importance of applying “agile” strategies in the textile sector or even in multiple sectors, they fail to make an in-depth analysis of the reasons that make its implementation easy or difficult, this being one of the results in this paper. “Agile” business model has been demonstrated to be a successful model in fashion industry (for example, in companies such as Zara or H&M) which could be imitated by all companies in this sector. In this context, this research will analyze to what extent the fashion sector have adopted, are adopting or intend to implement a similar system, identifying main difficulties for their implementation. More specifically, the case study methodology has been applied to analyze nine representative companies in the fashion sector in Spain in comparison with three leading companies worldwide (in aspects, such as, business model, new product development or internal and external organization for managing supply chain). The results in research represent a novel approach of utility, both in the scientific and the business area.

WC501 Information View as a Link in the Manufacturing Planning Process Modeling in a Supply and Distribution Chain

Andres Boza, Rosa-Isabel Navarro, Francisco-Cruz Lario, Universidad Politecnica de Valencia, Spain

Enterprise Engineering is defined as the body of knowledge, principles, and practices having to do with the analysis, design, implementation, and operation of an enterprise. Enterprise Engineering focuses on how to model, analyze and design enterprise systems. This can be management, manufacture or information systems (Giachetti, 2004; Neaga and Harding, 2005; Boza, 2004). In this framework, the modeling architectures provides a set of views, such as Resource, Organizational, Decisional, Functional, Information View and so on, that allow focusing and working on a specific side of the total enterprise model (Toh, 1999). Information View is a common element diploid in many modeling architectures such as CIMOSA, GRAI-GIM, PERA, GERAM, ARIS, Zachman and TOGAF, between others (Cuenca et al., 2005 y Tang et al., 2004).

The main goal of this paper is to highlight the role of the Information View as a link in the Manufacturing Planning Process Modeling in a Supply and Distribution Chain. Starting from independent Information Models, corresponding to Resource,

Organizational and Decisional Views of the above mentioned process, we find the connection points between the different models to arrive to an Integrated Information Model. In this work, firstly we make a brief introduction to modeling architectures and their underlying views. We present some Information View definitions. We highlight the relations between some Views and the Information View. We present three Information Models, using an UML class diagram, one for each individual view (Resource, Organizational and Decisional View). Then we show an integrated Information Model in which we emphasize the connection points. As a conclusion we highlight the usefulness of the Information View as an integration element in the total enterprise modeling process, and also in decision support, software development and process learning-knowing.

WC501 Establishing a Framework for Research in the Triple A (Adaptability, Agility, Alignment) in Supply Chains

Ivan A. Arona, Jose A. D. Machuca, Rafaela Alfalla-Luque, University of Sevilla, Spain

In the rapidly changing global business environment it can be seen that supply chains designs solely based on efficiency and speed do not necessarily lead to a sustainable competitive advantage (Lee, 2004). Lee states that this is only possible if supply chains are designed in such a way that they have the Triple A: Adaptability, Agility and Alignment. Although this statement has attracted great interest, until now it has not been empirically contrasted, as is essential. A number of studies have separately looked at the components of the Triple A, as for example agility (e.g. Christopher (2000), Swafford et al. (2006)) and alignment (e.g. Piplesis and Fu (2005), Mc Adam and Mc Cormack (2001)), but no study to date has jointly been conducted of the Triple A and any possible relationship it might have with efficiency and speed, or its possible impact on business performance. The main aim of this paper is to determine the measures that define the constructs that characterize said variables in order to be able to conduct an empirical analysis that would allow the accuracy of Lee′s statement to be confirmed or not. For this we shall carry out a literature analysis and, subsequenlty, we shall propose congruency and systemic fit models for the corresponding statistical analysis to be conducted.

WC501 Detecting Supply Chain Innovation Potential for Sustainable Development

Juan Ramis-Pujol, University Ramon Llull, Spain
Raine Isaksson, Gotland University, Sweden
Daniel Arenas, University Ramon Llull, Spain

With increasing global pressures for sustainable development, innovation is required at all levels such as improving products, improving processes and improving resources. Quality requirements are normally defined by customers and sustainability could be defined by stakeholders where nature could be considered as one of the important stakeholders. With a stakeholder focus it becomes easier to define sustainability in operational terms. However, without agreed measurements we cannot improve.

In this paper, we try to unveil potential measurement improvement for sustainable development in supply chains. Agreed measurements are essential for assessment; and therefore, for realising improvements and innovation actions on supply chains. Also in this paper, we will try show that generally there is a synergy between quality management and sustainable development and that particularly the process view is of great help. We will demonstrate this by applying a system based process model on supply chains with the purpose of highlighting improvement and innovation potential in terms of sustainable development. The reason for choosing supply chains is that we believe that processes that cross company lines have a larger potential for improvement and that this potential often goes undetected due to lack of process ownership. This potential could be seen as a key input for an innovation process. Finally, and going back to the stakeholder perspective, we study how improved measures and a process perspective can change the perception of stakeholders and, thus, influence their decision-making.

The main focus in the paper is on theory discussions, the results of which are then highlighted in face of case studies from various areas and various countries. Our preliminary results indicate that the expressions sustainability and sustainable development, in spite of having been in the limelight for some time, are not understood very well. The consequence is that in spite of a lot of good will there is a large undetected innovation potential. It seems that the sustainability indicators we are proposing could help in highlighting the existing potential as a prerequisite for innovation in supply chains for sustainable development.

WC503 Wednesday, 13:40-14:55 Track: m-Logistics and Physical Distribution Chair: Bulent Catay
Room: W2-503 Session: Modeling: Vehicle Routing Problem 2

WC503 A Dynamic Programming Approach to the Time-Dependent VRP with Both Transportation and Time Limitations

Said Dabia, Tom van Woensel, Ton de Kok, Eindhoven University of Technology, Netherlands

In many practical situations companies do not have an unlimited number of vehicles available to deliver goods to their customers. Although renting additional vehicles from a third party logistics service provider might be an option, it is not always the cheapest one. Moreover, due to road congestion, travel times are hardly time-independent making the day-to-day planning harder. In this paper, we consider a vehicle routing problem with both transportation and time limitations. We assume a time-dependent environment where the travel costs change over time. A warehouse uses a fixed fleet to fulfill customers' demand. Each truck has a finite capacity and is only available for a limited time during a day. Furthermore, demand is deterministic and is assumed to be known before a truck is dispatched. Contrary to most of the literature, our aim is to schedule the fleet such that the truck utilization is maximized and its travel time is minimized. The system is modeled as a multi-criteria time dependent knapsack. A pseudo-polynomial algorithm based on a dynamic programming formulation is used to compute the set of non-dominated routes. Finally, a numerical example is illustrated and gives interesting insights.

WC503 Integrated Inventory Problem and Vehicle Routing Problem in One Warehouse and Multi-Retailer Distribution System

Anchalee Supithak, Eastern Asia University, Thailand
Surya D. Liman, Texas Tech University, U.S.A.

This paper deals with the replenishment strategies of one warehouse and many retailers distribution system which involving inventory costs and transportation costs. We develop two heuristic models by applying the economic order quantity model with the power of two policy and the vehicle routing model such as cluster first-route second, route first-cluster second, nearest neighbor algorithm and saving algorithm.

The first model is based on the concept of cluster first-route second algorithm. First, retailers are clustered based on the inventory restriction. Then, each cluster is routed by using the nearest neighbor algorithm. After that, the solutions are improved by

applying the saving algorithm and allowing the shortage policy. On the other hand, the second model is developed by using the concept of route first-cluster second algorithm. First, all retailers whose demands need to be replenished at the same interval are routed into one route without considering the vehicle capacity. Then, a single route is clustered by considering the retailers' demands and the vehicle capacity. Like the first model, we finally apply the nearest neighbor algorithm and the shortage policy to each cluster to improve the solutions.

We performed the experimental study and evaluation in order to examine the performance of the developed models and analyze the sensitivity of the models to the setup cost factor (C), holding cost rate factor (H), and number of retailers' factor (R). The distribution system of 5 and 10 retailers are simulated on the C program by applying the algorithm of model 1, model 2 and independent model at each treatment combination of the C, H and R factor. The percent deviation (z), the deviation of total system costs by applying first model and second model from the total system costs by applying the independent model, is calculated. The results indicate that the setup cost and holding cost rate factors cause the significance difference in treatment mean C_i and H_i at all level of C and H respectively. We conclude that both models perform well when the company has low setup cost and high holding cost rate. In additions, the performance of model1 and model 2 is not different when the distribution system is small.

WC503 An Ant Colony Optimization Approach for the Mixed Vehicle Routing Problem with Backhauls

Bulent Catay, Sabanci University, Turkey

The Vehicle Routing Problem with Backhauls (VRPB) is a variant of the Vehicle Routing Problem where the vehicles are not only required to deliver goods but also to pick up some goods from the customers. In the mixed VRPB (MVRPB) each customer has either a delivery or a pick-up demand to be satisfied and the customers can be visited in any order along the route. Given a fleet of vehicles and a set of customers with known pick-up or delivery demands MVRPB determines a set of vehicle routes originating and ending at a single depot and visiting all customers exactly once. The objective is to minimize the total distance traversed with the least number of vehicles. A maximum route length restriction may also be imposed on the vehicles.

From a practical point of view MVRPB models situations such as distribution of bottled drinks, chemicals, LPG tanks, etc. In the case of the bottled drinks for instance, full bottles are delivered to customers and empty ones are brought back either for re-use or for recycling. In the chemicals case, some hazardous materials may need to be returned for safe disposal. Regulations or environmental issues may also force companies to take responsibility for their products throughout their lifetime.

For this problem, we propose an Ant Colony Optimization (ACO) approach utilizing a new visibility function which attempts to capture the "delivery and pick-up" nature of the problem. We perform an extensive experimental study to compare the performance of the proposed approach with those of the well-known benchmark problems from the literature. Our numerical tests show that the proposed approach provides encouraging results.

WD202 Wednesday, 15:15-16:30 Track: Quality Management and Six Sigma Chair: Hideo Suzuki
Room: W2-202 Session: Empirical research on quality management 2

WD202 The Influence of TQM on Innovation and Firm Growth
Julio F. B. Faco, EAESP/FGV, Brazil
Andre Luis Castro Moura Duarte, IBMEC-Sao Paulo, Brazil
Joao Mario Csillag, EAESP/FGV, Brazil
This research aims to study the relationship between Total Quality Management (TQM) effort and innovation indicators. Analyzing data collected on 1996 and 2001 over more than 2,000 organizations at Sao Paulo state in Brazil focusing on industrial sectors, authors conducted a literature review, to provide the necessary conceptual basis in order to refine and compare both innovation and TQM activities at firm level. These organizations had over 30 employees and varied from a total of 21 different industrial sectors. In terms of innovation construct, authors decided on measure it through innovation process and product innovation indicators available at this database.

The research tool used in this study was the statistical technique of multiple regression and correlation analysis. Applying this conceptual background on these data, as well as statistical models, authors were able to measure the influence of TQM effort on innovation either whole sample data or by sub-sectors of industrial activity at these organizations. The results point up that TQM has significant influence on process innovation at firm level, but less influence on product innovation. The analysis still made possible the comprehension of underlying subjects to the main theme that appeared along the study, such as the influence of firm size over both variables.

WD202 Relationship between Quality Management Practices and Their Effects on Competitive Performance of Manufacturing Plants
Anh Chi Phan, Ayman Bahjat Abdallah, Yoshiki Matsui, Yokohama National University, Japan
Purpose: This paper presents an exploratory study of relationship among specific quality management practices and indicators of competitive performance.

Methodology/Approach: An empirical framework of quality management was proposed and tested by path analysis. Multiple regression analysis was used to determine the path coefficient, which was decomposed into direct and indirect effects.

Findings: The results show that different dimensions of competitive performance such as conformance quality, manufacturing cost, on-time delivery, and volume flexibility are strongly related to process management, information analysis, workforce management, customer and supplier relationships, strategic planning, and top management support.

Research limitations/implications: The study relies on the use of perceptual data gathered from questionnaire survey.

Practical implications: The findings suggest the need to focus on process management, information analysis, workforce management, and leadership commitment to improve competitive performance of manufacturing plants in terms of quality, cost, delivery, and flexibility.

Originality/value of paper: The paper provides some suggestions on interrelationship among different quality management practices and their significant impact on different dimensions of competitive performance of manufacturing plants.

WD202 ISO 9001:2000 Application according to TQM in Small and Medium Companies
Angel R. Martinez-Lorente, Polytechnic University of Cartagena, Spain
Micaela Martinez-Costa, Daniel Jimenez-Jimenez, University of Murcia, Spain
ISO 9000 is a standard that can be applied at any kind of company. TQM has also been proposed as a management system valid for all companies. However, not all firms have the same characteristics and, therefore, the application of both TQM and ISO 9000 should be different. We intend to make a contribution to help SMEs to obtain the maximum from their ISO 9000 implementation by doing it according to TQM philosophy. In this way, companies will upgrade their quality management system, that will not only serve to show third parties that the company is ISO certified but also to really improve quality management internally, providing them the opportunities to get higher performance. Therefore, a model of application of ISO 9000 according to TQM in furniture companies is proposed in this paper. Furniture industry is mainly made of SMEs which do not produce too large series of products and suffer a strong competition, as it is the case of many SMEs of different industries in the world.

In order to design the model, the research methodology has been the following: first, a multiple case study of 27 companies has been done, second, a postal questionnaire was sent to 874 companies. The case study has been used to define what elements of TQM theory are valid for this kind of industry and are also valid to get the ISO 9000 certificate. The postal questionnaire has been used to test if our proposed model is correlated with company results. It has also been used to compare the separate effects of both ISO 9000 and TQM on these company results.

WD202 Structural Analysis of Quality Management Practices and Results in Japanese Manufacturing Companies
Hideo Suzuki, University of Tsukuba, Japan
Hirofumi Matsuo, Kobe University, Japan
Rita Arauz, Goethals Consulting Corp., Panama
The level of quality management has recently been said to be deteriorating among Japanese top-rated manufacturers. The manufacturers seem to have shifted their priorities from achieving high quality to responding to rapid changes in business environments, fierce price competition, and short product life cycles. On one hand, this leads to the decline of top management's quality consciousness, the reduction of in-house education and training, the reduction in the number of shop floor managers and workers, and the decline of their motivation and ability to achieve high quality levels. On the other hand, they recognize that quality is still the central concept in manufacturing, and thus it is necessary to readdress this quality management issue.

In this research, a questionnaire survey was designed to collect data from the manufacturing companies listed in the first section of the Tokyo Stock Exchange. It was conducted from December 2004 to February 2005. We investigated how they perceived the present states of quality management infrastructure practices (1. top management leadership, 2. supplier relationship, 3. customer relationship and 4. human resource management), quality management core practices (5. process management and 6. product development), and quality results (7. results of internal quality and 8. results of external quality). Furthermore, the covariance structure analysis was conducted to investigate the relationships between quality management infrastructure practices (4 latent

variables), quality management core practices (2 latent variables) and quality results (2 latent variables). Finally, based on these results, we discuss how the quality management framework should be redesigned.

WD301 Wednesday, 15:15-16:30 Track: Invited Chair: Philip Andrew Smart and Harry Maddern
Room: W2-301 Session: Service OM 3

WD301 A Review of Scheduling Problems in Hospitals
Fan T. Tseng, J. N. D. Gupta, University of Alabama in Huntsville, U.S.A.
K. H. Hsu, Chang Gung University, Taiwan
During the 20th century, the developments in scheduling theory have mainly been concentrated to the manufacturing and transportation sectors. Both discrete manufacturing and process industry scheduling problems have been studied, analyzed and solved using a variety of approaches and techniques. However, while considering service sector, the study of scheduling problems has not received as much attention as those in the manufacturing sector. The existing literature on scheduling related problems is quite eclectic and scattered. Further, no comprehensive framework is available to describe scheduling problems in the service sector. Existence of such a framework for specific service sector fields such as hospitals can help categorize the existing scheduling research in the service sector and help us identify problem areas requiring future research efforts.

This paper attempts to describe a framework for scheduling problems arising in a hospital. Based on the study of the existing scheduling literature, the paper suggests a comprehensive representation of scheduling problems in a hospital and attempts to identify their computational complexity. Available scheduling algorithms are briefly outlined and directions for future research are discussed.

WD301 Demand and Supply Management for Professional Services
Cornelia Schoen, University of Karlsruhe, Germany
For professional service providers (PSP), people skills are key assets. Work is typically project-driven, with high levels of client involvement. To remain competitive, a PSP has to carefully match its scarce resources with different clients' needs. We present a mathematical programming approach that integrates revenue- and project-management techniques to support decision-making at a professional service provider. In particular, the model simultaneously determines for a given period a) which project requests carry out and what price to quote to a potential client; b) how, by whom, and when to execute key activities of a project, considering the impact on client value; c) how to best compose the workforce with distinct capabilities; such that profit from the project portfolio is maximized. The problem formulation is a mixed-integer program that can be solved exactly by standard techniques in reasonable time for small-sized instances. For larger problem sizes, we present several heuristic techniques that have already proven good performance in pure project-management applications. A case study from a consulting company shows the applicability of our proposed model and methods.

WD301 Development of Broadcast Radio Production Laboratories at Social Communication Courses
Carlos Fernando Jung, PPGEP/UFRGS, Brazil
Vera Maria Broilo, FACCAT,RS, Brazil
Jose Luis Duarte Ribeiro, Carla Schwengber ten Caten, PPGEP/UFRGS, Brazil
This paper describes the results obtained by exploratory and experimental research conducted to develop a methodology for planning and implementation of broadcasting production laboratories used in graduation courses in social communication. The research was based on the curricular requirements for the different academic qualifications and the technologies existent in the market. The methodological model presented offers a theoretical/practical basis which can be used as a reference for future installations, or, where necessary, to update and re-equip older broadcasting production laboratories already in use in graduate courses in Social Communication. It also helps to improve the organization of the work and the usability of the learning system.

WD302 Wednesday, 15:15-16:30 Track: International Operations Management Chair: Ann Vereecke
Room: W2-302 Session: International OM 1

WD302 Offshoring Process: A Comparative Investigation of Danish and Japanese Companies
Dmitrij Slepniov, Aalborg University, Denmark
Hiroshi Katayama, Waseda University, Japan
STUDY BACKGROUND: Cyber-revolution, market liberalisation, innovative production technologies among numerous other factors made it possible for many tasks to be performed at a distance. The powerful forces of globalisation push more and more companies towards the global deployment of work. Indeed, companies nowadays resemble a dynamic, complex and globally distributed webs of relationships, rather than static and traditional co-located systems of production. Nevertheless, while the topic of production offshoring and international operations management received extensive attention in the literature, how this process varies in certain cultural contexts remains largely unexplored.

OBJECTIVES: The purpose of this paper is to contribute to bridging this gap by conducting a comparative investigation of the process of offshoring in Danish and Japanese companies. Our research attempts to shed light on how companies approach the process in different cultural contexts, which risk fields they consider, and how this affects the dynamics of their unfolding offshoring processes.

THEORETICAL BACKDROP AND METHOD: The paper builds on the existing offshoring and international operations literature (e.g. Ferdows, 1997). The concepts of core competences (Hamel & Prahalad, 1990) and cultural relativity of organisational practices (Hofstede, 1983) are also employed. The empirical part of the study is based on exploratory case studies.

OUTCOMES: Our main findings are conceptualized in a comparative framework. Based on the result of the investigation, we argue that there are lots of similarities between Danish and Japanese companies in how they approach offshoring process. This is especially visible in the realm of motivational factors lying behind offshoring initiatives. On the other hand, the findings of the paper indicate that there are substantial differences in how they see strategic risks resulting from offshoring, how their offshoring location decisions vary, and how they influence companies' domestic bases.

We close with a discussion of the implications for both theory and practice. The paper fosters a better understanding of the offshoring process and the cultural and geographical context as factors affecting it. The findings also can be used by managers dealing with transferring work globally.

WD302 Architecture and Global Competitiveness in Japanese Process Industry

Junichi Tomita, Toyo University, Japan

The purpose of this paper is to identify the source of global competitiveness in Japanese process industry from architecture based view (Fujimoto, 2003). An empirical study was performed by several case studies such as semiconductor, FPD, steel, flat-glass, and chemical industry. As a result, the product with integral process architecture tended to have high global competitiveness, and the product with modular process architecture tended to have low one in Japan.

WD302 The Globalisation of Automotive Component Suppliers

Chee Yew Wong, University of Hull, United Kingdom
Sakun Boon-itt, Thammasat Business School, Thailand

The offshore outsourcing strategies of many automakers have created a global component supplier base. To understand how component suppliers globalise, this research investigates two perspectives: (1) global positioning, which includes the levels of diversification, global sales, global production, and customer base, and (2) globalisation approach, which includes organic expansion, merger & acquisition, joint venture, and re-structuring.

The research is based on databases of 103 automotive component suppliers from USA, Japan, Germany, France and other countries. The results indicate the following interesting patterns of global positioning. The Japanese and German suppliers had relatively lower lever of diversification as compared with the American, France and other countries. The high levels of global market shares (average 25%), global sales (average 49%) and global production (average 64%) indicate that most suppliers have been aggressively expand globally. However, global sales for Japanese and American suppliers were relatively lower than those from Germany and France. Suppliers from Germany, Japan and France had similar levels of global production, which were relatively higher than those from the America. In term of customer base, there were more Japanese and American captive suppliers who relied greatly on a single customer.

The research found a mix of globalization approaches. Organic growth was a common strategy, but its levels varied greatly amongst different suppliers. Since most automakers tended to procure innovative modules and systems instead of individual components, there were many merger, acquisition, joint-venture and alliance amongst automotive suppliers. These strategies are adopted to develop modularization capability and to gain access to global market and technology. This seems to indicate they are the preferable means to acquire resources other than global expansion with internal resources. Interestingly, the results shows that the Japanese and German suppliers seemed prefer joint venture over merger and acquisition, unlike those from France and America. Finally, the results show that "global presence" was not necessarily enabling competitive advantage, but it is an important enabler for building up module capability.

WD302 Survival of the Fittest: Impact of Networking on the Future of Plants

Ann Vereecke, Vlerick Leuven Gent Management School and Ghent University, Belgium
Arnoud De Meyer, University of Cambridge, United Kingdom

Innovation and know-how have become critical for competitiveness. Consequently, the role of relationships and networking has become very important. Our research, carried out with the support of "Flanders District of Creativity", studies the knowledge networks of plants in multinational companies, and more specifically the role that each of the plants plays in this network.

The paper reports on a longitudinal research project, carried out in eight multinational manufacturing companies, with headquarters in Western Europe, and with plants in several regions in the world. We had studied these eight multinationals in 1995-1996; at that time, we had developed a typology of plants which describes the network position of the plants. We had identified four types of plants: isolated plants, receiver plants (characterized by a high inflow of innovations), hosting network players and active network players. We refer to our earlier publications for a detailed description. We have revisited these companies in 2005-2006, to study how they had changed their manufacturing network. In both research rounds, a rigorous methodology has been followed for data collection and data analysis.

Our main hypothesis has been that the position of the plant in the network has some predictive value for the future perspectives of the plant. In this paper we explain and test this hypothesis, and we draw some lessons for practitioners. Our research shows that several of the isolated and receiver plants have disappeared, whereas none of the hosting network players, and only one of the active network players have disappeared. The conclusion is clearly that network players have a more secure future than the isolated and the receiver plants. The research offers some insights for the plant manager whose objective is to safeguard the existence of his or her plant, as well as for the executive in headquarters, whose objective is to design the manufacturing network to improve or maintain competitiveness.

WD303 Wednesday, 15:15-16:30 Track: Environmental Management Chair: Tomoaki Shimada
Room: W2-303 Session: Remanufacturing and recycling

WD303 The Need for Inspection in Remanufacturing Operations

Mark Errington, Stephen J. Childe, Exeter University, United Kingdom

A crucial stage of the remanufacturing process is the inspection procedure. Surveys carried out in the automotive remanufacturing sector show that the industry is concerned about its need for such a large amount of specialist skills. Despite this, there has been little research into what is actually involved in the inspection process and what the outputs are from each stage.

This paper presents case based research that was carried out on the inspection procedures of both electronic and mechanical product remanufacturers. It discusses the similarities between the cases and the major differences between electronic product and mechanical product inspection. The paper also details some of the less obvious differences in the processes. These differences may also offer opportunities for substantial process cost reductions. The cases were drawn together using a grounded theory approach to give a generic framework which could be used to describe the inspection procedures. The research shows that there are three distinct purposes for inspection. Currently the majority are carried out by highly skilled individuals. The insights

developed in this paper present the opportunity for the aims of these stages to be clarified in order to improve their effectiveness and to reduce costs.

The findings discussed in this paper have led to many opportunities for further research in the area. Understanding which stages of inspection are vital to the process and which can be substituted or removed entirely offers many opportunities for process efficiency improvements. A great deal of work has been carried out to reduce the amount of testing and inspection required in forward manufacturing. Is it possible for similar strategies to be followed for some products in the area of remanufacturing?

WD303 Analysis of Reverse Logistics of Operations for a Computer Company

Albert Wee Kwan Tan, Arun Kumar, University of Wollongong, U.A.E.

As reverse logistics is a relatively new field in supply chain management especially in Asia, a detail study is conducted to understand the status of companies practicing reverse logistics to support their Asia Pacific operations. This paper discusses an empirical examination of a company performing reverse logistics in Asia with Singapore being the co-ordination hub with the US. Data on the transaction volumes and other part information are collected over a period of 2 years to understand the behaviour and trends of reverse logistics in this company. Statistical tools such as serial correlation, seasonality and trend analysis are performed on the data to understand their behaviour and its managerial implication. The study has shown that there is an upward trend for the return volume and there are significant correlations among some parts in a single return operation.

WD303 The Impact of a Large Retailer's Environmental Activities on Consumers' Purchasing Behavior in Japan

Takeshi Hama, International University of Japan, Japan
Tomoaki Shimada, Kobe University, Japan

Many companies in Japan are concerned about the environmental issues as a part of CSR (corporate social responsibility). In particular, large manufacturers are leading the activities for environmental sustainability because they produce a variety of products and by-products that influence the environments on earth. These activities extend to the downstream in a supply chain. Nowadays many large retailers are also working toward environmental protection by collecting and recycling packaging materials, implementing green purchase guidelines, or charging customers for plastic bags.

In this study, we conducted a questionnaire survey of consumers at one of the outlets in a large supermarket chain in Japan. In cooperation with the supermarket chain, we randomly chose the customers at its main entrance on the weekend and asked them to fill in the questionnaire form without rewarding them with any gift. Do consumers care whether the supermarket makes environmental efforts or not when they decide where to purchase products? Do they use collection boxes for recyclable packaging materials (e.g., cans, bottles, Styrofoam trays, etc.) at the supermarket? If not, does a reward encourage them to bring the recyclable materials to the supermarket? Are the environmentally conscious consumers loyal customers to the supermarket? How often do they visit the supermarket and how much do they spend there in a month?

One of the findings is that the consumers who are aware of the supermarket's environmental efforts spend as much money as those who are not aware of them at the supermarket in a month. Although this result is disappointing to the supermarket investing in environmental protection, it reflects only a short-term effect of the supermarket's environmental activities on consumers' purchasing behavior. In the long run, such CSR efforts may indirectly increase the consumers' loyalty and purchasing amount when social and institutional pressure makes consumers more conscious of the environmental issues. In fact, many studies on CSR show a positive relation between a company's CSR activities and its financial performance.

WD305 Wednesday, 15:15-16:30 Track: Purchasing and Sourcing Management Chair: William Ho
Room: W2-305 Session: Evaluating sourcing

WD305 Developing Performance Measures for Critical Outsourcing

Araya Sakburanapech, Richard Mark Greenough, Cranfield University, United Kingdom

Outsourcing is a competitive strategy that an innovative company uses in order to focus its limited resources on its core competencies. Outsourcing provides a number of advantages in terms of performance improvement and cost reduction. However, the company should be aware of associated risks particularly the risks associated with loss of control over a provider. As such, it is essential for the outsourcer and provider to employ a suitable performance measures. This paper describes research to develop a set of performance measures that are appropriate for aircraft maintenance outsourcing. The authors carried out action research with a company that plays the role of maintenance provider and also acts as a customer for maintenance services. The outcome of this research will enable not only the outsourcers to monitor and control the performance of their service providers more efficiently but will also enable the service providers to improve their performance to meet their customers' requirements.

WD305 The Supply Risk Construct and Measurement Methods

Fabio Z. Cerquinho, Marc Sachon, University of Navarra, Spain

Risk management applied to upstream industrial relationships is an urgent and incomplete topic of research. Among others, Ritchie and Brindley (2007) concurs that "the incorporation of risk constructs and risk management responses into supply chain management is timely and reflects both theoretical imperatives and practitioner requirements." Starting from the traditional and largely used Kraljic's portfolio model (Kraljic 1983) to segment and evaluate suppliers, we tackle the unsolved problem of supply risk measurement (Gelderman and Van Weele 2003). First, we review the literature regarding conceptual and empirical studies of supply risk (e.g. Zsidisin 2003), and propose an alternative definition for this construct. We try to avoid the ambiguity that often is present in studies related to risk analysis (Aven at al. 2004), and take a supply risk definition compatible with a classic quantitative risk approach: Risk = f (probability, losses) (Kleindorfer and Saad 2005). Second, drawing on diverse theoretical streams of buyer-seller relationships'; studies, taken from the strategy and marketing fields (e.g. Heide and John 1992; Dyer and Singh 1998; Grover and Malhotra 2003), we offer propositions about antecedents and/or substitutes for the supply risk construct.

The empirical part is carried in the context of a multinational firm in the Cosmetic industry, with a supply base of 400 direct material suppliers and about fifteen thousand SKUs. We collected a very comprehensive amount of qualitative and quantitative data, taking critical direct items and related main supplier as unit of analysis. The data analysis was done with cluster statistical techniques, in order to calculate and compare five alternative options for the supply risk construct. On the best of our knowledge, this

research is the first attempt to apply solid theoretical lens in order to define, calculate and compare a variety of supply risk constructs. Conclusions, as well as managerial recommendations and research limitations are offered at the end.

WD305 Modeling IT Outsourcing Decisions Involving Vendors

Jayavel Sounderpandian, University of Wisconsin at Parkside Kenosha, U.S.A.
Chun-Hung Cheng, Chinese University of Hong Kong, Hong Kong
Jaydeep Balakrishnan, University of Calgary, Canada
Wai-Chi Wong, Chinese University of Hong Kong, Hong Kong

In this research, we analyze Information Technology (IT) outsourcing decisions involving multiple vendors and apply modeling techniques to systematically evaluate such outsourcing decisions. We take costs of in-house production, outsourcing, and coordination into consideration simultaneously. Further we also consider the performance of vendors. To make our work more adaptable, we make different assumptions about the interaction between different jobs. Initially we consider only one vendor. Later we incorporate multiple vendors. For a case considering the interaction of a pair of jobs at a time, a linear model is formulated. An example problem is solved using a practical spreadsheet based optimizer and the managerial use of this model in decision support is emphasized. For a case considering multiple-way interactions among jobs, we formulate a non-linear model. We discuss how to reformulate and solve an equivalent linearized model. An example problem is also used for illustrative purposes.

WD305 An Integrated Analytical Approach for Selecting Suppliers Strategically

William Ho, Aston University, United Kingdom

Supplier management is one of the key issues of supply chain management because the cost of raw materials and component parts constitute the main cost of a product and most of the firms have to spend considerable amount of their sales revenues on purchasing, hence supplier selection is one of the most important decision making problems. Besides, selecting the right supplier significantly reduces the purchasing costs and improves corporate competitiveness. Therefore, supplier selection is a vital link in an effective supply chain.

Choosing the right suppliers involves much more than scanning a series of price list, and choices will depend on a wide range of factors which involve both quantitative and qualitative. Extensive approaches have been proposed for the supplier selection, such as the analytic hierarchy process (AHP), analytic network process, case-based reasoning, data envelopment analysis, fuzzy set theory, genetic algorithm, grey-based approach, mathematical programming, simple multi-attribute rating technique, and so on. Although these approaches can deal with multiple and conflicting criteria, they have not taken into consideration the impact of business objectives and requirements of company stakeholders on the evaluating criteria. In reality, the weightings of supplier evaluating criteria depend a lot on business priorities and strategies. In cases where the weightings are assigned arbitrarily and subjectively without considering the “voice” of company stakeholders, the suppliers selected may not provide what the company exactly wants.

To enable the “voice” of company stakeholders is considered, this paper develops an integrated analytical approach for selecting suppliers strategically. In the approach, multiple evaluating criteria are derived from the requirements of company stakeholders using a series of house of quality (HOQ). The importance of evaluating criteria is prioritized with respect to the degree of achieving the stakeholder requirements using AHP. Based on the ranked criteria, alternative suppliers are evaluated and compared with each other using AHP again to make an optimal selection.

WD401 Wednesday, 15:15-16:30 Track: Information Systems and e-Operations Chair: Chien-Hua Mike Lin
Room: W2-401 Session: Information systems 1

WD401 Agile Supply Chains through Information Systems Integration

Yi Wu, Jannis Angelis, Margi Levy, Warwick Business School, United Kingdom

Agility in the supply chain is critical for competitive advantage as it helps to explore and exploit opportunities, and seeks to provide prompt responses to customer requirements at an acceptable cost. Information systems (IS) are helping companies to manage their supply chains by reducing costs, shortening product life cycle and improving information visibility. Supply chain agility becomes a major focus in many leading companies, which includes customer sensitivity, process integration, network integration, virtual integration. These various integration processes in agile supply chains can be hampered by fragmented IS which inhibits information flow and coordination activities across function units and network partners. However, there has limited research on identifying specific mechanism on how information systems may affect supply chain agility. We address the gap by illustrating that IS complements supply chain agility on various operational dimensions.

The empirical context of this research is the Chinese automotive industry, where firms pursue effective operations to meet rapid growth and demanding customers in which supply chain performance has a direct impact on sustaining competitive advantages. Survey is carried out and data were collected in the departments related to IS, procurement, manufacturing, and logistics, covering 2nd tier suppliers, 1st tier suppliers and Original Equipment Manufacturing firms. 116 surveys were collected.

Our results suggest that integrated IS, consisting of data consistency and cross-functional application integration, enables firms to achieve agile capabilities of supply chain through various operational integration processes. IS integration enables firms to un-bundle information flow and to improve the information sharing among supply chain partners to facilitate the understanding of customer orders and market changes, the process of creating information-based approaches in business processes, the coordination among partners and the focus on core competences. Furthermore, integrated IS in the context of supply chain agility results in significant and sustained operational performance, especially in responsiveness and dependability.

WD401 Issues in Implementation of Information Systems in Factories: The Role of Similarity and Difference of Business Functions

Osam Sato, Tokyo Keizai University, Japan
Yoshiki Matsui, Yokohama National University, Japan
Hideaki Kitanaka, Takushoku University, Japan

Appropriate utilization of Information Systems (IS) is important both for a factory to succeed. People have invented a variety of IS with sophisticated combination of computers, networks, robots, and software. Objectives, users, usage patterns, are different among

these IS. But basic technologies employed are same. Software and systems approach provides the flexibility and versatility to IS. There are many IS that have been used in a factory. Some of them are similar in a part, but not same if we investigate it in detail.

We can guess that level of implementation and customization differ both among IS and among factories. But we don';t have many empirical studies and findings about the similarity and difference of implementation and customization of a variety of IS in factories.

ERP is also used to integrate IS and functions materialized by IS in factories. But the level of implementation of any IS and integration of functions into ERP is different among factories as well as among IS functions. We did a set of empirical study to get the knowledge and report the results in this paper.

We used a set of data gathered from IS department of factories of major companies in seven countries worldwide by a questionnaire. The focused industries are electric and electronics, machinery, and automobiles. The IS we focused range wide, 31 types of IS.

After a series of statistical analysis, we found the levels of implementation of IS and integration to ERP are not so different between world class factories and traditional factories with some exceptions. Level of implementation among IS as well as ERP relates significantly by factories. But the similarity varies depending on type of IS and functions integrated into ERP. Some IS, e.g. master production schedule, rough cut capacity planning, and material requirements planning have more similarity in terms of level of implementation to other IS. But other IS, such as groupware tools (e.g. Lotus Notes) and product configuration systems have less correlation to other IS.

WD401 Changes and Transitions in the Development of Enterprise Information Systems in Japan: An Empirical Study

Kazuko Hozumi, Kanagawa University, Japan

The objectives of this study are to identify transitional patterns of Japanese companies' usage of Information Systems (IS) and extract implications of their IS usage behaviors based on our own questionnaire and interview data of 89 Japanese companies established before 1980. Though Japanese companies' usage is unique, for example, few usage of ERP in manufacturing for its wide-spread introduction among leading companies, little has been reported and studied in academia about changes and transitions of IS in Japanese companies except some Governmental Reports. It is difficult to discern strategic behaviors in IS under the situation.

We focus on three agenda in this research. First agendum is concerned with the life span of a particular IS introduced. Second one is to identify what determines the reshape of IS, that is, what underlies the restructuring of IS. Third agendum concerns with effects and changes that emerged after the restructuring. These agenda are important for us to understand the transitional patterns of IS.

Our study will show some counterintuitive implications or not generally accepted implications about Japanese companies'; IS utilization. Some of them are the life span is not influenced by the progress speed of information technologies (IT), the size of company, or industry. The restructuring opportunities are given by rational internal forces rather than external changes such as business alliance and organizational amalgamation. Though, when it comes to IS, sometimes many Japanese companies are said they have been led by external drivers such as new IT or IT vendors or companies, our finding suggests Japanese companies emphasize users' satisfaction and the fit with existing organizational structures. Also we found the economic situation such as recession or boom triggered the IS investment behavior of Japanese companies. Our study is exploratory, but we expect it gives some important implications on Japanese companies'; behaviors with respect to IS and IT.

WD401 A Framework of EAI for Extending and Enhancing ERP

Chien-Hua Mike Lin, Stephen Taraszewski, Cleveland State University, U.S.A.

Before the era of ERP, many medium-size and large corporations have a variety of computer applications such as SCM applications, CRM applications, BI (business intelligence) applications, and other transaction-oriented applications which typically, and other applications which typically cannot communicate with one another in order to share data or business rules. The emergence of the enterprise information system was supposed to solve such anomalies. However Global market forces place demands on an enterprise information system such that the need for flexibility and adaptability become paramount. However, companies are finding that the rigidity imposed upon the information system by ERPs is problematic at best. With the ever-increasing scenario of autonomous legacy systems and disparate ERPs being accumulated by organizations through mergers and acquisitions, there is a further need to develop an information infrastructure that can remain fluid as strategic opportunities and threats are assessed. In addition, customer demand for more and better services necessitate the ability for firms to remain agile and satisfy the needs of their clients.

In this paper, we will present a framework for EAI (Enterprise Application Integration) which provides the reference for integrate enterprise-type applications and the development of a dynamic information infrastructure. We will also argue that EAI is positioned as a viable solution for post-implementation ERP-based enterprise integration. Further, the extensibility and enhancement capabilities of EAI for post-implementation ERP solutions can enhance the value of an enterprise information system.

WD402 Wednesday, 15:15-16:30 Track: Supply Chain Management Chair: Macarena Sacristan-Diaz
Room: W2-402 Session: Case research on SCM 2

WD402 Open Innovation in Operation: Organizational Performance and Engineering Networks

Susan C. Morton, Neil D. Burns, Loughborough University, United Kingdom
Roula Michaelides, Liverpool University, United Kingdom

Much as the concept of innovation has moved from being closed in the previous century to being open in this, so too have the practices of organizations in their approach to intra- and inter-organizational teams and team working. The ability of an organization to innovate and improve is related not only to its ability to utilize the knowledge of its own employees and learn from past projects, but also in having good links to external sources of knowledge. As globalization increases so too does the need for communication among organizations and partners.

Contemporary business discussions encompass multiple people and multiple organizations across many locations: communication is vital in such instances of cross-boundary collaboration. Perceptive organizations create formal structures for innovation that facilitate meaningful conversation and enable reflection and debate to flourish. Conversation helps break down barriers, although it neither needs to be formal nor face-to-face. Indeed, some of the most productive relationships have flourished after mutual trust and understanding has developed through informal and online collaboration.

This paper reports on performance improvement work that is taking place with the case study organization: a post-lean company working with the research team to develop its ability to learn from other organizations. Results will be presented from this longitudinal study that is monitoring and evaluating organizational capacity to adopt and adapt innovation from external sources in order to maximize continuous innovative potential and improve performance in the global marketplace.

WD402 Vendor Managed Inventory Model in Case of Industrial Low-Cost Materials Management

Jukka Hemila, VTT Technical Research Centre of Finland, Finland

Globalisation of business environment has forced manufacturing companies to increase their competitiveness. Operation cost reduction, increasing of productivity and outsourcing of non-core activities have been hot topic both for academics and practitioners during last decade. There are many opportunities for manufacturers to achieve competitive edge, and the purchasing is one of those. With effective purchasing could be achieved cost savings both in materials and services. In some industries the material availability has been a bottleneck for operations. Long delivery times or lack of raw material has set a big challenge for manufacturers to compete and fulfil customer needs. The keywords like availability, cost efficiency and outsourcing of non core functions have been motivation for many industrial companies to implement Vendor Managed Inventory (VMI) program. VMI is one logistics method to transfer more responsibility from customer to supplier. VMI has its roots on retail sector, where collaboration between Wal-Mart and Procter & Gamble is said to be one of the first successful VMI partnerships. Since then other industries have noticed the advantages of VMI, and nowadays VMI is widely used in all industrial sectors. From the academic literature could be found case examples of VMI in manufacturing industries. These examples are mostly focused on the valuable items, A- and B-class materials according the Pareto rule. The examples of the low-cost items, like MRO and C-class materials, are rare.

This paper is about the VMI models in low-cost material flows at the Finnish manufacturing industry. Paper presents the background information about VMI, based on the literature survey and findings in practise. Paper analyses how VMI effects on the supply chain management of manufacturing companies, and what are the reasons for implementation of VMI in low-cost materials supplier-customer partnerships. VMI is the topic of the responsible author's postgraduate degree (Licentiate of Science) studies. The paper concludes the findings from Licentiate of Science thesis. The research is based on the multiple case studies and action research methodology.

WD402 Measuring Supply Chain Performance - A Framework for Proritizing Measures

Aron Chibba, Halmstad University, Sweden

One could consider changing the expression "organisations compete on a market" to "supply chains compete on a market". The reason for this is that most organisations are interested in reducing cost and increasing profitability. The need to evaluate the appropriate type of supply chain performance measure is vital, as it can affect the decision-making process e.g. inaccurate or unreliable information may lead to wrong decisions followed by counter-productive actions.

Supply chain performance measures are often referred to in research and by practitioners as quality, delivery, cost/price and flexibility. The metrics describing these measures are: time to deliver a product, number of products delivered without defects, cost of a product etc. This paper focuses on the analysis of the supply chain performance in manufacturing organisations, i.e. the measures and metrics used to describe the performance of the supply chain. The main research question in this paper is: What types of supply chain performance measures should be prioritised to measure in different types of supply chain?

The objective of this paper is to present a framework that identifies which performance measures and metrics should be prioritised in relation to the type of product manufactured and the type of supply chain in which the organisation operates; i.e. efficient, quick, agile, market responsive, lean or hybrid. The objective is also to use the product life cycle (PLC) approach.

The method used to develop the framework in this thesis is built on the scientific principle of adding small pieces of theory to existing well known theories. The point of departure is the well known product life cycle (PLC) model with its four phases, which was used as a base for adding both old and new theory.

The framework presented consists of three descriptions of theories, which, when combined, provide valuable guidence for the priortisation of performance measures to be evaluated by manufacturing organisations. The three theories are presented below: 1) Type of supply chain; i.e. efficient, quick, market responsive, lean and hybrid; 2) Type of supply chain performance measure; i.e. quality, delivery, cost and flexibility; 3) Scope of measurement in the supply chain; i.e. functional, internal integrated supply chain, one sided integrated supply chain and total chain.

WD402 Measuring Supply Chain Performance: What Metrics Do Matter?

Job A. C. de Haan, Tilburg University, Netherlands
Macarena Sacristan-Diaz, University of Seville, Spain

Nowadays, chains rather than individual firms compete when serving the final customer. On a firm level performance measurement is strategy-driven. However on a chain level the partners as a whole do not have an explicit strategy and nobody is hierarchically in charge of the whole chain. This complicates performance measurement considerably. Although much literature exists on supply chain performance measurement in general and SCOR more in particular, still many questions remain unanswered. The issue of effective implementation, evolution over time and maintenance of the systems are among these questions. This paper focuses on the evolution and maintenance of the metrics in the systems as markets develop. Often these developments are not synchronized throughout the chains, e.g. if perishable fruits are processed into preserved marmalades, or if general fabrics are processed into customized dresses. In such cases the content and relevance of performance measures may differ in various stages of the chains.

The central research question of this paper is: how can performance measures be aligned in different stages of the supply chain? To answer this question we build a conceptual framework of supply chains with various stages with each different dominant performance criteria. In addition to this, cases will illustrate the message of the model. These cases have different backgrounds as they are from Spain and the Netherlands, as in some of them large retail chains are dominant and in others producers of branded products, as the products differ with respect to length of item life cycle and whether or not they express life style of the final consumers. The final conclusion of the paper is that the most dominant player in the chain with respect to the final customer sets the performance measurement system and chose the key performance indicators. These indicators will be imposed on and accepted by the other partners in the chain as far as this improves the overall chain performance. Whether the partners continue to accept depends on the perceived fairness of the sharing of the value added. Consequently the question is not whether firms or chains compete with each other but how dominant players in a chain compete with other, backed up by their partners in it.

WD403 Wednesday, 15:15-16:30 Track: Invited Chair: Sean X. Zhou
Room: W2-403 Session: Modeling: Supply Chain Management

WD403 Optimal Purchasing Policies of Fresh Product with Random Delivery Times
Xiaolin Xu, Xiaoqiang Cai, Chinese University of Hong Kong, Hong Kong
A distributor plans to purchase a fresh product from multiple suppliers, to sell it at a whole-sale market. The delivery time from each supplier is a random variable. The whole-sale market opens for trading only within a short time interval, and so any product arriving earlier has to wait and faces the risk of decay, while arriving later will lose the sales opportunity at the market. We formulate the problem as a multi-supplier selection problem with random yield. We derive the optimal selection criteria and propose algorithms to solve them.

WD403 Dynamic Pricing and Inventory Control in a Make-to-Stock Queue with Information on the Production Status
Liuxin Chen, James Z. Pan, *Frank Y. Chen, Chinese University of Hong Kong, Hong Kong
This paper addresses the dynamic pricing problem of a single-item, make-to-stock production system. Demand arrives according to Poisson processes with changeable arrival rate dependent on the selling price. Item processing times follow an Erlang distribution, which allows to use the information on the production status in a tractable way. The objective is to identify a dynamic control policy that decides production and adjusts the sale price to maximize the long-run total discounted profit. We characterize the optimal policy which coordinates the production and pricing decisions. Such a policy is based on the so-called "work-storage level" which captures the information of the inventory level and the status of on-going production process. Specifically, we show that 1) the finished goods inventory is optimally managed by a base stock policy: when the inventory is below a certain work-storage level, production is started if the system is currently idle, to raise the inventory to the base stock level; and 2) the optimal management of the demand process follows a price switch threshold policy: a certain price is posted when the work-storage level is at or below a fixed threshold corresponding to that level of price. Moreover, we develop an effective algorithm to compute the base stock level and price switch thresholds. Finally, we use our model to quantify the benefit of emerging technologies such as RFID that can provide the information on the production status or the location of the pipeline inventory along the supply chain.

WD403 Competitive and Collaborative Quality and Warranty Strategies in a Supply Chain
Yue Dai, Fudan University, China
Sean Zhou, Chinese University of Hong Kong, Hong Kong
In this paper, we consider a two-echelon supply chain with one manufacturer selling to one retailer. The product quality level and the warranty protection period need to be determined before the selling season. The retailer faces random demand that is sensitive to the length of warranty period. Two scenarios are considered: the manufacturer determines the warranty period or the retailer determines the warranty period. We investigate the equilibrium behavior of the decentralized supply chain under these two scenarios and provide some structural properties of the equilibrium. We show that, under both scenarios, it is not always beneficial for the manufacturer (the retailer) to increase (cut) the whole sale price. And we find that either the manufacturer or the retailer choosing the warranty period may improve the supply chain performance and customers satisfactory (higher product quality and longer warranty period) depending on the system parameters. Finally, we design a contract that allows the decentralized chain to perform as well as a centralized one.

WD403 Optimal Control of Inventory Systems with Multiple Types of Remanufacturable Products
Sean X. Zhou, Zhijie Tao, Chinese University of Hong Kong, Hong Kong
Xiuli Chao, University of Michigan, U.S.A.
Product returns have become a significant part for many manufacturing, distribution, and retail systems. Since products are returned under different operational conditions, they usually require different remanufacturing effort/costs. In this paper, we study a single-product periodic-review inventory system with multiple types of returns. The serviceable products used to fulfill stochastic customer demand can be either manufactured/ordered, or remanufactured from the returned products, and the objective is to minimize the expected total discounted cost over the planning horizon. We are interested in the optimal manufacturing/remanufacturing policies for systems without or with possible disposals of returned products. We show that, under some circumstances but not all, the optimal policy has a simple form and can be completely characterized by a sequence of constant control parameters. However, in other scenarios, the optimal policy is quite complicated and its control parameters are state-dependent. As the state-dependent policy is difficult to compute and implement, we develop simple heuristic policies for managing the system. Numerical studies show that the heuristics are effective. This work is motivated by a project with a major energy company that manages its inventory through the options of ordering and remanufacturing returned products of various conditions.

WD405 Wednesday, 15:15-16:30 Track: m-Inventory Theory Chair: Zhe George Zhang
Room: W2-405 Session: Modeling: Capacity and inventory management

WD405 A Multi-Component Available-to-Promise Stochastic Programming Model
Chien-Yu Chen, George Mason University, U.S.A.
An assemble-to-order (ATO) manufacturer needs to promise customer orders from different demand channels over several time periods. Customer orders from each demand channel require a certain subset of critical components. To enable real-time order promising, an available-to-promise (ATP) system pre-allocates the availability of each critical component into distinct time-channel buckets before knowing actual customer orders. Assuming discrete random demand scenarios, we formulate the ATP problem as a two-stage stochastic linear programming (SLP) model to maximize expected total profit. While time-channel pre-allocation quantities are the first-stage decision variables, the second-stage decision variables include sales, lost-sales, and ending inventories associated with each demand scenario. We solve the SLP model by using both decomposition and sampling techniques, and also conduct simulation experiments to reveal managerial insights of this ATP practice.

WD405 Optimal Sourcing Decisions under Alternative Capacitated Suppliers
Tarkan Tan, Eindhoven University of Technology, Netherlands
Osman Alp, Bilkent University, Turkey
Consider a producer which has the option of either producing an item in-house or outsourcing production to different capacitated suppliers. The firm has to decide how much of which option(s) to use. The same problem also exists for procurement decisions of companies. In this study, we deal with this problem when the item under concern faces stochastic demand. In addition to the variable costs of production and outsourcing, we assume that a separate fixed cost is incurred for each of the options utilized. We first show that the problem under concern can be transformed into a specific version of the fixed charge knapsack problem. Then we propose exact and heuristic algorithms to solve this problem. We also present a numerical study to compare the performance of algorithms and to assess the sensitivity of problem parameters to the optimal decision in order to provide managerial insights.

WD405 Inventory Models with Multiple Uncertain Supply Sources
Zhiyuan Chen, Houmin Yan, Chinese University of Hong Kong, Hong Kong
This paper considers a periodic review inventory system with multiple uncertain supply sources. These supply sources are with different costs and lead times. We assume that it is cheaper for a supply source with a stochastically larger lead-time. With an investigation to order crossing features, we develop structural results for the system with two supply modes; that is, one source is stochastic faster than the other. In particular, we address the matter when the base-stock policy remains to be optimal for inventory systems with uncertain supply sources.

WD405 Modeling Production and Inventory Systems with Multi-Server Vacation Models
Zhe George Zhang, Western Washington University, U.S.A.
Siping Su, Simon Fraser University, Canada
In this research, we investigate a manufacturing system combining "make-to-order" and "make-to-stock" productions with random demand by utilizing multi-server queueing model with server vacations. With such a model, the issue of capacity allocation and inventory decision is addressed. Using some approximations and bounds, we develop some closed form solutions to the optimal policy parameters. Numerical examples are also presented to show the accuracy of these formulas.

WD501 Wednesday, 15:15-16:30 Track: Spanish Chair: Luis Alejandro Rodriguez
Room: W2-501 Session: S-Purchasing management and strategy

WD501 The Environment as a Determinant Factor of the Implementation of Advanced Purchasing Practices
Javier Gonzalez-Benito, Universidad de Salamanca, Spain
Duilio Reis da Rocha, Universidade de Fortaleza – UNIFOR, Spain
Although within the scope of strategic management the environment has been considered as a fundamental variable to explain the strategic behavior of companies, few works analyze the environment in the formulation and implementation of functional strategies. In the last few years, the strategic importance of the purchasing function has significantly grown in industrial sectors. The identification of suppliers in the research of Michael Porter as critical elements in the strategic analysis or in the success of the Japanese productive systems in the eighties has been noted as a driver of this larger recognition. As a consequence, in the last two decades, many published works have addressed the identification of the determinants and consequences of the different options and strategic decisions used in the purchasing function. However, very few works have analyzed the determinant power of the environment in the formulation of the purchasing and supply strategy. Those works that have examined this role have centered on a single dimension characterizing the environment and have not attempted to discriminate those dimensions with a greater explanatory power. The present work intends to contribute to the development of this field of research by jointly analyzing the relationship between four characteristic dimensions of the environment - munificence, hostility, dynamism and complexity - and the implementation of supplier development, evaluation, involvement and logistic integration practices. We have labeled these practices as 'advanced' because they represent strategic alternatives that break with traditional or competitive paradigms. Given the interest they have aroused and the competitive potential that has been attributed to them, it is especially interesting to identify in which contextual circumstances companies consider their implementation appropriate.

WD501 Comparative Study of Purchasing and Sourcing Management in Spanish Industry
Ana M. Mejias-Sacaluga, Jesus Garcia-Arca, Jose Carlos Prado-Prado, University of Vigo, Spain
The interest of this paper is focused on purchasing and sourcing management and buyer-supplier relationships. The strategic importance that purchasing, especially of strategic raw material, has for most of the industrial sectors is clear (Carr and Pearson, 2002; Carr and Smeltzer, 1999; Carter and Narasimhan, 1996). On the one hand, the cost of purchasing is usually higher than the costs of production and physical distribution and, on the other, in many cases raw materials are scant resources. This took companies, in the present situation of globalization, to search globally for suppliers, trying to obtain lower prices and security in the supply, for which it is fundamental to establish long-term relationships with these suppliers (Cooper and Ellram, 1993). Thus, this paper presents a comparative study of purchasing and sourcing management in 36 Spanish companies of four sectors (food, fashion, kitchen furniture and granite) and 9 international leading companies of these sectors. More specifically, the objective of the study has been to analyse how the processes of purchasing and sourcing management have been implemented in these sectors, in order to: - Evaluate, in each, sector the strategic approach that this function has in the companies (level of implementation of the best practices, both strategic and operative, in this field); - Compare the results between the sectors considered and leading international companies in each sector; - Establish improvement actions according to the gaps detected in the companies with regard to the most developed companies in each sector and between one sector and the others. The basic technique for collecting data was a personal interview in companies, aided by a structured questionnaire (with open and closed questions).

WD501 Approach to a Methodology to Verify the Development and Coherence of an Operations Strategy
Luis Alejandro Rodriguez R., Universidad Nacional de Colombia, Colombia

Based on basic concepts of corporative strategy and operations, the development of a methodology is intended that allows the evaluation, deployment and congruency of these strategies for a company in the field of production of cement in Colombia. The methodological proposal answers questions such as: - Which are the criteria to characterize a strategy of operations? - In what extend the policies and strategies of the operation have congruency in relation with the strategies of companies or corporations? - Is the operation a source of competitive advantage? The proposal explores the development of competencies and advantages through the processes based in the following conceptual statements: -The consolidation of sustainable competencies and capacities, with no imitation are the result of the processes of collective learning (Prahalat y Hamel, 1990); - Competencies come from exclusive, rare and no imitable processes, with no substitutes (Barney, 1991); - Competencies and capacities come not from the resource itself but from the movilization of the resource through the processes (Lorino, 2000). The methodology applied to the company subject of study allows the identification of a profile of its global strategy and its strategy of operations in relation to its distinctive abilities, available resources and priorities, applying them according to strategic operation criteria. The analysis concludes with a reformulation of the methodological design as a contribution for future evaluations. The methodological contribution to the identification and interrelation of factors associated with the policies and strategies of management of the operations allows the qualitative evaluation, its congruency and contribution to the general management of the above mentioned company. In the same way, it makes possible to reformulate with more clarity new strategies for a near future.

WD503 Thursday, 13:40-14:55 Track: Supply Chain Management Chair: Andrew Junfang Yu
Room: W2-402 Session: SCM practices

WD503 Supplier Risk Relationship Management (SR2M): A Theoretical Framework.
Amrik Singh, Naomi Brookes, Aston University, United Kingdom

Supply Chain Risk Management (SCRM) has become a popular area of research and study in recent years. This can be highlighted by the number of peer reviewed articles that have appeared in academic literature. This coupled with the realisation by companies that SCRM strategies are required to mitigate the risks that they face, makes for challenging research questions in the field of risk management. The challenge that companies face today is not only to identify the types of risks that they face, but also to assess the indicators of risk that face them. This will allow them to mitigate that risk before any disruption to the supply chain occurs.

The purpose of this paper is to identify the types of risk that a small to medium sized enterprise (SME) in the aerospace industry currently faces today. This will be followed by looking at the behavioural indicators that occur in the organisation that first alert managers as to what type of risk that they may face, thus allowing them to formulate risk mitigation strategies. The SME was found to have a common perception as to which of its suppliers were most at risk. However, no formal process of mitigating that risk was in place. Furthermore, it was found that identifying risk through the organisations social networks was very important. A process of supplier risk relationship management (SR2M) was proposed to the organisation in order for it to identify and mitigate the risks it faced as identified by the behavioural indicators and social networks. SR2M = Critical Supply Information + Processes + Triggers. Thus, the critical supply information would include the behavioural indicators, as discussed earlier; the processes would include the social networks that exist in the organization; the triggers would include the points to action when a risk is found through the processes and critical supply information.

This paper extends practitioners and the academic understanding of the SCRM issues that face a SME in the aerospace industry. This has allowed the researchers to develop a methodology (SR2M) that allows practitioners to develop a tool that will let them mitigate the disruption risks that they face. This tool could be a combination of human interaction and a computer based repository.

WD503 Optimal Operation of Petrochemical Product Chain
Kentaro Yasuda, Kagoto Nakagawa, Masayoshi Takada, Mitsubishi Chemical Corporation, Japan

Current situation surrounding petrochemical industry is very severe, and each company is searching the way to become more competitive to survive the competition. Our company has three olefin plants and three aromatic plants in two petrochemical complexes in different location. More than ten downstream plants are located within or outside these complexes and we supply olefins and aromatics to all these plants. Some products from those downstream plants are used as intermediate feedstock to other plants. As the chain structure is quite complicated, determination of the olefins/aromatics allocation to each plant is complicated issue and is hard to evaluate the allocation, if this is the “best” or not.

We have introduced overall optimization of olefins/aromatics product chain to evaluate and optimize the operation. We have modeled whole product chain starting from olefins/aromatics using large scale non-linear programming. Solution gives us the most profitable plant operation and olefins/aromatics allocation.

In this presentation, we will show the example of our usage of this model as the decision support tool for the strategic planning. In our long-term planning of petrochemical department, we calculate the optimal operation of olefins/aromatics product chain. It shows us the operation improvement from the base plan and potential benefits we still have. We also investigated some investment plans, by performing case studies with modified model. The result quantifies the difference of each plan from the point of optimal allocation of olefins/aromatics with limited availability. This study showed us not only the optimal operation in the current situation, but the future direction to strengthen our competitiveness.

WD503 Strategic Global Supply Chain Positioning
Watcharavee Chandraprakaikul, Tim Baines, Roland Yan Guan Lim, Cranfield University, United Kingdom

It is widely accepted that customers are increasingly sophisticated in their demand for differentiated and better quality products. At the same time competitive pressures in global markets are intensifying especially from low cost countries. Therefore, strategic global supply chain positioning to take comparative advantages of different countries has become a critical element in enhancing company profitability and developing competitive advantage. Strategic global supply chain positioning is concerned in a holistic view with the choice of production-centred activities a company carries out internally and those provided externally and the decision of the most suitable configuration for those activities. In practice, it is directly impacted by actions associated to supply chain interfaces such as outsourcing, make or buy, offshoring, physical distribution management and infrastructure acquisition. The strategic global supply chain positioning decision is a complex task and many manufacturing companies are facing difficulties to make the decision. Moreover, currently there is no entire methodology to support manufacturing companies through all stages of the decision.

Therefore, the aim of this paper is to develop a methodology for global supply chain positioning and to evaluate the methodology into three industrial case studies. In order to achieve the aim of the research, the four-phase research programme has been defined. The first phase is to explore how leading manufacturing companies form their strategic positioning decisions. The second phase is to form a methodology based on the preliminary process from phase 1 and detailed process content from literature analysis in this phase. The third phase is to evaluate the methodology through industrial application into three manufacturing companies. The last phase is to analyse and discuss the results from industrial application and these results are then made to the refined methodology. The final methodology can provide an integrated and holistic approach to help decision makers of firm in the industry to identify the appropriate strategic position for their organisations, or in other words, to identify their optimum competitive space for manufacture.

WD503 Proactive Supply Chain Planning: a Dynamic Quantitative Planning

Timothy P. Tsai, Texas Instruments, U.S.A.
Junfang Yu, Southern Methodist University, U.S.A.
Wang Yiu Yuen, Texas Instruments, U.S.A.

This paper aims to promote planning practice from a passive, fire-to-fire operation into a proactive, leading role to plan in advance for supply continuity assurance. It will be too late to know the delinquency to react at the time of deliver from supplier since allocation and finding alternative sources all takes time and might suffer possible constraints from surge capacity or technology as well. In a volatile, on-demand market today, the ability to be proactive in planning is mandatory.

This study is to build a supply chain planning model which collaborate the dynamic supply chain data with multi-tiered suppliers in real time. This model provides the supply picture in the WIP and preparing material stages from the upstream in supply chain, and it is then used to calculate the arrival probability to compare with the committed shipping schedule for the planner to take action in advance. The action could drive supplier to catch up, build up inventory level from other sources, and reallocate among existing supply network, or even switch to new suppliers. Those all are possible solutions if there is enough time proactively. This ability is important especially to process industry that has long lead time and high switching cost on switching supplier.

The model is verified and implemented using a platform “Commitment Processes” which is a third-party platform to conduct the real time collaboration and dynamic negotiation on supply and demand. The planning job is therefore highly simplified by the enabler, which is much more reliable than the traditional email and file based collaboration and much easy and much less expensive to implement comparing with top notch Supply Chain System. In our experience, selecting such a third-party platform is also critical for fast switching on supplier array as well. With the build-in knowledge in the platform planner can focus on internal actions to take in a faster response and be scalable in managing suppliers.

Proactive planning not only provides a proactive way to prevent de-commitment from supplier, but also a powerful tool to adjust upside or downside from the dynamic demand. In today’s dynamic, competitive business environment, fast response in the entire value chain is one of the key success factors and it is exactly what the proactive planning performs.

RA202 Thursday, 8:30-9:45 Track: Quality Management and Six Sigma Chair: Natcha Thawesaengskulthai
Room: W2-202 Session: Perspectives on quality management 1

RA202 Performance Appraisal of RAJA Passenger Trains Operating Co. Using EFQM Organizational Excellence Model
Hassanali Aghajani, University of Mazandaran, Iran
Mohammad Alikhani, Islami Azad University of Ghaemshahre, Iran
Zohreh Allai, Iran
Scholars of management and organization studies believe that in contemporary competitive world, the appraisal of organizations performance is one of the most important actions for survival of organizations. The appraisal of organizations performance is related to control function - as one of the four elements of organization and management knowledge - in organizations. The appraisal of performance measures existence situation in organizations, and its output will be a base for continuation, modification or prevention of work doing.

In this article, with the goal of using EFQM Organizational Excellence Model for performance appraisal of RAJA Passenger Trains Operating Co., and after literature review, the Performance of RAJA Passenger Trains Operating Co. is investigated and analyzed. In this research, the statistical population and sample were 60 and 15 elements, respectively. Data collection instruments were Questionnaire and Documents, and collected data was analyzed by RADAR Logic. The results of research state that the Performance of RAJA Passenger Trains Operating Co is weak in different domains (195 mark from 1000). Finally, it is concluded with discussion, a summary of the key issues, implications for real world, and directions for further work.

RA202 Managing Quality in the Chinese Context
Yun Qiu, James D. Tannock, University of Nottingham, United Kingdom
A big challenge in managing global supply chain is to understand the complex and changing influences on quality and its management, including societal, environmental and cultural contexts as well as the government policy.

This research addresses an important issue of managing quality in the Chinese context through case study method. The questions of interest are: what are the quality management developments in China, what is the current status of quality management in China, what are the relationships between quality management and organizational culture, how does the Chinese context impact on management of quality, and what role does the Shanghai Quality Association play in management of quality. China is chosen because its importance to the global economy is well recognized for more than a decade. Shanghai is chosen as the target area because it is the China's major 'growth engine' and an important international and industrial centre.

The literature review of this research provides important background and secondary data for the empirical study in Shanghai. The primary data consists of six in-depth case studies and interviews with quality professionals in Shanghai. The findings suggest that the selection and implementation of quality management initiatives in Shanghai are customer- or market-driven, which are particularly visible in Chinese enterprises; there are phenomena of both "nominal" and "localized" quality management practices; and interestingly, the relationships between quality management and organizational culture in Chinese enterprises are found to be different from those in Foreign-Invested Enterprises. The results of this research should be of interest for academic scholars, both foreign and Chinese management practitioners, and quality professionals.

RA202 Concept for Collaborative Quality Management in Manufacturing Networks
Patrick Sitek, Marcus Seifert, Klaus-Dieter Thoben, Bremen Institute for Production and Logistic, Germany
Market success depends more and more on the ability to provide customized products. The increasing complexity of these products led to the situation that capital intensive, complex investment goods are almost realized in cooperative networks between partners. Today's opportunity to have worldwide access to resources and capacities enables companies to select for each business opportunity the best suitable partners to fulfill these highly customized products. Core competencies of each network partner and their resources are job-oriented combined for a defined period.

Networks are often characterised by the absence of hierarchies keeping and respecting the autonomy of each network partner. Also the abandonment of formal structures in networks as well as their temporary existence results in higher self-complexity and self-dynamic. Following informal structures, networks often show a diversity of production methods and information systems which have been brought along by each partner. This diversity results in unstructured production processes and disruption of information flows between network partners. Consequence of which are non value creating processes like reworking or redundant processes that finally affect the entire network output in a negative way.

However, in networks, quality aspects still seem to be of secondary importance. While being a network partner, companies often do not dispose of right concepts to measure and control quality of their network processes. Functionalities of existing quality management systems are limited to guarantee process quality within the own company but not in networks. While using traditional quality management systems, networks might run the risk of setting up a kind of "quality-bureaucracy" which could foil their essential principles. The risk to loose the advantages of a flexible network and to become more and more an inflexible traditional organization rises with the amount of norms and guidelines.

The paper will provide a concept for a collaborative Quality Management in manufacturing networks. It respects and covers quality requirements in networks and therefore contributes to process reliability and stability in manufacturing networks that are an important asset for today's production.

RA202 Selecting Quality Management and Improvement Initiatives
Natcha Thawesaengskulthai, Chulalongkorn University, Thailand
The increasing pressure towards continuous improvement (CI) and the organisational desire to achieve business excellence or to become a world-class organisation drives the adoption improvement initiatives. The CI mindset has urged managers to continuously improve their operations and look for best practices to adopt; this has become a common practice especially in such fast-growing newly industrialised countries such as Thailand. At one time, there were only few choices to choose from, e.g. QCC, JIT, and 5S. Now, a plethora of improvement initiatives have been created, mainly from the United States, and Japan, and they have accumulated over the past fifty years of Quality Management (QM) and CI development. Total Quality Management, ISO9001, Six sigma, Lean production, Business Process Reengineering, and Business Excellence model (MBNQA, EFQM) are among the popular management programmes to maintain organisation's improvement efforts.

Managers who do not claim to adhere to the latest QM or CI fashion may be afraid that they are slipping behind the competition - the 'me-too' syndrome. A growing number of publications have questioned and raised awareness of improvement fashions, especially in the area of QM and CI but literature in general management and strategic decision-making have urged managers to make rational decisions in initiative adoption. However, there is a limited body of research and literature addressing rational decision criteria for selecting improvement initiatives. Thus, this paper addresses the selection issue and presents a framework for selecting a QM and improvement initiatives. The research was carried out in three phases. Phase One established a conceptual background for the adoption based on extensive literature review. Phase Two provided empirical studies of the QM approaches adopted in three leading case companies in Thailand. Finally, Phase Three presented the selection framework and the theory of selecting QM and improvement initiatives which explained the four selection paradigms of fashion setting, pay-off, strategic fit, and organisation fit. The article concludes by discussing the phenomenon of QM adoption, and suggesting the way in which the selection framework might be most effectively used by managers for decision support in the choice of quality initiative.

RA301 Thursday, 8:30-9:45 Track: Mass Customization Chair: Dian Yan Liou
Room: W2-301 Session: Mass customization

RA301 Customers' Perceptions of Mass Customized Products in Service Sector in Greece
Irene Samanta-Rounti, Graduate Technological Education Institute of Piraeus, Greece
The aim of this study is to examine the current state of mass customisation from the perspective of banking services. The paper investigates three basic questions: Do customers need custom products? What prevents them from purchasing what is on offer? Do firms fail when introducing mass customisation? The sample used consisted of 558 customers of the five major Greek banks with a market share in excess of 65%. The participants were selected accordingly and research was conducted by personal interview.

The study refers to terminological problems, a shortage of reliable information about the real demand for customised products, and lack of management knowledge about organisational and strategic capabilities of mass customisation operations. From the practical point of view, customers understand what comprises a mass-customised product and also agree that the potential benefits that someone can enjoy from using such products may be greater than the benefits of a standardised product. The survey, however, underpins the following paradox. The majority of customers still prefer to use banking products or services that reflect a more standardised character. We therefore have to take into account that the progress and development of that kind of product, especially in the banking sector in Greece, only started some years ago. This paradox may look reasonable, if, before a mass-customised banking product is established, managers become familiar with it and recognise that it can be a useful tool for meeting customer needs more fully. Today organisations are changing to a more customer-centric approach using technology to obtain and manage customer data and any general information that can depict the profile of the customer. A major factor for the smooth transition from standardised to more mass-customised products and services is the time factor, given that news spreads quickly in the information era. The study evaluates different aspects of mass customisation and other forms of customer-firm value co-creation. The research analysis proposes a number of reasons why mass customisation has not reached its predicted growth and state of implementation.

RA301 Developing Ramp-up Strategies for A New Product Introduction in the Area of Mass Customization
Herwig Winkler, Michael Slamanig, Bernd Kaluza, Alpen-Adria-University Klagenfurt, Austria
Mass customization is the most successful hybrid competitive strategy. A significant amount of research has been done on various areas in the field of mass customization, such as configuring production and logistics systems, designing adequate information systems, and handling internal and external complexity. Most approaches have assumed both a given and a stable product range. Curiously, there are no studies that address, within the field of mass customization, problems related to new product introduction. The management of new product introduction, especially the ramp-up phase, poses an extraordinary challenge. An ineffective or inefficient ramp-up endangers the strategic position of a mass customizer. The purpose of this study is to erase this deficit; that is, to investigate occurring problems in ramp-ups within new product introductions. We discuss the requirements for ramp-ups in mass customization in cases of new product introductions. Furthermore, we develop specific ramp-up strategies for realizing successful new product introduction within mass customization.

RA301 The impact of Customer Learning on Mass Customizat Capability: An Exploratory Study of the Contextual Factors
Min Zhang, Xiande Zhao, The Chinese University of Hong Kong, Hong Kong
This study investigates the factors that moderate the impacts of customer learning on mass customization capability (MCC). Building on the social learning theory, we argue that both customer learning and internal knowledge creation practices contribute to the MCC and the later also moderates the impact of customer learning on MCC. Moreover, according to the arguments of knowledge creation theory, we propose that organization's conditions (continuous improvement, coordination in decision making, and interfunctional design) will enhance internal knowledge creation's moderating effects on customer learning. We employ regression analysis to test the hypothesized main and interaction effects, using data collected from 237 manufacturing plants in three industries and eight countries. Our results provide empirical evidences on the effects of the proposed contextual factors in supporting customer learning. This research is one of the first studies to integrate insights from social learning theory and knowledge creation theory. It contributes to the mass customization literature by exploring the contextual factors supporting customer learning, one of the key practices for mass customization.

RA301 The Flexibility of Service Operations for Banks: An Empirical Approach in Taiwan
Dian Yan Liou, Yu Da College of Business, Taiwan
Like most service companies, banks today face a myriad of demands on their delivery processes made by an increasingly fragmented market. Output flexibility enables the service provider to cope with both uncertainties in demand and the external production factors. This paper examines the relationship between service operations flexibility and long-term profitability of Taiwan's banks. The regression analysis using panel data reveals a strong positive correlation between branch number and long-term profitability. This may explain why banks seek mergers with poorly operating financial institutions. The disadvantages of increased overhead expenses

for enhancing services may be temporary. Service firms, in the day-to-day context, should have the capacity to change rapidly when successful operational practices in their adjacent environment change.

Although various operational objectives are pursued by banks, long-term profitability is essential to their survival regardless of the objectives they pursue. To investigate the relationships between flexibility of service operations and long-term profitability of Taiwan's banks, we adopt a special profitability measurement: the difference between internal rate of return (IRR) on cost and value, proposed by Fama and French (1999). Most researchers make theoretical contributions, while the few empirical works published use flexibility or adaptation indices that measure the number of times firms have changed, modified, or adopted different components or conducts (services offered, target customer profile, facility, or space requirements, etc.). According to these bases, the purpose of this paper is multiple and twofold: (1) to apply a manufacturing flexibility framework to service operations considering necessary adaptations to service industries' nature; and (2) to enhance the understanding of interactions between service operations strategy and long-term performance measures to the different dimensions defining both constructs in order to investigate the relationships between them. The empirical verification of this research will be developed within the service setting of banking in Taiwan.

RA302 Thursday, 8:30-9:45 Track: International Operations Management Chair: Kasra Ferdows
Room: W2-302 Session: International OM 2

RA302 The Impact of National Culture on Operations Management

Zheng Liu, **Yongjiang Shi,** University of Cambridge, United Kingdom

With the development of international business and global supply network, the characteristics of each country involved including its cultural factors impact greatly on the international manufacturing system. Traditionally, culture is studied under anthropological and sociological context, whereas the research of operations management is focused on daily operations of factories. How to combine the culture theories with industry and to provide practical solutions is essential.

This paper aims to improve the understanding of the interaction between culture and manufacturing system, specifically on the impact of national culture on factory based operations management. From reviewing and comparing the most influential theories in national culture studies, four types of culture norms —attitudes towards time, human relationships, internal integration, and external environment— are classified. Meanwhile, the key decision areas of operations management are defined as process design, capacity management, inventory management, quality management, and human resource management. Research gap is identified and a conceptual framework is proposed indicating principal theories and specific research questions. Based on review and analysis, a novel matrix is created to explore the relations between each type of national culture and each element of operations management. In detail, culture is found out to be most important to the adoption of technology, planning, quality system and human resource management. Examples and cases are also provided as further explanation.

To move the research findings forward, implementation processes and practical solutions are suggested. Conclusions are made and recommendations are given on the future areas—what is impact of national culture on manufacturing system from factory-based operations management towards inter-firm supply chain management and intra-firm global manufacturing system management.

RA302 Born Globals from Brazil: How Do They Operate Internationally?

Luis Henrique Pereira, Universidade Ibirapuera, Brazil
Susana Farias Pereira, FGV-EAESP, Brazil

Born global firms represent a case of enterprises operating in time and space compression conditions which have permitted/forced them to assume a global geographic scope from their birth. Born Globals are firms that "adopt an international or even global approach right from their birth or very shortly thereafter" (Madsen & Servais, 1997, 561). The Brazilian case is particularly interesting because this phenomenon is quite recent in the country, but the few existing samples show that it can become an important trend among young Brazilian firms.

The purpose of this article is to discuss the usefulness of the Born Global concept from both a theoretical and empirical point of view. Moreover, the study intends to investigate the process of creation of new global ventures and how these firms establish and operate themselves in the new markets they enter. The research was carried out in Brazil. The investigation has been done with the use of a structured questionnaire sent to the most representative companies that started their business in the last three years and are already operating internationally. The main results show that there is not a single pattern to describe the way born global companies operate internationally. This may happen because those companies act in different industries and also have different size and structure

RA302 Bridging Cultural Gap between Thai and Japanese Expatriates: Case of Japanese Expatriate Developing Local Suppliers in the Thai Automobile Industry

Phallapa Petison, Mahidol University, Thailand

Many Japanese automobile manufacturers have indicated their commitment to use Thailand as their export hub into this region (Techhakanon, 2004). It is inevitable that the development of a parts supplier industry is needed, particularly since the establishment of the Japan-Thailand Economic Partnership Agreement (JTEPA). This need also has been influenced by the changing structure of the automobile industry; in that, parts are now produced not only to use for Thailand but also for global part sourcing. Aware of the importance to build and harness relationship between Japanese expatriates and local suppliers in order to work in harmony, this study is conducted aiming to explore the roles of Japanese expatriates in building and developing building local networks, to study what and how the cultural gap affects their performance of these roles and to find out how to bridge the cultural gap so as to facilitate development of local networks.

In order to accomplish these study objectives, qualitative research methods are adopted through in-depth interview, focus group, and plant visit. Four key automobile manufacturers have been selected for study: Toyota Motor Thailand Co. Ltd. (TMT), Hino Motors (Thailand) Ltd. (HMT), Honda Automobile (Thailand) Co., Ltd. (HATC) and Isuzu Motors Co., (Thailand) Ltd. (IMCT). The study began by examining policy of these four automobile manufacturers in working with local suppliers. In total 25 Thai managers from 10 suppliers were interviewed. Interview results showed that Japanese expatriates have varies roles when working with suppliers.

Roles are determined by assignment of expatriates, working processes, task readiness and managerial readiness of suppliers, and relationship between suppliers and automobile manufacturers. Although both parties aware of culture distance and language barriers and attempt to reduce these challenge, conflict and misunderstand still exist in the working relationship.

RA302 Models of Global Production Networks

Kasra Ferdows, Georgetown University, U.S.A.

There are two seemingly irreconcilable models for building production networks. One advocates staying footloose - that is, constantly searching the world for a better factory and moving production there as soon as possible; the other advocates developing deep roots - making long term commitment to each production site and giving it the resources to reach its full potential. Both models have their own logic. Those in search of more agility in an increasingly uncertain and volatile world usually argue for more footloose networks; and those who want more stability to develop unique production capabilities, ironically to cope with the same uncertain and volatile world, argue for more rooted networks. The first group wants to leverage capabilities of others and conserve own resources for other functions like design and marketing; second group wants to use own production and supply chain capabilities as a competitive weapon. Both models can be successful. IKEA, Nike and Dell have succeeded with the footloose model and Intel, H-P, and Samsung with the rooted model. The problem arises when a company adopts a model by default. In particular, those that end up with a footloose network--and there seems to be more of them in recent years--often get there not by a deliberate strategy but through a series of ad hoc decisions. Each of these decisions may be justified in itself; but, together, they put the company often on a slippery slope towards the footloose model. And the process seems to be practically irreversible. Using clinical analysis of selected real cases, the paper describes these models and provides a normative framework for assessing the conditions under which each model would be optimal.

RA303 Thursday, 8:30-9:45 Track: Invited Panel Discussions Chair: Brooke Saladin
Room: W2-303 Session: Panel Discussions: RFID

RA303 Research and Applications of RFID in Goods and Services

Brooke Saladin, Wake Forest University, U.S.A.
David Collier, Florida Gulf Coast University, U.S.A.
Kurt Hozak, Indiana State University, U.S.A.
Kirk Karwan, Furman University, U.S.A.

Radio frequency identification devices (RFID) and technology is experiencing rapid adoption in a wide variety of applications such as in manufacturing, health care, and supply chains. This session will focus on RFID research and applications in factories, services, and supply chains. Research results are presented on the impact of RFID on transfer lot and sequencing decisions using performance criteria such as flow time, tardiness, and number of material movements in a job shop operating environment. RFID applications are also presented in service systems such as in health care and retail stores. We end the session by summarizing RFID applications across the entire supply chain.

RA305 Thursday, 8:30-9:45 Track: Manufacturing Technology Chair: Charlotta Johnsson
Room: W2-305 Session: Manufacturing technology and ergonomics

RA305 The Different Electrode Materials Affect to Micro-Cracking Defective on Tungsten Carbide Surface in EDM Process

Natdanai Suetragul, Apiwat Muttamara, Thammasat University, Thailand
Pichai Janmanee, Rajamangala University of Technology Krungthep, Thailand
Yasushi Fukuzawa, Nagaoka University of Technology, Japan

Electrical discharge machining (EDM) is now a well-established machining option in many industries. Tungsten carbide (WC-Co) is an important tool and die material mainly because of its high hardness, strength, wear resistance and high melting point. Normally, EDM process generated micro-cracks on the surface of workpiece. Consequently, use the workpiece as mould or applicated tools cause short product life time and defected of product part. The objective of this research is to study the influences of different electrode materials on tungsten carbide workpiece with EDM process. The electrode materials are graphite (Poco EDM-3), copper - graphite (Poco EDM-C3) and copper-tungsten (solid). The important parameters are discharge current, on time, off time, open-circuit voltage and electrode polarity. A workpiece material is a tungsten carbide (W 90-Co10). The results show that the electrode negative polarity performs very well. Poco EDM-3 gives significantly higher material removal rate (MRR) and lower surface micro-crack density than the Poco EDM-C3 and copper-tungsten. Both powder electrode (EDM-3 and EDM-C3) give the better MRR and less micro-cracks than solid electrode. The results show optimum of all electrodes same parameters with negative polarity, open-circuit voltage of 90 V, current is 25 A, on time is 25μs and off time is 200μs. The effectiveness of the process is evaluated of surface micro-crack density and MRR increases with the discharge current intensity.

RA305 Robotics and ISA 88 Batch Control Standard - Opportunities and Challenges -

Charlotta Johnsson, Lund University, Sweden

Manufacturing processes can generally be classified as continuous, discrete or batch. An industrially well accepted way of structuring and controlling batch processes is presented in the international batch control standard, IEC 61512 (also known as ISA 88). In exploring how this standard could be applied for discrete manufacturing processes and robotics, different challenges and opportunities are found. This paper will present a number of different opportunities found and also some challenges. The main opportunity is the advantage of having a stable, well tested and documented framework to be inspired and guided by.

RA305 The Application of Ergonomic Research Principles for Workstation Enhancement of Apparel Machinists

Kem Ramdass, University of Johannesburg, South Africa
Leon Pretorius, University of Pretoria, South Africa

South Africa is developing its diversified commerce and industry base that has shown its resilience and potential to compete in the global economy, although it faces many ongoing challenges in the commercial and manufacturing sector. The clothing manufacturing industry is labour-intensive with repetitive and skilled manipulation of fabric. With a challenge of skills development, SA faces a dilemma in terms of its productivity status. Poorly-designed workstations contribute to cumulative trauma disorders (CTD) such as musculoskeletal disorders of the neck, shoulder and upper limb, collectively known as repetitive strain injuries (RSI). This highlights the importance of the implementation of effective ergonomic practices in the clothing industry, that would improve the competitive status of organization and in effect the country. The importance is further enhanced by the necessity for a productive economy and thus, the necessity for a productive workforce.

Ergonomics, which can be used beneficially in the clothing industry, can be described as a system of interaction between components in the workplace, which include the worker, the work environment both physical and organisational, the task and the workspace. Effective ergonomic interventions could reduce health problems and accidents in the workplace. The investigation included questionnaires and discussions with machinists, supervisors and management that could contribute to productivity improvement through the application of ergonomic principles.

This paper focuses on the application of ergonomics in the clothing industry sewing workplace. Ergonomics can be defined as fitting the job to the worker. Workers are not the same size and all have limitations. Ergonomics aims at designing workstations, work processes, equipment and tools to fit the worker. As a worker, it is important to understand how to adjust your workstation for maximum comfort. If a job does not fit a worker, the worker is more likely to be exposed to risk factors that may lead to musculoskeletal injuries. The fundamental ergonomic principals that should be followed in the workplace are discussed in detail as well as recommendations towards reducing injuries and improving the health and safety of workers.

RA305 The Role of Ergonomics towards Performance Improvement

Kem Ramdass, University of Johannesburg, South Africa
Leon Pretorius, University of Pretoria, South Africa

South Africa has developed an established, diversified commerce and industry base that has shown its resilience and potential to compete in the global economy. The commercial and manufacturing sector provides a locus for stimulating the growth of other activities, such as services, and achieving specific outcomes, such as employment creation and economic empowerment (www.southafrica.info). This highlights the importance of commerce and industry on the economy and growth of the country as a whole. The importance is further enhanced by the necessity for a productive economy and thus, the necessity for a productive workforce.

This article focuses on the application of ergonomics in the workplace. Ergonomics can be defined as fitting the job to the worker. Workers are not the same size and all have limitations. Ergonomics aims at designing workstations, work processes, equipment and tools to fit the worker. As a worker, it is important that he/she knows how to adjust the office workstation for suitability. If a job does not fit a worker, the worker is more likely to be exposed to risk factors that may lead to musculoskeletal injuries. The methodology uses a case study application in an office environment and investigates the current practices with a view to improvement.

RA401 Thursday, 8:30-9:45 Track: Information Systems and e-Operations Chair: Susan Morton
Room: W2-401 Session: Information systems 2

RA401 The Virtual Development Office Framework in Enterprises Network Organization: The GPT Case Study

Paolo Taticchi, Marco Botarelli, Luca Cagnazzo, University of Perugia, Italy

The globalization of competition has entailed that organizations of developed countries have to face new kinds of competitors with low labour cost and often advantageous exchange rates and consequently favourable export selling prices. In such a scenario, innovation and organizational flexibility are becoming fundamental leverages to enable enterprises to increase their competitiveness. Although the importance of the industrial cooperation in collaborative environment as success factor has been already evidenced since the end of 1800s, the networking concept is really actual and in continuous development. Where once individual firms battled against each other, today the war is waged between networks or interconnected organization. This trend compels actors to pay attention to the health and well being of their network and the individual partner as if it were their own company. For this reason, the need arises of an organizational methodology that enables organizational flexibility and capacity of performing innovation while promoting collaborative environments.

Our recipe consists of the concept of network enterprises, to enable organizational flexibility, and the formalization of VDO concept - Virtual Development Office - to enable innovation in a collaborative environment. In this paper the authors present the VDO model analysing a case study of an enterprises network in Umbria developed during a project supported by the same authors. The case study underlines the issue that enterprises competitiveness is not based on company or industry, but on the value creating systems themselves, within which different economic subjects work together to co-create value and build a stable business network. For these reasons during the analysis of the real case some critical factors have been highlighted and they are used to define some key figures that define and justify the VDO model.

RA401 Proposal of a Framework for the Analysis of the Innovation Process in Networks

Jose Alcides Gobbo Junior, Sao Paulo State University, Brazil
Marcos Augusto de Vasconcellos, FGV-EAESP, Brazil

In a competitive scenario, where innovation is important, the organizational ability in increasing knowledge becomes the base for an innovative company. Therefore, the potential of innovation is multiplied when the company is acting in a network. An innovative network refers to a number of digitally connected and technologically sophisticated companies, organizations and intermediate agencies with a high degree of innovation orientation (Carayannis & Wang, 2002). The change in paradigm for the competition in networks is demanding, from the researchers, a stronger effort regarding an extensive re-evaluation of the existing practices. Also, designing a knowledge management framework to assimilate and share among various networks constituents is a pre-requisite. In addition, applying various analytical tools, which utilize this knowledge effectively is another important activity as part of innovation in a network.

This work discusses the process of network innovation, analyzing some elements or dimensions, in both, the external and the internal scope, which helps in understanding an innovative network. The objective of this research is to propose an analysis framework of the innovation process in a network context. This research aims at answering the following question: How and why did the internal and external elements of the innovative network contribute to more or less innovation capability? The analysis framework was designed based on literature review, and a case study research was conducted to contribute to the analysis framework. In order to identify the series of events, the proposed methodology for the case study consists of two distinct phases: (I) the study, in depth, of the innovation cases, from the company where the network is delimited; (II) the comparative studies of the diverse organizations that constitute the network. Both phases unfold in three "fronts": the study of the time line (To understand the current situation, from the historical perspective of the network); the case study of innovation itself and, finally, the study of the elements, external and internal to a network, which contributes to be more or less innovative. This is the third "front" - that we call "Study of the Process of Innovation" - the focus of the present work.

RA401 A Choice Model in Voting for a Political Party

Ilkay Gultas, Istanbul Kultur University, Turkey

I tried to model a voter's preference relation between party A and B. The voter has some worries about both social and economical. The basic benefit-loss analysis of model will be between the probabilities of economic growth and the continuation of the remaining regime. I assumed that a probability that the regime stability will erode if party A will have the political power without a coalition. I will give the conditions in which the voter will vote for party A or party B.

RA401 Vote for Performance Improvement: Virtual Organizational Teams and e-Collaboration

Roula Michaelides, Liverpool University, United Kingdom
Susan C. Morton, Loughborough University, United Kingdom

The concept of collaborative engineering has evolved as a means for providing concepts, technologies and solutions for innovation and product development in dispersed engineering teams. In collaborative manufacturing the purpose is to streamline business and supply chain processes to enable more informed decision-making; allow multiple groups to act together in the setting of plans and policy; agree actions; and execute operations more effectively, while boosting organizational responsiveness and agility. Collaboration is a key issue for lean, agile and flexible manufacturing organizations, with increased industrial demand for this innovative approach based on the proliferation of networked organization structures in many industry sectors. Over the last decade, transferring and generating knowledge within and between organizations has been increasingly achieved through online communities of practice, with interaction through such professional and social networks facilitating access to expertise, and bringing about contact with people and ideas that may challenge the accepted way of thinking about things.

This paper reviews the role of communication technologies in the collaborative relationships within and between firms aimed at innovation, and elaborates the inherent risks associated with, and that may be exacerbated by the adoption of such technologies without due consideration of the drawbacks. In so doing, it also considers the efficacy of collaborative practices for facilitating improvement to organizational performance.

RA402 Thursday, 8:30-9:45 Track: Invited Chair: Duncan Shaw
Room: W2-402 Session: Disaster management

RA402 Supporting Security Officers: A Study of Operational Performance

Ben Clegg, Duncan Shaw, Pavel Albores, Prasanta Dey, Andrew Greasley, Aston University, United Kingdom

We will report on a project that reviews aspects of operational factors for current and planned security processes where officers screen people using metal detectors and screen their personal possessions using x-ray machines (for example, where people entering law courts, federal buildings, and the like). This action research project assesses what levels of performance for security officers are realistically achievable, and inform analysts on which measures will help ensure that security officers perform to an appropriate level. This includes those aspects of the current processes that need to be changed to enhance the current effectiveness of security officers and will address any remaining weaknesses within the current practices and procedures.

The project addressed the challenges faced by security personnel at screening checkpoints, where security officers are required to deliver consistently effective and sustained performance often under significant duress. Ensuring a safe, secure, and resilient screening system demands a multifaceted and multi-layered approach that requires the effective integration of people, processes, technology, and organisations. Despite the substantive contribution of technology, we recognise that for the foreseeable future the effectiveness of the security process will rely on the professionalism and expertise of security officers. A security officer is likely make in excess of one million critical decisions per year. The staffs who operate our security screening checkpoints are one of the most critical assets in our proportionate response to the threat of terrorism and one day, one decision made by one security officer will be the one thing that prevents or allows a disaster.

The objective of this project is to enhance the performance of security officers who screen people and their possessions as they enter secure buildings by ensuring that operational processes make optimum use of the strengths of both security officers and the deployed technology working together effectively. This paper will present emerging findings.

RA402 Disaster Recovery and Business Resumption Planning

Luis Antonio Delgadillo Gutierrez, Aida Fajardo Montiel, Jose de Jesus Gonzalez Hinojosa, Universidad de Guadalajara, Mexico

The disaster risk management is the systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. The business continuance that sometimes is referred to as business continuity describes processes and procedures an organization puts in place to ensure that essential functions can continue during and after a disaster.

The first step in business continuity planning is deciding which of the organization's functions are essential, and apportioning the available budget accordingly. New technologies, such as disk mirroring over the Internet, make it feasible for an organization to maintain up-to-date copies of data in different locations, so that data access can continue uninterrupted.

RA402 Evacuation Responsiveness by Government Organisations (ERGO): A Preparedness Toolkit for Europe
Duncan Shaw, P. Tissington, P. Albores, Aston University, United Kingdom
Governments across Europe are preparing their emergency services and civil contingency to respond to major catastrophic incidents. Mass evacuation is one aspect that governments have to plan for, coordinate and execute. Since the need for mass evacuation is rare and unexpected (in that advanced warning is restricted), operational preparedness often centres on building predictive models to evaluate the ability of different operational configurations to meet performance targets. Also, the achievement of performance targets depends on the preparedness of the public to respond to calls for mass evacuation. Thus responsiveness depends on the accuracy and utility of the predictive models which influence decision makers' operational commitments and the preparedness of the public to respond as required.

Ergo is a three year project that is funded by the European Commission under the Directorate-General Justice Freedom and Security (JLS/2007/CIPS/025). The presentation will highlight the work and results from Ergo and describe its focus on analysing operational capabilities through modelling operations. Ergo will survey how EU countries prepare for mass evacuation and broadly identify good practice to share across Europe. The project examines: What analytical models are used to plan for mass evacuation; What policies and programmes are used to prepare the public to mass evacuate; How these models, policies and programmes are implemented in practice; How to better align these models and policies and programmes.

Ergo will examine operations throughout the stages of mass evacuation: planning (before an incident), execution (during an incident, including evacuation, temporary shelter provision, food availability), and after an incident (recovery, returning people). Our research methodology is based around working closely with partners from five EU countries and benchmarking against one non-EU country. As well as conducting an in-depth survey, we will design generic models to analyse operations as well as deliver tailored training packages for each country to extend their mass evacuation operational capabilities.

RA403 Thursday, 8:30-9:45 Track: m-Supply Chain Management Chair: Henk Akkermans
Room: W2-403 Session: Modeling: Simulating SCM

RA403 What is the Right Supply Chain Flexibility? An Evaluation Framework and Model
Yvan Nieto, Gerald Reiner, University of Neuchatel, Switzerland
Most manufacturing companies throughout the world face increasing competition due to global competitors and increasing customer requirements. These evolutions are associated with higher product customisation and shorter life cycles that increase uncertainty of the market and push companies to develop new strategies. In the context of supply chain management, being prepared to adapt supply to unpredicted demand variation is of key importance for many supply chains (mainly responsive supply chain and agile supply chain). Therefore, flexibility is one of the most useful and necessary properties of modern manufacturing systems. However, flexibility influenced by capacity management or inventory management generally comes at high costs. On the other hand, lack of flexibility becomes also expensive due to late delivery, lost sales… This trade-off can only be solved by innovative process improvements like postponement, platform strategies… In general, to identify the right "flexibility" at the supply chain level to match supply and demand is of great interest. We want to present a model that should support this evaluation of supply chain processes.

In this paper, we first develop a conceptual framework of supply chain flexibility that separates flexibility enablers (e.g. inventory management, flexibility of resources, enhanced forecasting…) from direct customer requirements (e.g. product variety, lead-time, price, service level…) and demand characteristics (demand uncertainty and demand variability). This structure detaches the capabilities of resources from the market requirements and allows to highlight discrepancies between supply and demand. Subsequently, we build a dynamic model in order to evaluate the benefits of distinct levels of flexibility regarding demand characteristics under consideration of process improvements. Due to the influence of product/industry specific factors, the results can be only partially generalized. Based on this, we calibrate our systems dynamics model to analyse distinct operational strategies and asses benefits and costs of their respective level of flexibility for an existing supply chains. Considering the costs of both over/under flexible supply chain, this kind of evaluation provides decision support for practitioners.

RA403 Exploring the Use/Abuse of Inventory Control Policies and Forecasting in Relation to the Bullwhip Effect and Customer Service by Means of Spreadsheet Simulation
Robert Boute, Vlerick Leuven Gent Management School, Belgium
Marc Lambrecht, Katholieke Universiteit Leuven, Belgium
It has been recognized that demand forecasting and ordering policies are two of the key causes of the bullwhip effect. In this paper we present a spreadsheet application, which explores a series of replenishment policies and forecasting techniques under different demand patterns. It illustrates how tuning the parameters of the replenishment policy induces or reduces the bullwhip effect. Moreover, we demonstrate how bullwhip reduction (order variability dampening) may have an adverse impact on inventory holdings. Indeed, order smoothing may increase inventory fluctuations resulting in poorer customer service. As such, the spreadsheets can be used as an educational tool to gain a clear insight into the use or abuse of inventory control policies and improper forecasting in relation to the bullwhip effect and customer service.

RA403 Concept, Processes, and a Supply Chain Simulation Approach for Vendor Managed Inventory
Guillaume Marques, Jacques Lamothe, Caroline Thierry, Didier Gourc, Toulouse University, France
Making the widespread assumption that the VMI is clearly described in the literature, our initial target was to implement, and then simulate VMI in a supply chain risk simulation tool: LogiRisk. Nevertheless, if there is no doubt about the real implementation of VMI in industry, it appears that a consensus about a global definition is missing. Is VMI a concept, a process, a strategy, a relationship? So, we firstly extract the VMI concept from the literature: a replenishment pull system; the supplier is responsible for the customer's inventory replenishment; Partners establish collaborative middle/long term agreements.

VMI is usually synonymous with distribution context. The purpose of this paper is to explore the extension of VMI notions to the relationship between industrial partners. We define three planning processes in this relationship. The Partnering Agreement (PA), specifies the integration of the planning processes of the partners into a "VMI replenishment planning process." The Logistical Agreement (LA) fixes the parameters, which regulate the management of each article (minimum maximum inventory level,

minimum delivery, transport frequency…). The Production and Dispatch (PD) monitors production dispatch and transport short-term decisions. We differentiate two approaches for the PD:

1/ Dispatch-VMI: VMI only impacts the supplier's dispatching decisions. Classical push or pull approaches are used to manage his production.

2/ Integrated-VMI: VMI also impacts the supplier's production: dispatch and production decisions are taken simultaneously. The target is to optimize the entire process.

To define a VMI collaboration policy, partners have to integrate their planning and physical processes. We extend a simulation tool, LogiRisk, we developed for the evaluation of risks of Supply chain collaboration policies. A collaboration policy is the gathering of: (i) a collaboration protocol that defines the decisional processes between the partners; (ii) the union of the decisional behaviors of the partners during their own planning processes. In the context of VMI, LogiRisk can not simulate a PA. But, during a PA, it can help in evaluating a global VMI process and particularly in the specification of the LA and PD. We therefore propose VMI models, their integration into LogiRisk and a small case study.

RA403 Short-Lived like Brushwood: On the Applicability of "Lean" Supply Chain Coordination Mechanisms to Short Product Life Cycle Industries

Henk Akkermans, Tilburg University, Netherlands

This paper investigates the use of a so-called "lean approach" to supply chain coordination in short product life cycle (PLC) industries such as high-tech electronics. For this investigation, a generic simulation model is developed of a typical high-tech electronics supply chain, with steep demand ramp-up and ramp-down, long supplier cycle times and push production control. This research suggests that lean supply chain coordination, which (1) uses a pull approach to production control, (2) strives for significantly lower stock levels, (3) achieves short set-up times and (4) abolishes "shortage gaming" in OEM ordering, may indeed yield superior performance than the conventional approach in short-PLC supply chains. However, it also shows that the steep demand ramp-up and ramp-down in combination does cause problems for a pull mechanism in combination with low stock levels. This is because the rate of production output is always lagging behind the rapidly changing market demand rates, due to the long cycle times. This issue can be overcome if the OEM allows for some extra buffer stock of finished product or if the supplier uses demand extrapolation to drive production dur

RA405 Thursday, 8:30-9:45 Track: m-Inventory Theory Chair: Taner Bilgic
Room: W2-405 Session: Modeling: Inventory policies

RA405 An Inventory Model for Deteriorating Items with Stochastic Supply Lead-Time

Reza Tavakkoli-Moghaddam, University of Tehran, Iran
M. Sheikh-Sajadieh, Islamic Azad University - South Tehran Branch, Iran
T. Mojibi, Islamic Azad University - Firoozkuh Branch, Iran
M. Tabari, Islamic Azad University - Ghameshahr Branch, Iran

This paper presents a new inventory model of deteriorating items with stochastic lead times and constant demands, in which the order quantity is supplied by one supplier. A continuous review inventory system (s, Q) is considered because the order is placed when the inventory position reaches the reorder level. The proposed model is to determine the reorder point and order quantity by minimizing the expected total cost (ETC) per unit time that consists of ordering, inventory holding, shortage, and deterioration costs. To validate and verify this model, a number of experiments are carried out. Finally, conclusion and some managerial insights are observed and discussed.

RA405 Exact Performance of (r, Q) Policies for a Lost-Sales Inventory System Where Multiple Replenishment Orders May Be Outstanding

Anders Thorstenson, Søren Glud Johansen, University of Aarhus, Denmark

We study the important continuous-review (r, Q) system in which unfilled demands are treated as lost sales. The reorder point r may be equal to or greater than the order quantity Q, whereby multiple replenishment orders might be outstanding simultaneously. Hence, we do not restrict attention to the well-known case with at most one order outstanding, but our modelling streamlines exact analysis of that case. We assume that demand is Poisson, lead times are Erlangian, and orders do not cross in time.

As the main result, we determine the exact system performance by finding the equilibrium distribution of the inventory on hand at the delivery instants from the equilibrium solution of a Markov chain. This solution is efficiently obtained by the Gauss-Seidel method. In particular, we show by a partially novel modelling approach how system performance is crucially dependant upon the long-run average fraction of demand lost to the system. To identify good values of the policy variables r and Q we also develop an adapted version of the standard optimization algorithm for the backorders model (BO).

The results obtained can be used for benchmarking textbook approximations. Our numerical study shows that, except when lead times are long and variable or when the unit cost of shortage is low, the BO model provides a fair approximation to the exact average cost. Moreover, the suggested optimization procedure finds solutions that dominate those found using the textbook approximations.

RA405 The Joint Replenishment Problem with Truck Cost Structures

Mehmet Mustafa Tanrikulu, Alper Sen, Osman Alp, Bilkent University, Turkey

We consider inventory systems with multiple items in the presence of stochastic demand and jointly incurred order setup costs. The problem is to determine the replenishment policy that minimizes the total expected ordering, inventory holding, and backordering costs; the so-called stochastic joint replenishment problem. In particular, we study the settings in which order setup costs reflect the transportation costs and have a step-wise cost structure, each step corresponding to an additional transportation vehicle. For this setting, we propose a new policy which we call the (s,Q) policy. Under this policy, a replenishment order of fixed size Q is triggered whenever the inventory position of one of the items drops to its reorder point s. The replenishment order is allocated to multiple items so that the expected backorder costs are equalized as much as possible. The policy is designed for settings in which backorder and setup costs are high, as it allows the items to independently trigger replenishment orders and fully exploits the economies of scale by consistently ordering the same quantity. A numerical study is conducted to confirm that the policy works as designed and to

compare its performance against the (Q, S) and (Q, s, S) policies that were previously suggested in the literature. The study shows that the proposed (s,Q) policy outperforms the (Q, S) policy when backorder and setup costs are high and when the vehicles are not capacitated. When the vehicles are capacitated, the new policy outperforms both other policies under most settings studied.

RA405 Expediting Decisions for an Assemble-to-Order System

Onder Tombus, Taner Bilgic, Bogazici University, Turkey

Assemble-to-order systems give manufacturers the ability to postpone production and enable better configuration management. We consider an assemble-to-order system where all of the random demand for a finished product should be met in a single period. After demand is realized there is an opportunity to fulfill the shortfall by expediting. Expedition can be in the form of overtime or sourcing from another supplier and it is more expensive than regular production. Furthermore, if more than one component is expedited there is a discount in expedition costs (e.g. all expedited components share the same transportation modality).

We fully characterize the optimal policy of component stocks and show that an extended (s,S) policy where the reorder point and order-up-to level of one component is dependent on inventory level of other components is optimal for this class of problems. We provide observations on optimal expediting decisions under different scenarios and conjecture on the structure of the multiple-period extension of the problem.

RA501 Thursday, 8:30-9:45 Track: Spanish Chair: Rafaela Alfalla-Luque
Room: W2-501 Session: S-Teaching innovation in POM

RA501 Information Technologies and University Teaching Methods in Business Administration: Analyzing OM Students' Opinions

Francisco J. Arenas, Carmen Medina-Lopez, Jose A. D. Machuca, University of Seville, Spain

Adapting to the European Higher Education Area (EHEA) common credit system could mean a fall in the number of presential classes in various subjects and important changes to current teaching methods. Information and Communications Technologies (ICT) based teaching materials provide very useful tools to respond to these demands.

This paper presents the results of two experiments to evaluate self-learning multimedia software conducted with University of Seville Business Administration students. A JIT instruction application was used together with an application for the study of MRP systems to analyze the degree to which the various computer assisted learning methods were used and to obtain students' assessments of ICT use in university teaching in general terms, and in JIT and MRP in particular, amongst other things. The way their perceptions evolved during the experiment provides some interesting conclusions for the current Higher Education transformation process taking place in our discipline.

RA501 Environmental Management System Performance Indicators for a Knowledge Organization: Experiences at the Technical University of Catalonia (UPC)

Juan Carlos Aguado-Chao, Pere Busquets-Rubio, Adriana Carolina Cortes-Cardonia, Jordi Fortuny-Santos, Maria Rosa Gonzalez-Siso, Ramon Navarro-Antunez, Antonio M. C. Verdu-Gonzalez, Technical University of Catalonia, Spain

The most usual environmental management systems in Europe, like ISO 14001 and EMAS, are centered on the continual reduction of the negative environmental impact of an organization that manufactures products or supplies services. As a consequence, those systems are designed according to a logical methodology for the identification of processes and their relevant negative environmental impacts. Then, their causes and effects are determined in order to establish actions to minimize the negative effects and to ensure the ongoing improvement of the management system.

Nevertheless, we need to progress towards a culture where positive environmental impacts are taken into account, as much as we need to progress from current information society towards a knowledge society. Nowadays, very few organizations can exhibit a direct positive impact on the environment, but precisely the so-called Knowledge Organizations should a show, at least an indirect, positive impact.

Paramount amongst Knowledge Organizations are the Universities, in their role of generators (through research) and transmitters of knowledge (through regular courses, technology transfer and divulgation). It is reasonable to accept that the future environmental behavior of the society depends on the education that its members and leaders receive at university.

As a consequence, in the environmental management system of a university, it is necessary to include the quantification of the environmental education both offered to the students and interiorized by them, together with the environmental and sustainability implication of the research. In this paper we present the performance metrics that are being developed for a pilot EMAS implementation in the Technical University of Catalonia and their generalization to any Knowledge Organization. These performance indicators must encompass not only the conventional measures of environmental situation, behavior (resource consumption, waste generation, etc) and system's effectiveness, but also and most of all, metrics of the environmental implications of the research, education and divulgation that the University offers, and measures of how this education is assimilated by the students, and taken into account both in their present and future circumstances, and both personally and professionally.

RA501 OM-Multimedia Applications: An Improvement in the Learning Process or Just a Technological Fad?

Carmen Medina-Lopez, Francisco J. Arenas-Marquez, Jose Carlos Ruiz-del-Castillo, University of Sevilla, Spain

Teaching methods are being updated and adapted to the new requirements of the educational environment, of the disciplines themselves, and of the users, and, most especially, are capitalizing on the opportunities that Information and Communication Technologies (ICT) present. The area of OM (Operations Management) is no exception. The traditional lecture class based on the use of the blackboard or transparencies and/or the case method are gradually being supplemented by new types of teaching that help improve the teaching/learning process. But is this improvement real?

This is the question we asked ourselves concerning the use of multimedia applications for teaching OM. Our research group has been working along a line of research aimed at designing, developing and testing OM educational multimedia applications for several years.

In this paper, we present an experiment designed to evaluate the training received with the use of a multimedia application. Two JIT (Just in Time) teaching environments were created, one traditional, and the other based on a multimedia application we ourselves devised. The study (in which a sample of 100 students of Business Administration took part) measures the

effect of these environments on the student's learning, while analyzing a range of aspects: the acquisition of knowledge, effort and time required. The students were given a number of objective tests and opinion polls. The results were then processed in such a way for conclusions to be drawn.

The main conclusion was that a well-developed multimedia training application has a positive impact on the teaching-learning process, favouring the acquisition of skills and knowledge in a shorter time and with less effort. Other relevant conclusions were also drawn that demonstrate that the use of multimedia applications favours evaluation of the instruction, which is highly valued by the student.

RA501 Learning Experiences: Making Operations Management More Interesting and Appealing for the Student Through ICT

Rafaela Alfalla-Luque, Francisco J. Arenas-Marquez, Carmen Medina-Lopez, University of Seville, Spain

Motivation is a primary component of adult learning. The lacks of interest and inquisitiveness are usually linked to the student's perception of the subject matter. In this sense, Operations Management (OM) is not an easy business area for teaching. In prior studies, students have generally found OM difficult to understand and outside their sphere of interest (Cox & Walker, 2005; Hill, 2002; Johnson & Drougas, 2002; Polito et al., 2004; Yazici, 2006). Given this situation, we must ask ourselves what image of OM we are conveying, and in what way we can improve training and interest in the subject. With this objective, a survey of 1,541 OM students has been conducted. Some of the results that were obtained attest to the need to improve teaching in this discipline, by making it more interesting and appealing for the student. To this we must add the fact that OM is not the learner's favourite area for a future career.

In this context, we consider that OM should determine a direction for teaching practice to take, making it more approachable for the student, fomenting the student's interest and providing guidance towards the subject. With this objective in mind we have developed two learning experiences using ICT. To be specific, we have developed two OM educational multimedia applications for training in MRP and JIT. For each we have conducted an experiment to test the validity and suitability of the application in which two distance learning scenarios are compared. We have evaluated a wide range of aspects. In this paper we have focused on aspects related to adapting the method to the user and the learner's motivation.

On the whole, the results obtained demonstrate that when a multimedia training application (that takes advantage of the potential of ICT) is well-designed on the technical, content and instructional levels, and when it is incorporated into a learning environment in an appropriate manner, then it will have a positive influence on the teaching-learning process, favouring student motivation, as well as on the student's autonomy and responsibility for his/her educational process.

OM must renew the teaching methods employed and adapt them to the new needs of the discipline, taking advantage of the possibilities for improvement offered by technological advances. The multimedia applications analyzed are a case in point.

RA503 Thursday, 8:30-9:45 Track: m-Project Management Chair: Indra Gunawan
Room: W2-503 Session: Modeling: Project management

RA503 PERT/GERT Project Network Simulation with Arena

William J. Cosgrove, California Polytechnic University - Pomona, U.S.A.

Arena software is one of the most advanced simulation tools employed in business and industrial engineering. Based on the established simulation language SIMAN, Arena utilizes graphics that are typical of advanced Windows applications, including drag and drop features with modules (SIMAN routines) for model construction and animation. Since Arena is more suitable for modeling entity flows through queuing based systems than project networks, the purpose of this study is to develop new Arena modules that accommodate project networks such as PERT and GERT. Arena modules for the arcs and nodes in PERT, and stochastic branching in GERT, are developed to mirror PERT and GERT networks within an Arena graphics window. Mouse clicks on the modules create dialog boxes with permit the selection of theoretical or empirical distributions with fields to enter parameters. Drag and drop modules provide graphics output for total project completion times, and can accommodate the multiple completion time distributions generated by GERT networks. An application of this study for practitioners is the use of simulation to compliment most existing commercial project management software based on the classical PERT approach (e.g., Microsoft Project), which generates distributions that understate completion time means (i.e., PERT bias), a problem completely resolved by using completion time distributions generated by simulation. For advanced users, other features in Arena and SIMAN are available permitting the imbedding of project networks into larger models. The new modules will be available as downloads at a website.

RA503 Procurement Performance Analysis for International Development Projects

Kamrul Ahsan, Auckland University of Technology, New Zealand

Procurement is one of the biggest challenges faced by international development (ID) projects. The purpose of this research is to identify procurement issues of ID projects. In general, the study looks at ID project characteristics and implementation problems, and in particular examines procurement policies, processes and performance issues. We will further look at probable correlation between project and procurement performance. The study is based on secondary data obtained from the Asian Development Bank post project reports. Through data analysis we investigate overall project characteristics in terms of budget and duration, performance in terms of time and cost, causes and effects of slow procurement implementation and lessons learned. The research will benefit ID project professionals, ID project organizations and the future development of ID project Body of Knowledge.

RA503 An Interdisciplinary Approach towards Managing Projects and Change: Revisiting some Old Concepts

Samir Dani, Neil Burns, Chris Backhouse, Loughborough University, United Kingdom

In the 1950's a seminal paper was published by Charles Lindblom 'The Science of Muddling Through' which highlights the theory of decision making through small discrete increments rather than big pre-planned steps. Lindblom identifies two methods of decision-making. One is the rational comprehensive (Root) approach where policy formulation is approached through means end analysis where first the ends are isolated then the means to achieve them are sought. The other approach is the (Branch) approach where means and ends are not distinct. Means–end analysis typified by the Root approach is often inappropriate and the Branch analysis process involves the continuous adjustment of the project implementation to meet a very limited set of ends. Means and ends are continuously adjusted as information about project progress is obtained.

The paper revisits the Incrementalism, Rationalism and Cybernetic concepts to study the usefulness of these in today's manufacturing and project environments. The discussion is focussed around the processes for manufacturing strategy formulation and implementation in an environment of uncertainty. The research is presently in its infancy and this paper discusses a conceptual research model. As the research progresses further, validation of the model will be possible using the case-study technique. Presently, in its current state it can be used to retrospectively validate secondary data.

RA503 Implementation of Design Structure Matrix to Reduce Design Iterations in Engineering Development Projects

Indra Gunawan, Auckland University of Technology, New Zealand

Traditional project management tools such as Program Evaluation and Review Technique (PERT), Critical Path Method (CPM), and Gantt chart allow the modeling of sequential and parallel processes in projects, but they fail to address interdependency of feedback and iteration, which is common in complex engineering development projects. One method of explicitly accounting for iteration in the design process, Design Structure Matrix (DSM), is introduced.

In this paper, ways of improving planning, execution and management of projects using the DSM algorithms (partitioning and tearing) are presented. It is shown that the main advantage of the DSM over traditional project management tools is in compactness and ability to present an organized and efficient mapping among tasks that is clear and easy to read regardless of size.

RB202 Thursday, 10:05-11:20 Track: Quality Management and Six Sigma Chair: Matthew Pepper
Room: W2-202 Session: Perspectives on quality management 2

RB202 Establishment of Strategic Quality Management Model Utilizing Science TQM
Manabu Yamaji, Kakuro Amasaka, Aoyama Gakuin University, Japan
One of the requisites for winning corporate competitions today is success in the "global marketing" for quickly offering high-quality, latest model products in response to customer needs. For manufacturers to advance "manufacturing" that precisely meets the customers' preferences, it is vital that their affairs and management sections also share the global view and become a core of corporate management and strategy. More specifically, the key to success in "global production" lies in full functionalization of "partnering", in which forefront divisions of technology, production, and sales as well as the affairs and management sections collaborate in a cooperative strategic scheme to realize "global quality and optimal production". This study proposes "Strategic Quality Management Model, SQMM" mainly in connection with the administration. Further, the effectiveness of this model is verified at the application example.

RB202 Quality Management and Management Innovation: The Challenge for Innovators
Teerapon Tanomsakyut, Natcha Thawesaengskulthai, Chulalongkorn University, Thailand
In recent years, the term of "innovation" becomes more important and prevalent in various business areas. Many firms apply innovation into their products, services and processes in order to ensure the sustainability of the firms. The form of innovation has therefore been broadened in its scope from product service and process innovation to strategic innovation, value innovation and management innovation. Quality Management (QM) is a kind of management innovation that creates long-term advantages to the firm by creating new management model or framework.

The evolution of QM implied the series of management innovation. The new concepts of QM began to be formalised to miximise the highest quality with systematically changes of quality techniques and approaches. Statistical theory had been applied to the quality model. Few popular techniques in the past such as QCC, TQC and JIT became today's fashionable QM approaches such as TQM, ISO9001, SIX SIGMA and BPR.

The purpose of this paper is to look at the development of QM initiatives in the view of management innovation and to understand the reasons why there was a need of new QM initiatives by analyzing their backgrounds, definitions and influential factors. In addition, this paper aims to compare the historical development of QM initiatives with the theories of innovation to see whether or not the QM initiative can interchangeably be called management innovation, or there are some significant differences between QM and management innovation.

A number of published works on QM and management innovation were criticized. The findings from the literature review were used to provide the background, definitions and influential factors for the series of well known QM initiatives which are QC, TQM, ISO9001, Six Sigma and Business Excellence Model. The paper also summarizes the relevant innovation management theories and compared to the development of QM initiatives. The clear understanding of QM and innovation management provides a great foundation for developing a unique QM innovation process in the future.

RB202 The Integration of Lean Six Sigma
Matthew P. J. Pepper, Trevor A. Spedding, University of Wollongong, Australia
Recent research has seen a number of articles discussing the implementation of lean six sigma programs within manufacturing environments. However, the discipline of lean six sigma has yet to fully mature into a specific area of academic research. In response to this, this paper presents a review of the literature on the integration of the two approaches, and its evolution from previous improvement paradigms, such as Total Quality Management. This review of literature identifies current trends in the research discipline of lean six sigma, and goes on to highlight key areas for consideration as future research foci. The critical elements for consideration when designing a lean six sigma framework are also identified and examined. Leading on from this, the benefits that may be realised through a structured, scientifically underpinned framework design are considered, along with the possibility of developing industry specific lean six sigma frameworks. The efficacy of such frameworks is addressed, followed by an industry based case study. This case study highlights the use of lean techniques to identify key opportunities for improvement to be leveraged with six sigma tools. The study illustrates the successful deployment of a lean six sigma framework, designed specifically for continuous process industry environments.

RB301 Thursday, 10:05-11:20 Track: Invited Chair: Genaro J. Gutierrez
Room: W2-301 Session: Finance and operations interface

RB301 Offshore or Not to Offshore: Capacity Planning Under Exchange Rate and Demand Uncertainties
Shanling Li, Letian Wang, McGill University, Canada
In recent years, under the constant pressure to reduce manufacturing and service costs and deliver high-quality products to market quickly, companies in North America are attracted to offshoring and outsourcing. While the allure of dramatic savings is undeniable and the use of offshore facilities is virtually unavoidable, risks involved in offshoring/outsourcing are significant. Among all, the greatest risk is the expectations about how much the savings from offshore will be. In this research, we address two important questions:
(i) how the uncertainty of exchange rates affects firms' capacity reservation decisions with suppliers overseas?
(ii) would different risk attitudes (risk neutral versus risk averse) affect offshoring capacity strategy significantly? And in what ways?

We develop a two-stage analytical model to examine the impact of uncertain exchange rates and/or uncertain demand on the choice between overseas and domestic suppliers in terms of capacity size and production quantities. The problem is modeled as a newsvendor network to evaluate the trade-offs between the expensive production cost with no risk and cost savings by offshoring under the risk of exchange rate. The challenges in our research are comprised of uncertainties in (i) exchange rate and/or (ii) demand; as well as two risk attitudes: (i) risk neutral and (ii) risk averse. The firm considered here is a single expected utility maximizer and her decisions involve the sizing in capacity reservation and order quantities to either or both suppliers. Both numerical and analytical results are presented.

RB301 Private Label Products: When Structural Inefficiency Increases Supply Chain Profits

Stephen Gilbert, University of Texas at Austin, U.S.A.
Yusen Xia, Georgia State University, U.S.A.
Liwen Chen, University of Texas at Austin, U,S,A,

We examine how a retailer's ability to introduce an internally produced low-end version of a national brand affects both the product assortment that is offered to consumers as well as the total profit that is generated by the supply chain. Our analysis allows for the possibility that the retailer may have some influence over the extent to which consumers are exposed to the product category. Under the assumption that consumers perceive the quality of the private label to be lower than that of the national brand, we show that there exists a wide range of conditions under which the total decentralized supply chain profits increase when a low-end private label is introduced, even though such a product would not be included in the optimal product line for a vertically integrated channel. Thus, even though the introduction of the private label is structurally inefficient, it can nevertheless result in an increase in the overall efficiency of the decentralized supply chain. We obtain our results with a relatively general family of consumer-valuation distribution functions that allows us to explore how different distributions of valuations affect the direction and magnitude of impact that the private label has upon the profits of the manufacturer, the retailer, and their combined profits. Interestingly, for product categories for which the retailer may have significant influence over their exposure to consumers, we are able to show conditions under which both the manufacturer and the retailer benefit from the introduction of the private label.

RB301 Historical and Risk-Neutral Probability Measure Approaches to the Valuation of Operations Management Decisions and Contracts

Genaro J. Gutierrez, Ramesh K. S. Rao, University of Texas at Austin, U.S.A.

We represent the firm as a nexus of contracts and express the value of the firm as the sum of the values of all individual contracts. Knowledge of the correlation of the drivers of the volatility of the cash flows generated by each contract with the return of the market, allows us to use the Arbitrage Pricing Theory to link the "historical" probability space with the "risk-neutral" probability measure of the volatility driver of each contract; hence, we can assess the impact of marginal changes on each of the firm's contracts on the value of the firm. We will discuss the general theory and then present examples in project evaluation, in the evaluation of supply chain contracts, and in the evaluation of operational decisions.

RB302 Thursday, 10:05-11:20 Track: International Operations Management Chair: Chee Y. Wong
Room: W2-302 Session: International OM 3

RB302 Outsourcing Value Creation Activities: Achieving Overall Optimal Performance

Shishank Shishank, Rob Dekkers, University of the West of Scotland, United Kingdom

The information available to the managers and engineers during the stages of value creation activities of design, product development and engineering of products is incomplete and hence, not all desirable information for decision-making is available. But both the engineers and managers will need to make informed decisions on sourcing of subsystems, components and parts. Earlier studies by academics have poorly or not addressed this issue at all. Decision-making on outsourcing takes place at different levels of strategic, tactical and operations within a company. Distinguishing these three levels will help assigning specific frameworks and requirements for each of these three processes and simultaneously assist in free and continuous flow of information from one framework to another. During all the stages the decisions differ; during pre-design it concerns mostly of subsystems or equipment and during later stages it turns to detailed production planning. The decision at these levels is based on the availability of information and different levels of aggregation. In stages, information is transformed according to specific requirements of the individual process; hence, probability of distortion of this information during change remains high. In light of the significant impact outsourcing has on the overall performance of the organisation, the motivation for developing an integrated multi decision making criteria and a framework on different aspects of outsourcing incorporating the accurate transformation of information during different stages of these value creation activities and the criterion adapted by the engineers and management in the industry is evident. This framework enables a sequential decision-making process with accurately transformed information at different stages for outsourcing and identifies necessary actions to be taken to implement the outsourcing decisions.

This paper will illustrate that outsourcing should be carried out from the strategic perspective and integrated into the overall strategy of the organisation by proposing an outsourcing framework. Additionally, the research will provide objective measures of the effectiveness of the integrated framework within the Scottish Enterprises.

RB302 Strategic Supply Management of Japanese Companies' Overseas Operating Facilities

Osamu Sam Uehara, NPO Institute for Supply Management, Japan

This presentation focuses on how the Japanese companies develop overseas supply-base, and satisfy local contents in order to have smooth and smart operation in overseas plants. They have different tactics and implementation in overseas plants from a supplier evaluation and development's point of view. The research survey is executed for major manufacturing companies (small-medium sized enterprises included) in Japan who have significant existence and potentiality in the world. The key to a successful global supply strategy is more or less related to the business strategy and effective supply management global insight.

This research tries to understand the Japanese companies' direction for the global area, especially in terms of supply-base development, training, evaluation and long-term development. Japanese companies' operation especially in automobile-related and electronic/electric industries has been enlarging beyond the Archipelago since 1980. They spared lots of effort and spent most of financial and human resources. However, when it comes to material and components procurement, it is plant manager's responsibilities to assume and develop those key supply management. Maintaining the "world-class identical and consistent quality" is the key strategy for almost all manufacturing companies who wish to win the increasing global competition. For that phenomenon, development and evaluation of overseas suppliers and local contents are mostly required by Japanese companies, even US/European companies. Global supply strategies are completed only in accordance with the business strategy even in overseas affiliates in the manufacturing side. We see the Japanese major companies focus on how to nurture, upgrade and develop their local suppliers and create the Win-Win relationship with those suppliers.

RB302 A Sino-European Framework of Cultural Standards SCM Performance Improvement through Cross-Cultural Communication in China

Roger Moser, Supply Management Institute SMI – India, India
Martin Lockstrom, Supply Management Institute SMI – China, China

The ongoing concentration of global connectivity in business practice has proven to enhance the number and impact of Sino-European business relationships significantly along the supply chain. A quintessential pre-requisite for achieving successful cooperation is the effective use of communication and the mutual awareness of cultural discrepancies. This paper constructs a conceptual framework for Sino-European cultural standards by reviewing popular research approaches of culture and subsequently liaising the acquired information with a case study as a real-world business experience. The cross-cultural framework is employed to conclude implications for managers seeking to improve supply chain performance through cultural awareness.

RB302 Key Issues of Manufacturing in China

Hong Seng Woo, Middlesex University, United Kingdom

China's manufacturing sector has enjoyed a long period of sustained and impressive growth, much of which is a result of the instigation of the 'open door' policy in the late 1970s. China is now the world's third largest manufacturer after the USA and Japan, with many observers expecting the country to overtake the USA by 2020. The majority of growth in manufacturing is concentrated in the Yangtze River Delta in the Eastern Coastal region and the Pearl River Delta in the Southern coastal region. Frequently referred to as the 'world's factory', success factors include having clusters of like-manufacturing and supply chain, a large domestic market, good infrastructure in the Yangtze and Pearl river deltas and fast developing elsewhere, a large base of human resources and government incentives. However, recently, both foreign and in particular local Chinese manufacturers are feeling the effects of increasing operational costs. The cause of these includes rising raw material and labour costs, increasing government tax; shortage of skilled labour, quality control problems, lack of strong intellectual property rights, limited industrial space in the manufacturing strongholds, and frequent power shortages. This paper aims to examine these issues and propose possible solutions.

RB302 Organizational Innovation and Paradigm Shift: Comparing the Change Process of Two China's State-Owned Enterprises (SOEs)

Rui H. Gao, Chee Yew Wong, Kobe University, Japan

Knowledge in an organization often consists of aggregates of complex organisational routines that cannot be efficiently transferred or unlearned. It has been structured, systematized and embedded within the organization after a long period of operations. For this reason organization innovation can be hard to achieve. Similar problem persists in the Chinese State-owned Enterprises (SOEs); they face difficulty in shifting from a planned economy paradigm to the market economy paradigm. International alliances are among the most effective means to knowledge acquisition, which may lead to organization innovation. It is because learning new and often tacit knowledge from other organizations requires a replication of the organisation itself. Alliances allow for the direct observation of operations and enable the gradual and experiential learning that is essential for successful transfer of tacit knowledge. However, the organizational learning literature offers little knowledge on how the learning process can be effectively organized.

This research investigates the learning processes of two longitudinal case studies which involved two SOEs and their alliances with different foreign partners. The case studies involved cosmetic SOEs - Jahwa and Liyuan. Altogether there were 92 interviews at the SOEs, their alliances organizations and the foreign partners. The research revealed a second stage of learning which was very important. The aims of the alliances were not just to gain profits, but more importantly transferring new knowledge to the parent organization. In this stage, Jahwa created an independent company and empowered staffs from one of the (failed) joint-ventures to experiment market economy approach. The new company has attractive pay-structure. The leaders, who were trained from the joint-venture and other alliances, changed their old (production-focused) paradigm by establishing research & development and marketing departments. Learning and paradigm shift within the parent company occurred due to the reshuffling of staffs amongst the parent company and alliance organizations. Liyuan instead had difficulty in transferring new knowledge from alliance organizations to the parent organization mainly because no staff was willing to return to the poorly-paid parent organizations.

RB303 Thursday, 10:05-11:20 Track: RFID Chair: Mihalis Giannakis
Room: W2-303 Session: RFID 1

RB303 Inventory Management and RFID Technology in Supply Chain

Reza Tavakkoli-Moghaddam, University of Tehran, Iran
H. Amoozad-Khalili, Islamic Azad University - South Tehran Branch, Iran
S. Ayani, Islamic Azad University - South Tehran Branch, Iran
A. Haghparast, Islamic Azad University - Qhazin Branch, Iran

This paper presents the concepts, components, and characteristics of the RFID technology from the warehouse and inventory management point of view. Then, we discuss the effects of using the identification technology through radio frequency waves on ordering policy, inventory costs, amount of demand, and total profitability in an organization. Furthermore, security issues and the strategy of creating the RFID technology in the scope of financial management and production chain are addressed. Finally, we show how to implement this technology in warehouse and inventory management in developing the related business.

RB303 Three Dimension (3D) Anthropometric Age

Marie-Eve Faust, Hong Kong Polytechnical University, Hong Kong
Serge Carrier, Universite du Quebec a Montreal, Canada

Today's 3D body scanning technologies achieve a level of precision that was unimaginable only 10 years ago. Not only are measurements taken without human contact but the 3D body scanner can extract thousands of data bits in just few seconds. Once extracted, the data can be treated with sophisticated analysis software. When required, the 3D body scanner can also be programmed to capture specific body measurements to address a specific research need or industrial application. For researchers such as Pine (1995); Gray (1999); Istook & Hwang (2001); Istook (2002), Xu, Yu and Chen (2002), and Piller (2005) 3D body scanning is not only a means to acquire a national anthropometric database, but a enabling tool to mass customization; i.e. one-of-a-kind garments with individualized sizing, tailor-made yet competitive in price and in response time. For others such as Burns & Bryant (2002),

McKinnon & Istook (2002), Koontz & Gibson (2000) 3D body scanning can also be a tool allowing virtual garment try-on, eventually leading to the creation of virtual communities (Kim & Jin, 2006); although (Ashdown & Loker) the virtual environment is currently still under development. Once scanned, an individual could visualize himself or herself on a computer while clothing of various sizes, colours, styles or textures are superimposed on a rotatable image; thereby immediately visualizing fit, to select the most appropriate garment, and in some instances to eliminate the need for a live mannequin (Yu, 2004).

Our research provides an update of the 3D body scanning applications and more specifically when linked to RFID. It discusses the benefits and difficulties that manufacturers and retailers encounter when implementing such technologies. It also presents the latest research on the consumers' perception and acceptance. Implementation of smart card technology, based on scanned body measurements, will change the apparel shopping process (reduced time spent in fitting room, increased product and service satisfaction, reduced merchandise returns and exchanges).

RB303 Streamlining Supply Chains with the Use of RFID Technology

Mihalis Giannakis, Warwick University, United Kingdom

RFID (Radio Frequency Identification) technology promises to revolutionize supply chain management and usher in a new era of cost savings, efficiency and business intelligence. The potential applications are vast as it is relevant to any organization engaged in the production, movement or sale of physical goods.

The main objective of this paper is to explore the challenges and compliance strategies for companies that are in the early stage of adoption of RFID technology. In particular the following questions are explored; What is the business case for adopting RFID in an organization?; What is a viable time frame for the adoption of the technology?; What is the impact of RFID on purchasing, logistics and supply chain relationships?

The research uses the case study approach by investigating strategies for generating internal efficiencies using RFID and for driving RFID adoption into the supply chain. An in depth case study in two major retailers in the UK is currently conducted. The analysis of the data collected involves the following specific tasks: A cost benefit analysis that specifies the usefulness for the adoption of the technology; A needs analysis to identify what an organization needs from an RFID system; Examination of the barriers to implementing new tracking solutions, including costs, standards, and the ability to financially justify evolving technology; Identify ways organizations can leverage RFID tagging to improve their own purchasing processes, inventory management, distribution, asset management and security operations.

Preliminary results indicate that the cost of the individual tags and difficulties in the reliability of the technology are still major hurdles for the applicability of RFIDs. Appropriate supplier relationship management strategies should also be put in place before embarking on it in order to streamline the supply chain. Finally as RFID technology only provides information about the identification of inventory across the supply chain, this cannot be easily translated into meaningful information about demand patterns and therefore it does not lead to amelioration of the bullwhip effect across complex and volatile supply chains. The use of information systems that can integrate information about the "identification" of products into information about the "identity" of this product is required.

RB305 Thursday, 10:05-11:20 Track: Teaching innovation Chair: Uttarayan Bagchi
Room: W2-305 Session: Teaching Innovation in POM 1

RB305 Teaching Supply Chain Management (SCM): A Modified Beer Game

Antonio Ka Wing Lau, City University of Hong Kong, Hong Kong
L.S. Kong, University of Queensland, Australia

The Beer Game is one of the most popular simulations used in SCM courses to introduce students the concepts of bullwhip effect and supply chain collaboration. The purpose of the Game is to meet customer demand for cases of beer, through a 4-stage supply chain with minimum back orders and inventory. The Game is usually played at the first session of the course and gives participants a visual impact on the problems of poor information sharing across a supply chain. However, it fails to help them apply new knowledge learnt during the study period, usually 12 weeks. This paper provides a teaching strategy that integrates the Game's concept in the course content, helping students to not only understand the challenges of managing supply chain, but also apply the knowledge learnt in the course to solve the problems of bullwhip effect.

The teaching strategy has three sections. First, students play the beer game as is its original format, following that the lecturer reviews the results of each team and discuss the lessons involved. Second, they are required to play the Game again, but allowed to create ways to improve the overall supply chain performance. Finally, for the coursework assessment, their performance will be compared and discussed. Students are also required to present their findings and submit a report on their reflections on the Game.

This teaching strategy was used to teach SCM courses with over 250 undergraduates. The results show that, by using this strategy, students could learn the importance of information visibility and supply chain coordination. Through attending lectures and self-learning, they adopted techniques, such as collaborative forecasting systems, vender managed inventory and strategic partnering, to improve their supply chain performance that the lecturer even felt excited.

The paper aims to introduce this strategy and its tools as well as the critical factors of implementing this strategy, so as to make SCM teaching fruitful and meaningful. The teaching tools are also appendixed.

RB305 Effect of Online Business Game on SCM Education

Motonari Tanabu, Yokohama National University, Japan

The author developed business game development and execution system in which game developer easily constructs one's own business games and players do business gaming simulation in generated game environment through the Internet. The system is called YBG, and it has been applied to various business educations, such as marketing, finance, accounting, and production and operation management. The Beer Game of YBG version was already developed and has been utilized in several universities. In some cases, mobile phone was used. In this paper, we look at overview of YBG and how YBG Beer Game works. Then we compare the result of actual online game with the one of board game. In the YBG Beer Game, player tends to place a large quantity of order in contrast to the board game. We analyze the reason from players' psychological point of view, and evaluate the effect of online game on SCM education.

RB305 The Design of Industrial Engineering Education Using Supply Chain Management

Katsuhiro Sakamoto, Aoyama Gakuin University, Japan
Yoshiki Nakamura, Nihon University, Japan

Manufacturing management has become a major theme at the universities. In these courses, students learn about the theory and practice of manufacturing planning, manufacturing systems, inventory issues and quality control etc. However, as these themes are pursued individually, the educational system does not incorporate or offer any insight into the interrelationships in SCM. University education must therefore enable students to learn about the relationships between them, and their links with management plans and targets.

The purpose of this research is to design an educational program in which students can gain management and industrial engineering knowledge, and which will enable them to study the importance of their interrelationships and the sharing of information with other companies. The program consists broadly of two elements. The first is a simulator that makes it possible to learn about theories and methods concerning the knowledge essential for each field. For example, demand forecasts are vital when decisions have to be made about order-receiving, and the simulator enables students to learn about forecasting methods used for these purposes, including the moving average method and regression analysis. The second element enables study regarding the effects that management plans and targets have upon each individual activity, and the knowledge that is needed in these cases. In order to do so, the relationship between plans/targets and individual activities are analyzed and modeled using a BSC. Thus students enable to obtain a visual grasp of the influence that decision-making in one activity has upon all the others. With reference to these studies, it becomes possible for students to concretely implement the processes of management plans and targets, activities and feedback, and also helps them to make the best use of the information that they have learnt.

This educational program was implemented amongst students. From our inspections and observations, the following results were obtained: 1) Students were able to recognize the consistency between management targets and plans, and manufacturing activities; 2) Students were able to grasp the significance and the effects of manufacturing management education in universities.

RB305 Laws of Operations

Uttarayan Bagchi, University of Texas at Austin, U.S.A.

In this paper, we ask, “Are there laws of operations?” and then proceed to suggest a list of laws. The motivation is threefold. First, in a research institution, it is important to ask what theory is uniquely associated with the field of operations management (OM). Second, our ability, as communicators of OM knowledge, to achieve successful product differentiation - OM versus marketing versus finance as an example - is enhanced if laws of operations inform what we teach and how we teach. Third, to what extent does what we do as OM academics make a difference to the practice of OM in the outside world? If Kurt Lewin’s famous maxim, “There is nothing so practical as a good theory.” is true, then the practice of OM that is informed by and grounded in laws of operations would be better practice all around.

We view OM as process management. The process perspective is uniquely associated with OM. In business schools where OM competes with finance, marketing, strategy and other disciplines for limited curriculum space and student attention, the process perspective is OM’s strongest differentiator and claim to a seat at the table. To be on our list, a law must:
- be generally considered to be more affiliated with OM than with other business disciplines;
- not seem too obvious to a lay person;
- enhance a manager’s capacity to act (Senge);
- merit a place in every manager’s (not only every operation manager’s) knowledge space.

For each law on our list, we discuss the origin/antecedents of the law and how that law fits in with the other laws on the list. We believe that this article will contribute to the generation of a theory uniquely associated with OM. Furthermore, we believe that this article will impact the teaching of OM and consequently, the practice of OM.

RB401 Thursday, 10:05-11:20 Track: Knowledge and Technology Management Chair: Chengter Ho
Room: W2-401 Session: Knowledge management 1

RB401 Knowledge Management Tools for Transfer Information: Case Study in One OEM

Ricardo Mateo, University of Navarra, Spain

Many companies in the world have based their growth strategies in the generation, transfer and application of new knowledge. Knowledge is widely recognized as a resource able to explain the differences in performance and innovation. However, it is necessary to know better how the knowledge could create value for the company. Specifically, it must study in depth what are the mechanisms for the generation, transfer and application of new knowledge.

This paper researches about how the mechanisms of transfer of knowledge affect the capacity of knowledge generation and their implementation. Multinational company in the automotive industry was analyzed. In these kinds of companies it is common that engineering centers, assembly lines and sales are far away, and it is essential to create specific mechanisms for transferring knowledge. We wonder how the physical distance obstructs the transfer process and how it affects the process of generation and application of knowledge. In particular, we are concerned about how to transfer knowledge for the decision-making process. We have studied two complete models years using different transfer mechanisms. The paper suggests that the electronic knowledge transfer generates considerable delays in implementation processes and produces disincentives to the generation of new knowledge as a result. For this reason it is better introduce a human interface in the electronic knowledge transfers.

RB401 The Management of Process Planners' Knowledge Based on Manufacturing Feature Concept

Hendry Muljadi, Tokyo Metropolitan College of Industrial Technology, Japan
Koichi Ando, Hayato Yagyu, Shibaura Institute of Technology, Japan

Process planning plays an important role in linking design and manufacturing. It comprises in details the selection and sequencing of processes and operations to transform raw material into the desired form. In order to generate process plans, process planners must possess the ability to interpret engineering drawings, the knowledge of materials for manufacture, the knowledge of manufacturing processes, etc. The management of the knowledge of process planners is an important task. It may enable a smooth knowledge transfer, and may as well play an important role for the development of an automatic process planning system.

This paper discusses the management of the knowledge of process planners based on manufacturing feature concept. Here, manufacturing feature is defined as a geometric shape and its corresponding manufacturing information to create the intended shape, where the corresponding manufacturing information reflects the knowledge of process planners. In other words, a well-structured process planners' knowledge representation based on manufacturing feature may enable the management of process planners' knowledge, and may as well facilitate the generation of process plans based on manufacturing features.

RB401 Case-Based Reasoning System for Fastener Forging Process Design

Chengter Ho, Jerri Mathew, National Kaohsiung University of Applied Sciences, Taiwan

Engineers have always been on the run to design, develop and arrive at new solutions to problems in the quickest time possible. The increasing use of Artificial intelligence (AI) has been an answer to this problem. This research uses Case based Reasoning (CBR), an Artificial Intelligence (AI) technology to arrive at solutions to problems encountered in real time situations at a rather quicker rate in comparison to the conventional methods. CBR uses explicit historical experiences to solve new problems. It assumes that problems reoccur and that similar problems have similar solutions. The work aims at reducing the trial and error processes required to arrive at the solution which otherwise would consume a lot of time. The research focuses on creating a case-based system for forging process design. Real time forging process simulations are created using the DEFORM tool and the results obtained are input into Protege, a knowledge based framework that helps in constructing the system. Inputs includes realistic process sequences, taking into account the manufacturing conditions such as the number of forging loads, materials used., die and work piece dimensions etc. Various solved cases are input into the system to make the database. Frame based representation is used to represent the cases for the data base. Efficient case retrieval is achieved by a feature based similarity analysis. The work mainly focuses on the similarity measures (SM) required to arrive at retrieving solutions close to the problems encountered. SM represents a heuristic for estimating the a-priori unknown utility of the case. By describing the current problem, cases are retrieved based on the Attribute weights and global and local SM assigned to it. The efficiency and the competence of the CBR system is improved significantly by encoding more specific domain knowledge about the utility of the cases into the SM.

RB401 Automatic Filing Mechanism for New Cases in Case-Based Reasoning System

Chengter Ho, Gin-Feng Kuo, National Kaohsiung University of Applied Sciences, Taiwan

Case-based reasoning system (CBRS) is regarded as a powerful tool for engineers in new product development. Object-oriented framework has made the CBRS for versatile for collaborative product development for product with complex configuration. However, the filing of the new cases would involve the decision of proper class the new case should reside and the storage of attribute values at the proper slot. The objective of this research is to develop an automatic filing mechanism for new cases in CBRS to assist engineers filing new product cases after the product being certified for production. This mechanism is required due to the framework of CBRS being object-oriented. Therefore, new case needs to be properly placed in the corresponding class. The framework could be divided into two parts. The first step of the mechanism is to decide the proper class in which the new case would reside. Ontology technology tools were used in parsing and analyzing the key document of the new case. The attribute values of the new case also retrieved for later were used at this stage. After key document being analyzed and the class being settled, the attribute values of the new case were put into the CBRS database for later use.

RB402 Thursday, 10:05-11:20 Track: Supply Chain Management Chair: Simon T. Alexandre
Room: W2-402 Session: Case research on SCM 3

RB402 Using a Methodology for Evaluating the Supply Chain Management in Industrial Companies

Simon T. Alexandre, Silvio R. I. Pires, Methodist University of Piracicaba, Brazil

Nowadays many authors in Operations Management consider that during the last decades business management has entered in the era of inter-network competition. This means that individual businesses no longer compete as solely autonomous entities, but rather as supply chains. In this emerging competitive environment, the ultimate success of the single business will depend on management's ability to integrate the company's network of business relationships. In this context, Supply Chain Management (SCM) is a way through which such an integration can be achieved, and nowadays it is a new and important area in the field of management. However, despite the increasing interests in this area and its proliferation within the academy and industrial environment, yet there is still a lack of academic literature concerning topics such as methodologies to guide and support SCM evaluation and implementation. The absence of a methodology for evaluating supply chain management can be considered one the most critical lack in this area. In addition, most methodologies related to SCM implementation have been provided by consulting companies and present a restrictive publication and use. Therefore, before implementing SCM in a company, as any other concept, it is recommended first to evaluate its status concerning SCM related concepts and for that it is of utmost importance to establish measurement scales.
Considering the limitations in current literature and in SCM practical applications, the objective of this article is (1) to present the basis of the last version of a developed methodology for evaluating in what extent companies adhere to a conceptual model of SCM, and (2) to present the preliminary results of its application in a selected group of industrial companies operating in Brazil. The methodology was based on the conceptual model of SCM proposed by Cooper, Lambert and Pagh in the last decade, and on a series of SCM initiatives and practices. It involves eleven analysis referential axis established from key business processes, SCM horizontal structure and initiatives & practices. In general terms the results confirm the expectation that the developed methodology should provide mainly a basic framework for SCM analysis, an effective method for the SCM field development, and the opening of new frontiers for future research in the area.

RB402 A Practical Tool for Supply Chain Improvement - Experiences with the Supply Chain Maturity Assessment Test (SCMAT)

Torbjoern H. Netland, SINTEF, Norway
Erlend Alfnes, Norwegian University of Technology and Science, Norway

The purpose of this paper is to report on experiences with a simple mapping tool for supply chain improvement, developed in a Norwegian research project aiming at improving the efficiency of agri-food supply chains. A maturity model aims to aid companies to benchmark the maturity of their operations relative to industry best practice. Maturity models have been developed within a wide range of disciplines. However, only a few models are targeting supply chain management (e.g. Lockamy and McCormack, 2004;

Naim et al, 2002; Netland, 2007; Srai and Gregory, 2005). Building on the generic Supply Chain Maturity Assessment Test (SCMAT) (Netland et al, 2007), this paper discusses why such maturity tests should be further developed and how they should fruitfully be carried out in real world projects.

An action research methodology (e.g. Arbnor and Bjerke, 1997) has been applied; where the researchers have been involved in and facilitated projects with the maturity test and adjacent improvement processes. In action research projects, the researchers are both participants as well as observers, which give detailed insight into processes, procedures and data in the case companies. This paper reports on the findings from several companies where the test has been applied and continuously improved.

There is a need for more conceptual and empirical research into supply chain maturity tests. In SCMAT a number of defined best practices in supply chain management are used which should continuously be considered and redefined; thus more conceptual research into the content of maturity tests is needed. More empirical case studies should be carried out to further develop and shape the technical functionality, structure and procedures of such maturity tests.

Supply chain managers ask for a simple and quick tool which could be used as an eye-opener and a compass. By discussing how a supply chain maturity assessment test can fruitfully be used in a company's supply chain improvement project this paper fills a gap in the literature. The test under development, SCMAT, is an excel-based audit scheme built on best practice statements within key decision areas such as strategy, control, processes, materials, resources, information and organisation (Alfnes, 2005). It has successfully been applied in several companies' development projects.

RB402 Upgrading in the Dual Chain: A Case Study of Wanxiang

Xiaozheng Jin, University of Cambridge, United Kingdom

The subject of upgrading in the value chain has drawn considerable attention among academia in recent years. Most of current researches adopt a macro view to approaching this topic, say analysing the dynamic of upgrading in the chain level. However few touched on individual firms, the most dynamic element in the upgrading process. One strong force observed that keeps pushing upgrading is from the button of the chain, namely from those firms in emerging countries. It would be meaningful to look at how new players that are upgrade in the chain from shallow to more integrated position.

Thus this paper was intended to examine how the upgrading process takes place within the supply chain in the individual firm level. I focus my study on the automobile industry by conducting an in-depth case study of Wanxiang, a prominent Chinese local automobile component manufacturer, headquartered in Hangzhou, with a company history of more than thirty years. This study employs qualitative method to examine and map out the mechanisms of upgrading of the individual firm from late industrialisation countries in the context of globalisation.

My two propositions in this study are: (1) the specific case of Wanxiang confirms Gereffi's proposition that "in quasi-hierarchical chains, suppliers in developing country can experience great product and process upgrading" and (2) the upgrading process is enhanced by the company's insertion into both quasi-hierarchical chains and networks chains (known as "dual chain" insertion) as a result of engaging in foreign and domestic OEMs markets respectively, where two different types of chains are complementary in terms of firm's upgrading process.

This research paper would be structured as follows. After the introduction, related research literatures on upgrading would be briefly reviewed. The third chapter contains a description of the research methodology employed, namely, the case study. The fourth chapter will be devoted to the case description, giving a general understanding of industrial context and the company background. And the fifth chapter presents a summary of the research findings, analysis and discussions. Final chapter concludes the case study and indicate its limitations.

RB403 Thursday, 10:05-11:20 Track: m-Supply Chain Management Chair: Yalcin Akcay
Room: W2-403 Session: Modeling: SCM optimization 1

RB403 Dual Sourcing with Contract Manufacturing

Youssef Boulaksil, Jan C. Fransoo, Eindhoven University of Technology, Netherlands

In this paper, we consider an OEM (Original Equipment Manufacturer) who faces stochastic demand and who has two supply sources for the same product: a contract manufacturer and its own manufacturing plant. The two sources are constraining the supply quantities in different ways. Its own manufacturing plant is more rigid, cheaper and capacitated, whereas the contract manufacturer is more flexible but more expensive. Further, bounds for the annual volume to be purchased at the contract manufacturer are set contractually. A mathematical programming model for the considered dual sourcing setting is proposed. Based on an extensive simulation study and data from a real life situation, we compare a dynamic allocation strategy to a rigid allocation strategy and we provide some insights into the structure of the optimal allocation strategy. Further, the effect of the annual bounds (for the contracted cumulative purchased quantities) on the total supply chain cost is studied. The results of our study show that a simple and rigid allocation strategy performs substantially better than a dynamic allocation strategy. These insights are helpful for managers when having contract negotiations with the contract manufacturer.

RB403 The Study of Real Option Trading in a Secondary Market and its Impact on the Supply Chain Management

Gang Hao, City University of Hong Kong, Hong Kong
Xu Chen, University of Electronic Science and Technology of China, China

We propose an unprecedented study of the secondary market for real option trading and its impact on the supply chain management. Real options entail a right for delivery of a particular goods at a particular time, place, and price to hedge price risks, supply risks and reduce cost. Unlike the open-market options trading whose practices evolved from years of empirical optimization, real options trading in the secondary market studied here just began to emerge, are normally confined to within one or several supply chains, and could serve to maximize the overall chain's value. The study was in part triggered by the difficulties faced by a largest e-marketplace provider, in deciding whether to extend its e-platform to real options, given the growing practice of self-initiated exchanges amongst buyers. Many questions need to be addressed before an informed decision can be made, most of which are non-trivial and unanswered in the literature, e.g.: What are the conditions to sustain the secondary market, thereby the e-platform? Would it increase or decrease the overall chain's values to consumers? Would we see fewer (or more) stock-outs at the buyers and thus less pressure of product returns or buy-backs for the supplier?

These and many other issues are of great importance to a manufacturing - based emerging economy, and particularly so to the capital-intensive industries, where the companies are plagued with highly uncertain demands, shrinking product life cycles, high risks of inventory obsolescence or significant profit losses from stock-outs and underutilized capacity. Direct effort to address them has been few. Pertinent models only exist within the realm of static pricing and the highly-simplified one supplier-two buyers scenario.

We develop an analytical framework to capture and analyze characteristics of the secondary market of real options, to assess its effects, to guide the search of optimal strategies for each party, and to establish conditions under which B2B exchanges are efficient and sustainable. For the market participants identified for the study, this study would provide business models and solutions for facilitating the options trading to improve demand and supply coordination through e-platforms. The study not only leads to improved industrial practice but also open research opportunities in multi-objective optimization, and cross-disciplinary advance in e-commerce, supply chain management, management science, and industrial management.

RB403 A Stochastic Programming Model for Production Loading Problems under Global Supply Chain Environment

Yue Wu, University of Southampton, United Kingdom

Global supply chain management presents some special challenges and issues for business organizations, which are different from domestic supply chain management. This paper is concerned with applying stochastic programming to the production loading problems with the importing quota limits under global supply chain environment. Loading production among different plants usually involves uncertainty such as inaccurate market demand, fluctuating quota cost, inventory cost, and purchasing cost. Stochastic programming is a useful tool to handle uncertainty.

We propose a two-staged stochastic recourse model for the production loading problems under global supply chain environment. A global manufacturing company is selected as an example. A series of experiments are designed to test the effectiveness of the proposed model. Compared with the results of traditional deterministic programming model, stochastic recourse programming model present a better solution.

RB403 Pricing of Random Quality Products

Yalcin Akcay, Fikri Karaesmen, Seray Aydin, Koc University, Turkey

We consider the pricing problem for a retailer whose objective is to maximize the total expected profit earned from a fixed inventory of random quality products over a finite time horizon. Consumers' valuation of the products is a function of the product quality, which can be observed by each individual consumer. On the other hand, the retailer only has information about the distribution of quality. We formulate this pricing problem using a two-stage stochastic optimization model. We assume that the retailer sets a price at the beginning of the first stage, and then observes the realized sales during this stage. The number of products sold in the first stage is used as an indicator (signal) for the distribution of the quality of products remaining in inventory. In essence, the retailer uses this initial stage as a learning tool. The retailer then updates the price in the second stage using this information so as to clear all products.

Using this model, we generate managerial insights on the impact of quality on pricing, particularly how variance of product quality affects the expected profits. We also investigate whether such a two-phased pricing mechanism can replace the quality control at the supplier. Another interesting issue that we study is how to determine the duration of the first stage in order to maximize overall performance. Since the problem is a finite horizon problem, having a longer first stage translates into a shorter second stage. The retailer could potentially have a relatively long first stage and have a better understanding of the remaining inventory quality, but will have a short time left to clear inventory. Alternatively, the first stage could be short and the information gathered could quickly be reflected into a better pricing policy. We demonstrate our findings using an extensive numerical study.

RB405 Thursday, 10:05-11:20 Track: m-Inventory Theory Chair: Peter Kischka
Room: W2-405 Session: Modeling: New formulations for inventory management

RB405 A Single-Period Inventory Model with Possibilistic Information

Peijun Guo, Yokohama National University, Japan

Single-period inventory problem (Newsvendor problem) has the following characteristics. Prior to the season, the buyer must decide the quantity of the goods to purchase/produce. The procurement lead-time tends to be quite long relative to the selling season, so the buyer can not observe demand prior to placing the order. Due to the long lead-time, often there is no opportunity to replenish inventory once the season has begun. Excess stock can only be salvaged at loss once the season is over. Clearly, newsvendor problems are typical one-shot decision problems in which decisions are made only once. Many extensions have been made in the last decade, such as different objects and utility functions, different supplier pricing policies, different newsvendor pricing policies. Almost all of extensions have been made in the probabilistic framework; that is, the uncertainty of demand and supply is characterized by the probability distribution, and the objective function is expressed as maximizing the expected profit or probability measure of achieving a target profit. Some papers have dealt with the uncertainty in newsvendor problems by fuzzy methods.

In this paper, the inventory problem of new products with short life-cycle is considered. For such kinds of products, there is the lack of prior information on their demands and no data can be used for statistical analysis to predict the future demand. The uncertainty of demand is characterized by the possibility distribution not directly by the fuzzy linguistic language, such as "good", "better" etc. possibility degrees reflect the potential levels of demands occurring in the future, which is based on the matching degrees of product feature and custom needs. Because newsvendor problem is a typical one-shot decision problem, simultaneously considering all of states of nature (demands) is inappropriate and unsuitable. Eight kinds of criteria are provided for determining which state of nature (demand) should be considered. Based on the selected state of nature, the optimal order amount is obtained to balance satisfaction and plausibility instead of maximizing mean value in probabilistic models and ranking fuzzy numbers in fuzzy models.

RB405 Interval Probabilities and its Application to Newsvendor Problems

Peijun Guo, Yokohama National University, Japan
Hideo Tanaka, Hiroshima International University, Japan

In recent years, dealing with uncertainty using interval-valued probabilities is receiving considerable attention by researchers. Most of researches in the areas of combination, marginalization, and condition operations of interval probabilities assume interval

probabilities are known. How to elicit interval-valued probabilities from subject is a basic problem for the applications of interval probability theory and till now a computational challenge.

In this research, two approaches for estimating interval probabilities are proposed. The first one is for the situations where the subject is represented by the pair-wise comparison of the possible outcomes to know which one is more likely to occur. The second one is for the situations where a decision maker can give some rough range of subjective probabilities for each possible outcome. The method to combine interval probabilities from different decision makers is presented. Interval expectation, interval variance and interval moment are investigated. The decision criteria under interval probabilities are given. As an application, a newsvendor problem for new products is considered where the demand in the future is characterized by the interval probabilities for reflecting the uncertainty of demand. Based on the proposed decision method, the optimal quantity of order can be obtained.

RB405 Inventory Model with Stock-Level Dependent Rate and Variable Holding Cost Under the Given Total Inventory Cost

Masatoshi Tanaka, Matsumoto University, Japan
Shin'ichi Yoshikawa, Nagoya Keizai University, Japan

Inventory models, in which the demand rate depends on the inventory level, are based on the common real-life observation that greater product availability tends to stimulate more sales. Previous models incorporating inventory-level dependent demand rate assume that the holding cost is constant for the entire inventory cycle. In reality, it is particularly true that the holding cost is influenced by the time spent in storage. For example, the longer the perishable foods and the deteriorating items are kept in storage, the more sophisticated the storage facilities and services needed, and therefore, the higher the holding cost.

In this paper, we consider an inventory policy for an item with a stock-level dependent demand rate and a storage-time dependent holding cost. Recently, Hesham K. Alfares is the first person who solved such a problem. His model is to decide the order quantity or the cycle time that minimize the total inventory cost. In reality, some situations are impossible to reach for the optimal cycle time on account of policy reasons such as lack of the number of workers, performance of machine, etc. Therefore, it is necessary to construct the model which can correspond to such situations. As a solution, we consider the problem of reducing the order quantity or the cycle time as long as possible subject to the restricted total inventory cost. Now, the holding cost per unit of the item per unit time is assumed to be an increasing function of the time spent in storage. Especially, as an increasing function, we focus on the two types of holding cost functions: Retroactive holding cost increase, and incremental holding cost increase. Then, we provide solving algorithms to determine the optimal ordering quantity and the optimal cycle time for both cost structures.

RB405 Stockout-Averse and Loss-Averse Newsvendors

Peter Kischka, Werner Jammernegg, Friedrich Schiller University, Germany

In the classical newsvendor model for given probability distribution of demand and cost parameters, the optimal order quantity is computed, e.g. by maximising the expected profit. Empirical as well as experimental investigations in general show that the actual order quantity differs from the optimal quantity. Thus, contrary to the optimisation approach and also to the structural estimation approach where the order quantity is assumed to be known, we propose to compute the order quantity for a stockout-averse as well as loss-averse newsvendor. Stockout-aversion is expressed by a given level of product availability, loss-aversion by a given level for the probability of loss. In doing so, the critical ratio (cost of understocking and/or cost of overstocking) is determined endogenously, i.e. by means of the specified performance measures cost parameters, e.g. the selling price and/or the salvage value, can be determined. Furthermore, we analyse the influence of different demand distributions on the critical ratio. These results are also relevant for newsvendor models with uncertainty (i. e. the demand distribution is not known exactly). Numerical results for Weibull distributed demand variables are given.

RB501 Thursday, 10:05-11:20 Track: Spanish Chair: Elena Revilla
Room: W2-501 Session: S-New product development and knowledge management

RB501 Managing New Product Development Processes: A Study of Concurrent Engineering from a Contingency Approach

Sandra Valle, Daniel Vazquez-Bustelo, University of Oviedo, Spain

This paper studies the link between the use of concurrent engineering (CE) -overlapping activities, inter-functional integration, and teamwork- and success in new product development (NPD) under varying conditions of uncertainty and complexity. The main aim is to identify the most appropriate circumstances for successful adoption of this methodology. Based on the general proposition that CE does not produce positive results in every context, a study is carried out to determine whether the positive effect of CE on NPD, time and cost reduction, and new product superiority depends on the type of innovation carried out: incremental versus radical.

The research uses linear regressions and data from a sample of 134 manufacturing firms to test the hypothesis. The results show that companies adopting CE practices to carry out incremental innovations achieve time reduction in product development and higher product quality. However, companies that adopt this methodology in contexts with a high level of uncertainty, novelty and complexity (i.e. carrying out radical innovations) do not obtain positive results for either of the performance measures indicated. The results also show that companies adopting CE to carry out radical innovations may not be able to reduce development time or obtain superior new products, but may be able to reduce product development costs. These findings have an immediate implication for the management of innovative companies: CE is not necessarily a recipe for success. Managers must be cautious when adopting CE, and must not fall into the common trap of considering that greater concurrence is always better. Companies should first analyze the characteristics of their innovation process and prioritize their objectives before selecting the most appropriate path to follow.

RB501 Team Vision: Its Components and Impact on Product Development. An Empirical Evidency

Elena Revilla, Instituto de Empresa, Spain
Beatriz Rodriguez, Universidad de Valladolid, Spain

In today's more complex multinational and technologically sophisticated environment, the group has re-emerged in importance as the project team (Thamhain and Wilemon, 1999). This is also true in the development of new products. Work teams are important to organizations in general, but it is especially critical in product development because it spans many functional areas including

engineering marketing, manufacturing finance, etc, and new product teams must frequently be composed by individuals from different backgrounds and perspectives.

Effective teamwork is seen as a key success factor in deriving competitive advantage from these developments. At the same time, the process of teambuilding has become more complex and requires more sophisticated management skills. In order to overcome those challenges and enhance team performance, it is necessary to develop a team vision of the project they have in hands (Lynn and Akgun, 2001). This means that it is important to develop a common view among team members, in order to minimize the effects of the functional diversity in the group, and to promote a better performance. In this work, we call Team Vision to the existence of a common background, a clear set of goals, priorities, trade-offs and a good understanding of the overall goals of the firm and of the project itself, above department or functional level.

Although the concept of team vision is receiving increased attention at the organizational level, there is a great deal we still do not know regarding vision at the product development level (Crawford and Di Benedetto, 2000). On light of this surprisingly little research on vision in new product development teams, the purpose of this article is to define team vision, discuss its components, and explore its impact on successful product developments. After studying the team vision on 80 new product developments from a wide variety of firms, we found that an effective team vision varies depending of the knowledge strategy - defined in terms of exploration and exploitation as lowly ambidextrous, highly ambidextrous and Exploitation-based-. Our results demonstrate that while clarity is positively associated with success in all strategies, trade-off is only associated with lowly ambidextrous strategies and strategy-fit is only associated with highly ambidextrous strategies.

RB501 The Effect of Tacit Knowledge and Value of Knowledge on Franchise Systems Performance

Beatriz Minguela-Rata, Maria Concepcion Rodriguez-Benavides, Jose Ignacio Lopez-Sanchez, Universidad Complutense de Madrid, Spain

In this paper, we study the influence of tacitness and value of knowledge on the performance of franchise systems. With this aim, a linear regression analysis is conducted on a sample of franchisee of different franchise chains and sectors of activity operating in Spain. In the model we added a control variable, named transformation, which represents the kind of activities carried out in the franchisee units: just commercial or transformative and commercial activities. The findings show that tacit knowledge has a negative impact on franchise systems performance, the value of knowledge affects it in a positive manner whereas the control variable is significant.

RB501 Knowledge Complexity, Absorptive Capacity and Weak Ties: An Empirical Analysis of Its Effects on Franchise Systems Uniformity

Beatriz Minguela-Rata, Maria Concepcion Rodriguez-Benavides, Jose Ignacio Lopez-Sanchez, Universidad Complutense de Madrid, Spain

In this paper, we analize the effect of knowledge, franchisee and relationships characteristics on franchise systems uniformity. Specifically, we study the influence of knowledge complexity, absorptive capacity and weak ties between franchisor and franchisee on standards compliance related to quality and operative procedures. With this aim, a linear regression analysis is conducted on a sample of franchisee of different franchise chains and sectors of activity operating in Spain. In the model, we added a control variable called transformation, which represents the kind of activities carried out in the franchisee units: just commercial or transformative and comercial activities.

RB503 Thursday, 10:05-11:20 Track: m-Forecasting Chair: De-bi Cao
Room: W2-503 Session: Modeling: Forecasting

RB503 Synergy of Chaos Theory and Artificial Neural Networks in Time Series Prediction

Muhammad Ardalani-Farsa, Saeed Zolfaghari, Ryerson University, Canada

In this paper, a unique technique to predict chaotic time series is proposed. A combination of chaos theory and artificial neural networks is used to analyze and predict nonlinear time series. Based on a phase space reconstruction method, the embedding parameters generate phase space points. The magnitude of the produced points is calculated to summarize the effect of the elements in the embedded phase space points into one single input when we train the artificial neural network. The Mackey-Glass (M-G) equation and Logistic equations, which produce chaotic time series, are used to validate the proposed technique. Numerical experimental results confirm that the trained neural network can predict the chaotic time series effectively and accurately.

RB503 A Fuzzy Mathematical Programming Approach for Time Series Forecasting

Josefa Mula, Raul Poler, Universidad Politécnica de Valencia, Spain

Multiplicative decomposition, moving averages, single exponential smoothing and Holt's linear method are four common techniques in forecasting. In these traditional forecasting methods, data and results are all crisp. Also, the forecast errors or differences between the observed values and the estimated values are assumed to be due to observation errors. In our fuzzy models, we consider crisp input data and fuzzy output results which are explained as the vagueness of the forecasting system expressed by fuzzy parameters. Thus, forecast errors are considered to be fuzzy in nature. Fuzzy models for time series forecasting are generated with fuzzy mathematical programming like fuzzy linear programming (FLP) or fuzzy non linear programming (FNP).

This paper presents a new fuzzy mathematical programming model to forecast time series based on the Theta model proposed by Assimakopoulos and Nikolopoulos (2000). In the proposed model a modified Theta version is formulated by using a possibilistic programming approach. The possibilistic formulation is then transformed to an equivalent conventional non linear programming model and solutions obtained by solving this transformed non linear programming problem.

The proposed fuzzy forecasting model combines the advantages of the Theta model and the possibility theory (Zadeh 1978, Dubois and Prade 1988). The main contribution of this paper is a practical application of known possibilistic programming in forecasting problems accompanied by empirical experiments. Other applications of fuzzy concepts in forecasting problems can be found in Tanaka et al. (1982), Savic and Pedrycz (1991), Song and Chissom (1993), Chen et al. (1999), Tseng and Tzeng (2002) and Song et al. (2005).

The effectiveness of the proposed approach is established by using the M3-Competition (Makridakis and Hibon 2000, Stekler 2001, Koning et al. 2005) to determine which forecasting procedures perform better than other methods as the basis of this

empirical research. The 3003 series of the M3-Competition include various types of time series data and different time intervals between successive observations. Also, five performance measures are used to evaluate the performance of the various forecasting methods.

RB503 A Method for Forecasting Model Selection

Raul Poler, Josefa Mula, Universidad Politécnica de Valencia, Spain

Demand Forecasting is a crucial process to any enterprise, such as supplier, manufacturer or retailer. In the literature there are many works about time series forecasting techniques. Likewise a lot of software forecasting packages exist. Nevertheless, in most cases, the selection of the best forecasting method for each data pattern remains a complex problem.

Researchers generally agree forecast accuracy should be assessed using out-of-sample tests rather than in-sample tests (Fildes and Makridakis, 1995). For a given forecasting method, in-sample errors are likely to understate forecasting errors. The M-competition (Makridakis et al., 1982) and other empirical studies show that forecasting errors generally exceed in-sample errors. Overfitting and structural changes may further aggravate the divergence between in-sample and post-sample performance (Leonard, 2000).

Makridakis (1990) used the sliding simulation as a process for method selection and estimation. Makridakis applied variants of the sliding simulation to some time series used in the M-competition (Makridakis et al., 1982) and demonstrated that post-sample forecasting accuracy improved when smoothing weights were calibrated to minimize the post-sample error instead of calibrating weights in-sample. Fildes (1989) also used the rolling horizon procedure to compare the efficacy of various method-selection rules.

There are two basic sources of knowledge about forecasting method selection: empirical studies and forecasting experts (Collopy and Armstrong, 1989). The empirical literature provides numerous guidelines for selecting among forecasting methods. Rule-based forecasting (RBF) is a type of expert system that is applied to time-series extrapolation.

In this paper a procedure for automatic selection of forecast models for time series is described. The set of time series forecast models is composed of a total of 24 techniques, 17 of these have been modelled using Mathematical Programming. The proposed selection criterion has been tested using the monthly time series of the M3 Competition and it has demonstrated a good performance.

RB503 Tacit Knowledge Aggregation for Demand Forecasting in Prediction Market

Akihiro Nakatsuka, De-bi Cao, Keio University, Japan

Tacit Knowledge Aggregation for Demand Forecasting through Prediction Market is effective when we could not get the data of sales or we could not know the trend or the cycle observing real market. In this research, we assume that individuals act as an agent in the market, and have different preference and behavior on the buying activities. One simple classification of the marketing behavior is pioneer and follower introduced in the Bass model. Using agent simulation incorporating the behavior into each agent, we carried out agent simulation with micro-macro loop in tacit knowledge aggregation process and we try to apply it to demand forecasting through prediction market. We further examined how the simulation works under the several conditions. As a result, we found that the price distribution of market maker converged realistically, except for some specific conditions. Our research shows that the agent simulation could apply to demand forecast.

RC202	Thursday, 13:40-14:55	Track: JIT & Lean Production	Chair: Mikko V. Koho
	Room: W2-202	Session: Lean production 1	

RC202 Lean Production within the German Capital Goods Industry - An Empirical Analysis

Kai-Ingo Voigt, Lothar Czaja, Christian W. Scheiner, University of Erlangen-Nuremberg, Germany

Concerning quality management, productivity, cost-efficiency, growth in sales and stock exchange capitalization, Toyota Corporation with its Toyota Production System (TPS) is the benchmark for other companies. Following the principles of Lean Management, all processes are strictly aligned to avoid any kind of wastage. Although Toyota cultivates an open-door policy, based on the idea that copying several constituent parts of TPS will not suffice to implement the whole Japanese production system, a comparison between targeted objectives and achieved results shows that most companies fail in their efforts to transfer the principles of Lean Management and Lean Production, to their own company (DAVIS/OTT 1999). Former research has mainly focused the automotive industry (WOMACK/JONES/ROOS 1991).

Within this study a different industry perspective was chosen to analyse the implementation and realisation of the principles of lean management. Therefore, the survey sample comprises companies from the capital goods industry. To ensure the quality of the survey only persons in top management positions (e.g. CEO, head of production, head of logistics, production manager, six sigma manager etc.) were contacted between November 2007 and January 2008. Of 300 companies 103 participated in this study which illustrates a response rate of 34%. Furthermore, the effects of the implementation on the production and operation activities will be surveyed. For the analysis of the data correlation tests, chi-square test and logistical regression were used. The majority of the participating companies has more than 1000 employees (55%), generates more than 250 mio. Euro (49%) and follows a product differentiation strategy. The operation activities were mainly characterised as more cost-intensive, inflexible, personal-intensive and individualised. From the lean management principles only Jidoka, 5S, standardisation and auditing and Kanban were implemented by almost all companies.

RC202 Key Characteristics of a Well-Performing Make-to-Order Production System

Mikko V. Koho, Seppo J. Torvinen, Tampere University of Technology, Finland

This study aimed at identifying key characteristics of a well-performing make-to-order production system. These are characteristics of a production system that enable implementation and use of efficient and effective production processes. Thus, these key characteristics of a production system are seen to result in or at least contribute towards the achieving of good production performance in terms of lead time, quality and cost.

An initial set of key characteristics of a well-performing production system was identified on the basis of a literature review covering production strategy and production paradigms such as Lean manufacturing, Agile manufacturing and Mass customization. Then, theme interviews with 33 production management professionals from 26 world-class Finnish mechanical engineering companies were conducted in order to evaluate the appropriateness and usefulness of the set of key characteristics to the target companies in this study. The key characteristics of a well-performing production system were then modified on the basis of the observations made and the information collected in the interviews. This paper presents and discusses the results and conclusions of the interviews and presents the modified set of key characteristics. Thus, the paper and the key characteristics combine both theoretical and practitioners'; views on production systems. In discussing the key characteristics, their linkage with and contribution towards production objectives are also discussed.

This study focuses on mechanical engineering companies that operate based on the make-to-order approach and produce customised products. The contribution of this study is to identify key characteristics of a production system that is able to produce the required product variety and volume using effective and efficient processes. These key characteristics can assist companies in improving their production systems by supporting identification of important characteristics of a production system and by assisting companies in assessing the current state and in identifying improvement potential of their production systems.

RC202 Key Performance Indicators (KPI) for the Implementation of Lean Methodologies in a Manufacture-to-Order Small and Medium Enterprise

Markus Leonard Stamm, Thomas Neitzert, Auckland University of Technology, New Zealand

This paper presents a key performance indicator (KPI) concept for the implementation of Lean methodologies with a special focus on a manufacture-to-order small to medium enterprise (SME). Within a case study the concept is developed, continuously extended and improved. The purpose of the measurement system is to monitor the early Lean implementation process of a manufacture-to-order SME.

The paper explores the current literature about Lean performance measurement and also discusses the critical success factors of a Lean implementation referring to publications on the topic. It is suggested to integrate the performance dimension "leadership" which is one of the commonly accepted most critical success factors into a KPI concept. The KPI concept consists of five dimensions: leadership, quality, costs, time and people. Additionally the Lean metrics "Process Velocity" and "Value Velocity" are presented and adapted to the specific requirements of a manufacture-to-order environment. The application of the KPI concept in the case study is presented and some examples are discussed. The benefit of an early integration of an appropriate KPI system during a Lean implementation could be confirmed. According to the relevance of "leadership" highlighted in current publications as a critical success factor, the integration of this dimension into a measurement system seems to be reasonable.

RC202 Value Stream Mapping (VSM) in a Manufacture-to-Order Small and Medium Enterprise

Markus Leonard Stamm, Thomas Neitzert, Auckland University of Technology, New Zealand

This paper discusses the Lean methodology of Value Stream Mapping (VSM) and its adaptation to a manufacture-to-order (MTO) environment. Within a case study of a batch-of-one mold making company the method is developed, continuously extended and improved. The purpose of VSM is to initialise the Lean implementation process and to develop a shared understanding of the whole value stream of a company which builds the basis for further improvement strategies.

The paper explores the current literature about VSM and also discusses the specific characteristics of a MTO environment and its correspondent limitations regarding the application of the current VSM methodology. Based on this an adapted VSM procedure with a special focus on MTO small to medium enterprises is presented and its application and outcomes within the case study are discussed. Elements of the Theory of Constraints (TOC) and of conventional Project Management are integrated into the

VSM methodology. The first adapted VSM analysis provided valuable insights into the value streams respectively the material flow for the management team. Therefore it was decided to use this method in a slightly modified way as a "Value Stream Monitoring" tool which continuously observes and evaluates the impacts of all Lean implementation activities.

RC301 Thursday, 13:40-14:55 Track: Tutorial Chair: Kakuro Amasaka
Room: W2-301 Session: Science TQM - Toyota's New Strategy

RC301 Science TQM - Toyota's New Strategy
Kakuro Amasaka, Aoyama Gakuin University, Japan
In this tutorial, the author proposes "Science TQM", a new quality management principle. This principle consists of the "Total Development System, TDS", "Total Production System, TPS", "Total Marketing System, TMS", "Total Intelligence Management System, TIS", and "Total Job Quality Management System, TJS". It aims to realize an integrated form of a next-generation management strategy. Furthermore, this paper demonstrates how the utilization of "Science SQC" and a "Strategic Stratified Task Team" contributes systematically and organically to solving quality management problems. Its validity has been verified through its application within the Toyota Motor Corporation, Toyota group companies, and others.

RC302 Thursday, 13:40-14:55 Track: Manufacturing Strategy Chair: Andy David Neely
Room: W2-302 Session: Empirical research on manufacturing strategy 2

RC302 Competitiveness Evaluation of the Manufacturing Sector: An Empirical Investigation
Himanshu Kumar Shee, Victoria University, Australia
Alka Nand, University of the South Pacific, Fiji
Competitiveness is of particular importance for small states because of their vulnerabilities and handicaps. Heseltine (1994), Corbett and Wassenhove (1993) define competitiveness as meeting customer needs or market desires more effectively and efficiently than other firms. Being interdisciplinary in nature, competitiveness related study can be carried out across the industries. Manufacturing firm competitiveness can be studied using various competitive capabilities (Rondeau et al. 2000; Corbett and Wassenhove 1993).

It is critical for small economy like Fiji Island to survive in the globalized world market (Hoa 2003). Fiji is not one of the ranked countries in Global competitiveness ranking (GCR, 2006) although it has the potential to be listed. Fiji manufacturing sector, the focus of this study, is not competitive in the market. The success of Fiji's manufacturing sector depends heavily on its competitive capabilities, hence the urgency for more research on firm competitiveness (Nabalarua 1998). The study explores the factors responsible for the poor performance and hence low competitiveness.

The major research question of this study is whether the competitive capabilities (e.g. product and its quality, customers, technology, information technology application, human resources, financial resources, government assistance etc.) do enhance the competitiveness of the manufacturing sector. To test this research question, an 84-items questionnaire was administered to the middle-order managers of manufacturing firms in Fiji. The questionnaire items were newly developed by the researchers but adapted the capabilities constructs suggested by Rondeau et al. (2000). The firms are considered as the unit of analysis. This paper will analyze the usable-questionnaire data to test the set of hypotheses and to examine the contribution of predictor variables (e.g. competitive capabilities) towards "firm competitiveness" as dependent variable. To measure the competitiveness, this study has suggested few questionnaire items directly asking the respondent whether they feel (using 5-point Likert scale) the sector or his/her firm is competitive or has potential to be competitive. The paper highlights the study limitations and proposes the direction for future research.

RC302 An Empirical Analysis of Formulation and Implementation of Manufacturing Strategy
Jorn-Henrik Thun, Mannheim University, Germany
Rob Dekkers, University of West Scotland, United Kingdom
Marie-Christine Anselmann, Mannheim University, Germany
Since Skinner (1969) has addressed the importance of a strategic alignment of the manufacturing function, manufacturing strategy has become one of the most discussed issues in the field of operations management. Many publications concentrate on the content of manufacturing strategies whereas the process perspective of manufacturing strategy is predominantly neglected so far. There is a lack of empirical work, especially regarding formulation and implementation aspects of manufacturing strategies. Therefore, these aspects should be investigated based on statistical analyses in order to give empirical evidence in this field using data from manufacturing companies.

Accordingly, this paper gives insights about manufacturing strategy contributing some empirical results to the question concerning formulation and implementation. By means of a factor analysis the key facets of manufacturing strategy are operationalized. A cluster analysis distinguishes between plants with a high implementation degree and traditional plants. Based on this cluster analysis a comparison of means allows insights concerning manufacturing related topics.

RC302 Plant Roles and Decision-Making in Manufacturing Networks
Andreas Feldmann, Jan Olhager, Linkoping University, Sweden
This paper is concerned with manufacturing networks, with a particular focus on the distribution of local and central decision-making within the network. Based on a survey of more than 100 Swedish manufacturing plants, we explore how the role of the plant, with respect to site competence and reason for location, affects the decision-making autonomy of the plant. The decision-making structure is concerned with the allocation of tasks to the local plant and those decisions that are taken centrally. 17 different decision-making areas have been identified and are tested in the survey. We also control for plant focus, plant specialization, and process choice. We analyze patterns within this context, to identify potential archetypes of plants with respect to roles and decision-making structure.

RC302 The Servitization of Manufacturing: Further Evidence
Andy David Neely, Cranfield University, United Kingdom

Manufacturing in developed economies is under massive pressure. Commentators advocate that manufacturing firms should move up the value chain. While this strategy is popular, there is limited empirical evidence about its impact. This paper seeks to fill a gap in the literature by presenting international empirical data on the range and extent of servitization. Data on 10,078 firms incorporated in 23 different countries are used. The data suggest: [i] manufacturing firms in developed economies are adopting 12 separate approaches to servitization; [ii] while those firms that have servitized are larger than pure manufacturing firms, they generate lower profits as a percentage of sales; [iii] the reasons for this are that they have higher labour costs, higher working capital per employee and higher total assets per employee; and [iv] there are some hidden risks associated with servitization, the sample contains a greater proportion of bankrupt servitized firms than would be expected.

RC303 Thursday, 13:40-14:55 Track: RFID Chair: Stephen C. H. Leung
Room: W2-303 Session: RFID 2

RC303 A Review of Radio Frequency Identification (RFID) Contemporary Trends
Apichaet Thanachareonkit, Natcha Thawesaengskulthai, Chulalongkorn University, Thailand
Radio frequency identification (RFID) has been used since 1939 in the World War II for military purposes. During the 19th century, it was expensive and not widely utilized in manufacturing but now RFID becomes cheaper and smaller which increases its applications for several industries especially in the area of supply chain management. Many obvious characteristics of RFID make it more appealing than before and promoting its substitution to a barcode system.

Despite RFID have been known for few decades, the RFID study just start in 1989 and the RFID technology is still in its infancy. This paper presents a brief overview of RFID themes, and then provides quantitative evidence of its trends based on a Printed-Media-Indicator (PMI) method using online publication databases and a Google trend. The trends of applications for a range of areas including supply chains, inventory, barcode, warehouse, and tracking illustrate significant changes in popularity over recent years. The result indicated that publication on RFID has frequently associated with supply chains and inventory. RFID has received the greatest recent interest in academic and practitioner journal in the year 2005 but the interest has noticeably fallen almost half in the year 2007. This sharp rise and fall of RFID publications may reflect the unreadiness of its technology which tarnishes its image while barcode system is still popular, reliable, and cheaper to use.

RC303 The Management of Medical Assets across Australian Defence Force Supply Chains - A Radio Frequency Identification Enabled End-to-End Process Model
Peter O'Neill, Monash University, Australia
Annibal J. Scavarda, Royal Melbourne Institute of Technology University, Australia
The Australian Defence Materiel Organisation (DMO) manages the acquisition of equipment and sustainment of vast quantities inventory for the Australian Defence Force (ADF). Complex logistical activities and integration rely heavily on technology enablers to effectively manage supply chain networks. The DMO uses a Logistics Information System to provide global visibility of all inventories. This visibility means that common parts used by all services can be requested as any time. However the present system has a significant constraint in that asset visibility is lost once an item leaves the warehouse and enters the distribution chain, until it arrives at its requested location. The result is the customer may request the order again, causing unnecessary congestion in the supply chain and increased acquisition costs. Radio Frequency Identification (RFID) is considered to be the most prolific technology that provides supply chain collaboration and uninterrupted visibility of assets and inventory, accurate tracking, control, security, ordering and delivering of items within supply chain networks. The key driver of RFID adoption in the ADF is in-transit visibility and RFID data generation to support decision making processes. This is being achieved by RFID tags, allowing military commanders in the front line or logistic support providers within Australia to track and trace in-transit supplies and provide auto location tracking at any point within the supply chain.

The purpose of this study was to investigate RFID adoption from an ADF Medical Supply Chain process model perspective. This study reviewed and analysed the utilization of RFID technology in the DMO medical supply chains. We find the application to have reduced high value inventory, reduced supply volume, reduced request repeats, reduced loss and drug counterfeiting during storage or whilst in-transit.

RC303 Design of an RFID-Enabled Decision Support System for Outbound Logistics
Stephen C. H. Leung, Jie Wei, City University of Hong Kong, Hong Kong
Ben Kwok, S. C. Lee, Avanti Innovation Technology Group Ltd., Hong Kong
Outbound logistics at the production plant refers to the activities related to the warehousing and distribution of finished goods from the end of the production line to its customer. To maintain high competitive advantage, logistics managers have to better control two distinct activities: the movement of products and the transaction of relevant documents. Hence, the management of truck from the check-in to check-out, consisting of assigning parking area for the truck arrived, directing the truck to loading bay and weighting and sealing the truck after loading, and the management of the registration of the start and finish of shipping processes are crucial. In reality, it is not uncommon to see that a number of trucks have to queue up for documentation and wait for the availability of loading bay. Worst still, the truck is moved to incorrect loading bay or the products are loaded to wrong truck. It is realized that information systems and technologies are used to support logistics activities such as transportation, material handling, communications and so on.

In this paper, we propose to employ radio frequency identification (RFID) technology to enhance the outbound logistics operations. The main objective of this paper is to design a decision support system with RFID technology to make loading and delivery processes more efficient. A case study in a printing company in China is addressed. A discussion of the difficulties involved in implementing an RFID-enabled decision support system is included.

RC305 Thursday, 13:40-14:55 Track: Teaching Innovation Chair: Prafulla Joglekar
Room: W2-305 Session: Teaching innovation in POM 2

RC305 Teaching Manufacturing Operations and Strategies in Higher Education
Charlotta Johnsson, Carl-Henric Nilsson, Lund University, Sweden

The importance of software systems for the planning and execution of production has drastically increased over the passed decades. This has lead to a growth in number of software systems used within sites. The companies'; problem today is no longer only to find relevant software systems but to coordinate and synchronize existing systems.

Students at higher technical educations e.g., bachelors and masters, are traditionally taught in software programming and factory automation. Students at higher economical and management schools are exposed to different manufacturing strategies and their economical impacts. However, in many education programs, the larger perspective, of how to combine the technical and the economical aspects is not highlighted. Without a clear structure of how to tackle the puzzle of combining the different software systems, the risk of getting a complex and fragmented information exchange between the manufacturing and the business software systems is high, this, with the bi-effect that production strategies with regards to time, cost, flexibility and quality are not maximized.

Technology Management is a unique program at Lund University, Sweden, where a number of students from the school of economics and management and from the engineering faculty are taught together during the last year of study. Their views on problems and challenges in today's industry complement each other. The course "Technology, Strategies and Structures" includes, among other things, projects done in collaboration with industries. In this course an international standard concerning Enterprise-Control System Integration and Manufacturing Operations (IEC 62264/ISA95), is discussed, analyzed and used in projects. The standard is used as a tool for structuring complex manufacturing systems, structuring information exchange within production sites, and for harmonizing the company's information flows. Examples of projects done by students treat; Lean Production, World Class Manufacturing, and Production Strategies.

This paper includes a discussion about how knowledge about Manufacturing Operations and Integration, through the use of the international standard IEC 62264/ISA95, can be incorporated in higher technical and economical studies, and it describes some of the industry projects done by the students.

RC305 Technology for Teaching Operations Management

Prafulla Joglekar, La Salle University, U.S.A.

In 2006-2007, I obtained a "Technology for Teaching" grant from Hewlett-Packard (HP) to restructure the content and improve the teaching methods of a required course, "MBA625 Effective and Efficient Operations Management." The grant gave me all the hardware needed to setup a wireless TabletPC laboratory in any classroom. My goal was to exploit the technology to address important teaching and learning issues associated with MBA625, a quantitatively focused course in operations management. The ultimate purpose was to make our students competent and confident in using OM concepts, principles, and quantitative decision-making tools to solve real-life business problems.

This paper summarizes how I planned to restructure my operations management course, which of those ideas worked and which did not. Actual examples of some real life applications of quantitative techniques by my student teams show the educational and practical value of this pedagogical approach. The paper concludes with lessons learnt and directions for further improvements in the course structure and teaching methods.

RC305 Application of Lean Principles in Academic Support, Focused in the Current Programme of Industrial Engineering (School of Engineering) at the Pontificia Universidad Javeriana, Bogota-Colombia

Joseph Robert Voelkl, Pontificia Universidad Javeriana, Colombia

Since Lean Thinking started to be applied in the companies to improve their processes and reduce or eliminate their wastes, the philosophy has been adapted and adjusted to different kind of business. At first, the main purpose of the methodology was the application in manufacturer fields, then after the successful results there, service companies started the application of it in their transactional business. Nevertheless, the knowledge and experience about lean successful implementations in this sector totally has not been worked. Specially in academic institutions, the result of the survey conclude that few institutions analyse them as a business, but still it is important to mention that in the few ones that tried to apply lean initiatives, the results were not as well as they expected. This situation is caused mainly by wrong implementation processes. Individual and independent initiatives were applied without control and communication through the organization. For that reason, this project developed a methodology to implement lean thinking in academic institutions, determining the stages necessaries to identify the wastes and eliminate or reduce them, from the general analysis of the context to the control and support of the changes. In addition, the project analyse the metrics and tools that should be used to support this kind of implementation, including general evaluation systems for the institution, its environment and its processes. Finally, the author suggest an implementation plan for the Industrial Engineering undergraduate programme, at the Pontificia Universidad Javeriana, Bogota-Colombia.

RC305 Design of a Methodology Based on CRM, as Input of Lean Thinking in Services, in the Definition of the Value Added Expected by the External Customers of the Industrial Engineering Undergraduate Programme at the Universidad Javeriana

Joseph Robert Voelkl, Jorge Alberto Silva Rueda, Clara Mabel Solano Vanegas, Edward Parra Florez, Pontificia Universidad Javeriana, Colombia

In the last decades, the companies which started to implement lean thinking discovered the importance of identifying the expectation of their customers, especially through the generation of value added in all their associated products and services. Actually, the main goal of lean thinking is eliminate "mudas" or wastes in the production processes, leaving the core and value added activities to produce the end product or service. But the fact around this situation is: how does the company define the value added expected by the customers? The best way is to ask them, and include this information inside the whole process of lean implementation and operations management. On the other hand, CRM (Customer Relationship Management) was developed as a business strategy to improve, grow and maintain the relationship with the customer. This strategy was introduced in an integral way since 90's decade, especially for commercial and marketing uses; although, the potential of this strategy, for other fields, has not been developed and used completely. Part of these potential as knowledge management is to recover and manage the perceptions and expectations of the customers, including what they expect as value added. Using the results of this information, the company could align its processes respect to the identified value, reducing wastes. Nevertheless, each CRM strategy should be designed according with the company and its own characteristics.

Following that, the result of our research is a methodology to identify the value added expected by the external customers, in service companies, designed for an institution that provides academic services, specifically in the undergraduate programme of

industrial engineering at the Universidad Javeriana; methodology based in the concepts and strategy of CRM, as the preliminary stage of a lean thinking implementation, who finally is a useful tool for waste and non-value added activities identification and the definition of the value stream.

RC401	Thursday, 13:40-14:55	Track: Knowledge and Technology Management	Chair: Ian Hipkin
	Room: W2-401	Session: Knowledge management 2	

RC401 New Production Development and Manufacturing Methodology Based on Subject-Oriented Service Engineering toward 21 Century Industry Era

Takeshi Kamogawa, PHOENIX Co., Ltd., Japan

In recent years, Japanese industry world has been faced many problem caused by globalism and informative society. The competitiveness of many commercial products has become not so strong except some specific products. Also these current products are changing to be service oriented products. Business model and profit become coming from more service layer other than hardware production business. Cellar phone products and communication service business are most typical example for such industry trend. The importance of competitiveness of such service oriented products would be service-oriented characteristics such as cosmetic design, usability, safeties, eco-compliance more than their functionality and convenient benefit. So it is necessary for engineers, and industry people should have the capability to satisfy consumers' sense of values and adopt various sensibilities under vivid design turn around capabilities. Also the total design credibility and productivity should totally cover hardware, software, and service-ware to realize the best quality, dignity and elegance.

In this paper, we propose and explain new design methodology dealing with the capability of invisible matters such as human sense of values, satisfactions and social interrelations. These new concept-context oriented engineering philosophy and methodologies are called subject-oriented or subject-base oriented ones developed over (beyond) object oriented design for software engineering world. Introducing this new technology into service engineering, we become able to handle human intention and semantics of decision and behavior in product and service design concurrently and totally. Also these new service engineering process are very effective practical project management and human resource development/education for 21 century industries.

Service engineering can gives strong weapon to recover of Japanese industry. Subject-oriented technology is comprehensive philosophy and technology. We explain also new Project Base Learning to develop super engineers and creators for service industrial new Japan. We believe to give strong influence toward the 21th service oriented industry global y as New Japonism introducing and continuous developing service engineering based on Subject-oriented philosophy and technologies.

RC401 Importance of a Solid Cultural Base to Implement Productive Methods in Small and Medium Size Mexican Manufacturing Enterprises

Eligio Espinoza Mendez, Uiversidad Politecnica de San Luis Potosi, Mexico

This article has the intention to present an analysis of the internal environment problematic that nowadays the Mexican small and medium size enterprises (SME's) live when these try to implement a productive method in the production line. A proposal to minimize this situation is presented too. This proposal is a model named "Implementation model of world class manufacturing practices to implement productive methods", and this is based on principles and world class practices to facilitate the implementation of productive methods that world class enterprises are applying in their organizations. This model was designed to develop SME's and it pretends specifically to generate a formation process of a new work culture concentrated in the continuous improvement.

Nowadays, Mexican SME's represent potentially one of the main instruments that could be essential in the development of Mexico's economy for the following years, because besides contributing not only with the 50% of formal jobs also they are an essential supply chain linked to large enterprises. Actually, Mexican SME's have financial support from different public and private organizations. It is important to recognize that economic factor is essential to obtain others resources to support the development towards greater productivity, but it isn't everything. On the other hand, this kind of enterprises needs to implement productive methods in their production lines to generate more productivity. However, neither the economic nor the methodological factors ensure that the enterprises will be more consistently productive in the future.

In order to achieve a higher productivity in SME's we also need a solid cultural base that has to work integrally and together with economic and methodological factors.

RC401 Operational Competence and Competitive Advantage through Absorptive Capacity in Process Industries

Ian Hipkin, University of Exeter, United Kingdom

Reactions to events such as accidents at the BP Texas refinery and the UK Buncefield storage depot in 2005 demonstrate that society strongly condemns operational deficiencies. The complexity of modern installations extends the debate on failure beyond equipment degradation to organizational mechanisms that do not operate as intended, and to human negligence and complacency.

The research referred to in this study investigates the application of absorptive capacity as a mechanism for improving operational competence in process industries. The concept of 'absorptive capacity' (AC) appears among the ingredients in the literature for addressing the organizational routines that sustain competitive advantage and superior operational performance. It refers to processes of acquiring, assimilating, transforming and exploiting knowledge.

The study uses the methodological approach by Meredith whereby a number of postulates are derived from the absorptive capacity literature and tested in several process industry case studies. The research demonstrates that knowledge is best acquired from diverse sources, and assimilated through relationship-specific routines. A regulated operational environment with verifiable data as the basis for decision-making enhances operational efficiency, but its rigidity is not conducive to transformation and exploitation. A less regimented environment where individuals have collective control over critical decisions lends itself to exploitation, but lacks a generation trail backwards to the source of knowledge. The research examines whether the components of AC cumulatively afford a level of production competence that potentially leads to sustained competitive advantage through knowledge transformation and exploitation.

The findings illustrate a paradox of absorptive capacity. A regulated and risk averse approach for acquiring and assimilating knowledge overemphasises existing practices and fails to exploit new possibilities. On the other hand, it is difficult to demonstrate to regulators that the autonomy and independent thought necessary for transforming current practices derives from disciplined knowledge acquisition and assimilation. The study shows that certain industries benefit from regulations in their

knowledge acquisition and assimilation, but their reluctance to step beyond knowledge-based decision making constrains their ability to exploit knowledge for operational competitive advantage. A less regulated environment encourages knowledge transformation, but less defined knowledge acquisition and assimilation procedures may not provide rigorous justification for new operational procedures and engineering interventions. The research is an original investigation of absorptive capacity in process industries. Its value lies in highlighting a potential discontinuity between rigorous knowledge acquisition and assimilation, and creative transformation and exploitation.

RC403 Thursday, 13:40-14:55 Track: m-Supply Chain Management Chair: Matthieu Lauras
Room: W2-403 Session: Modeling: SCM optimization 2

RC403 The Impcats of Process Synchronization on the Lead Time of Linear Manufacturing Supply Chains
Hongyan Dai, Mitchell M. Tseng, Hong Kong University of Science and Technology, Hong Kong
Time-based competition puts manufacturers under tremendous pressure to reduce lead time and be responsive to dynamic market. The situation is particularly severe in production of large systems like airplanes and cargo ships, whose manufacturing system are serial in nature. Delays in material delivery from suppliers or internal product disruptions could propagate and be amplified along the manufacturing process, resulting in costly delays in final delivery. Recent publicized cases of Airbus380 and Boeing787 illustrate the dire consequences of delays and indirectly reveal the challenges to compress lead time. Lead time compression has been extensively studied under various subjects that include business process re-engineering, project management and concurrent engineering, etc. Despite their theoretical appeals, the actual implementation is often handicapped by lack of timely and accurate information. Recent development in RFID technology promises a means to provide quality information in a timely manner. However, RFID adoption in industry is still very limited. Besides the significant investment, the economic benefits of implementing RFID remain unclear to practitioners. Justification of RFID adoption has been approached from various aspects.

This study contributes to this stream of research by focusing on the impacts of RFID on lead time compression in serial manufacturing systems. Specifically, a serial manufacturing system is modeled as sequential production processes and each process starts with the arrival of required materials from corresponding suppliers. Both suppliers' delivery time and manufacturer's processing time are assumed as stochastic. Early and late deliveries incur inventory holding costs and delay penalties, respectively. RFID technology is assumed to be able to reduce the variability of suppliers' delivery lead time, which will potentially result in better synchronization and shorter manufacturing lead time. A simulation model is constructed to compare the manufacturing system with or without RFID in terms of the lead time and costs. Sensitivity analysis based on the simulation model is performed to evaluate the economic benefits of RFID under different scenarios. The results of the study can help managers make informed decisions concerning RFID adoption.

RC403 RFID Tagging Level on Inventories
Evsen Korkmaz, Istanbul Technical University, Turkey
Tarkan Tan, Eindhoven University of Technology, Netherlands
For some industries operating inventory-carrying facilities, the key success factor has always been to minimize the inventory carrying cost while providing a high customer service level. This situation is also valid for retail industry. To survive in the competitive, rapidly and ever-changing retail industry, because of the cardinal importance of purchasing power, merging strategy is one of the main trends of this market. Due to the coercion of merging, fierce of competition, low profit margins and lack of customer loyalty, retail firms have been making big investments to automation technologies since the early 1980's. Technology is needed to manage huge systems. Even a medium-sized retail chain carries thousands of Stock Keeping Units (SKUs). Tracking the inventory record of every SKU and managing the replenishment policy for the whole system manually is a very time-consuming process. In this context, it can be easily said that keeping track of the location of every item and making sure that the inventory record is equal to the actual stock quantity is a task of primary importance. The improvements on automatic tracking technology and inventory management literature help the retail industry with the investments of automation. As its name implies, Radio Frequency Identification (RFID) uses radio signals to automatically identify the individual items. RFID presents several distinctions over barcodes. However RFID deployment might be still very expensive to justify tagging on item-level for all SKUs. In this study we present a mathematical model to decide on the optimum level of RFID tagging for each SKU in the inventory under the consideration of misplacement and shrinkage error factors.

RC403 Impact Analysis of Information Sharing to Chaotic Behavior in Supply Chain System
Yu Wang, Haiyan Wang, Southeast University, China
Chaotic phenomena exist in dynamic changing process of different levels inventory in supply chain systems. To investigate how information sharing decreases chaotic behaviors of inventory, the dynamic mathematic model of inventory in a simple supply chain which only includes a distributor, and a retailer is formulated in this paper. Then two kinds of chaotic behaviors of dynamic inventory changing of different levels system in the supply chain which based on that only demand information sharing between distributor and retailer, or both demand and inventory information sharing between distributor and retailer, are studied respectively. Moreover, chaotic behaviors of dynamic inventory changing without information sharing are also compared. Numerical simulation shows that chaotic degree of dynamic inventory changing can be reduced effectively using information sharing at last.

RC403 Order Fulfillment in Stock-out Situations Using a Non Sequential Advanced ATP Model
Matthieu Lauras, Uche Okongwu, Verane Humez, Lionel Dupont, Toulouse University, France
In today's highly competitive business environment, firms need to explore new market opportunities by effectively managing and integrating their supply and demand chains. Supply chains (SC) are generally said to lay more emphasis on efficiency (implying leanness) while demand chains (DC) are said to lay emphasis on effectiveness and responsiveness (implying agility). The integration of the SC and the DC can be achieved by maximising the performance of the Order Fulfilment Process (OFP) or more precisely the Order Management (OM) activity, which is a key component of the OFP. The OM activity consists of analyzing order portfolios in order to determine if, how and when orders can be delivered. In practice, there are tools that managers use to choose between different alternatives. However, in case of stock-out, these tools are insufficient for decision making in that they do not adequately take into account certain variables such as late delivery, multi-sourcing, product shortage and/or substitution. Moreover, they do not

consider the conflicting objectives of the different business functions such as marketing, distribution, logistics and manufacturing. In other words, in case of stock-out, the OM decision maker is often faced with two key questions: 1) How should the gap between the efficiency-driven supply side and the effectiveness/responsiveness-driven demand side of the OFP be bridged? 2) What are the best delivery options that would guarantee customers' satisfaction and loyalty while reconciling the conflicting objectives of the different actors involved in the OFP? Many authors have provided partial answers to these questions, in a sequential manner.

In this paper, we propose a model that tackles the two questions concurrently by using a non-sequential Advanced Available-To-Promise approach. This model is used to analyse a complete order portfolio while executing different delivery strategies that aim for leanness, agility or leagility. The strategies depend on the flexibility capabilities designed into the supply network, as well as on the degree of efficiency, effectiveness and/or responsiveness desired by the OM decision makers. The model is applied to a numerical example and the results obtained are used to illustrate the different delivery strategies.

RC405 Thursday, 13:40-14:55 Track: m-Inventory Theory Chair: Antonio Arreola-Risa
Room: W2-405 Session: Modeling: Production and inventory management

RC405 Production and Inventory Problem for a System Comprising an Assembly Supply Chain and a Distribution Network

Yu-Cheng Hsiao, Tai-Yueh Lin, Ya-Han Yang, Takming University of Science and Technology, Taiwan

In practice, products are manufactured by an assembly supply chain and delivered to retailers through a distribution network. An assembly supply chain consists of a mainline and several branch lines. Each line contains multiple production stages. This study investigates the production and inventory problem for a system comprising an assembly supply chain and a distribution network. The demand of each retailer is known and constant. Backlog is not permitted at every production stage and retailer. A uniform lot size is produced uninterruptedly with a single setup at each production stage. Equally sized batch shipment policy is applied to the whole system and the number of batches can be varied. All retailers have agreed on a joint replenishment policy with a common replenishment cycle. An agreement provides that the set-up costs of the assembly supply chain are shared by all retailers. The objective is to determine the optimal common replenishment cycle, the number of batches of each production stage and retailer, all of which minimizes the integrated total cost per unit time. Moreover, a new concept is introduced; namely, critical replenishment cycle. The replenishment cycle division (RCD) and recursive tightening (RT) methods are then developed to derive the optimal solutions to the subject problem. Two theorems are verified to ensure the solutions obtained by the RCD and RT methods reaching the global optimum. An example is presented to illustrate the procedures involved in the RCD and RT methods.

RC405 An Optimization Approach for Stochastic Production-Inventory Systems

Antonio Arreola–Risa, Texas A&M University, U.S.A.
Víctor M. Giménez–García, José Luis Martínez–Parra, Universitat Autònoma de Barcelona, Spain

The complexity of real-world stochastic production-inventory systems which are found in global supply chain management, usually leads to analytical optimization models that are mathematically intractable. Consequently, the common methodology of choice for the optimization of this type of systems is simulation. However, optimization via simulation suffers from the widely-known curse of dimensionality. For instance, finding the optimal values of the base-stock levels in a stochastic production-inventory system with 3 different items would require a tri-dimensional line search, and in a system with 100 different items, it would require a 100th-dimensional line search. While the tri-dimensional line search would not pose a challenge to practitioners, the 100th-dimensional line search would simply not be feasible for real-world decision makers.

We postulate an optimization approach for real-world stochastic production-inventory systems that takes advantage of simulation and at the same minimizes the impact of the dimensionality curse. The basic idea behind the proposed approach is simple: 1) Run a small and carefully selected set of simulations; 2) Use regression analysis and the simulation results to model the cost expression of interest as a function of the decision variables; 3) Apply calculus to the obtained function by regression analysis in order to identify the optimal values of the decision variables. The optimization approach is tested via an extensive simulation experiment on 900 test problems of a particular stochastic production-inventory system configuration. The results suggest that the postulated optimization approach is promising.

RC405 The One-Vendor Multi-Buyer Problem with Permissible Delay in Payments

Beatriz Abdul-Jalbar, Jose M. Gutierrez, Marcos Colebrook, Joaquin Sicilia, La Laguna University, Spain

In practice, it is frequent to deal with multi-echelon inventory systems where the installations are coupled to each other. Concretely, these inventory systems are common in both distribution and production contexts. For example, regarding distribution, these systems arise when products are distributed over large geographical areas. In this case, stocking points are located close to the customers and replenish their inventories from a central warehouse. In the production framework, stocks of raw materials, components and finished products are coupled to each other in a similar way.

Specifically, in this paper we deal with a two-level distribution system where a vendor supplies an item to multiple buyers. This model has been extensively analyzed in the literature and it is known as the one-vendor multi-buyer problem. Traditionally, it is assumed that the buyers must pay to the vendor as soon as the items are received. However, in practice the supplier often allows a certain fixed credit period to settle the account. During this credit period the buyers accumulate revenues on the sales and earn interest on that revenue. Then, if the payment is not settled by the end of the credit period a higher interest is charged.

In spite of being a common situation in real life, there are few papers dealing with the one-vendor multi-buyer problem assuming delay in payments. In addition, most of the previous studies focus on the single-buyer case. In this paper we extend the model to consider multiple buyers. In particular, we provide procedures for determining replenishment policies under both non-cooperative and cooperative relationships. In the cooperative case, the goal is to determine effective policies that minimize the total cost for the system. For the non-cooperative situation, we propose a two-level optimization approach which consists of computing first the replenishment policies for the buyers and then, determining the shipment schedule at the vendor.

RC405 An Integrated Single-Vendor Two-Buyer Inventory Model with Credit Period Incentives

Beatriz Abdul-Jalbar, Roberto Dorta, Jose M. Gutierrez, Joaquin Sicilia, La Laguna University, Spain

Traditional inventory models assume that the buyers must pay the vendor as soon as they receive the items. However, in practice, it is

common that the vendor allows a certain fixed period to settle the account for stimulating buyer's demand. This business strategy is very advantageous for the buyers since they do not have to pay the vendor immediately after they receive the items, but they can delay the payment until the end of the allowed period. Therefore, during the credit period the buyers can earn interest on the accumulated revenues. In contrast, if the payment is not settled by the end of the credit period a higher interest is charged.

Under these assumptions, the main goal of this paper is to compute inventory replenishment policies that minimize the total system cost. Most previous papers dealing with permissible delay in payments focus on determining replenishment inventory policies only for the buyers. That is, the aim is to minimize the total cost at the buyers without taking into account the total cost at the vendor. However, it is well-known that integrated inventory models usually have the advantage of reducing total cost. Accordingly, most researches have conducted their efforts in studying the case where the vendor and the buyers collaborate and integrate their decision processes to achieve a more efficient control. In spite of this, contributions on the integrated model assuming permissible delay in payments are confined to considering a single buyer. Although, in practice, the vendor usually supplies multiple buyers, we find few references in the literature addressing the multiple buyers case with delay in payments. In this paper, we extend the analysis to the case where the vendor supplies an item to two different buyers which face a constant deterministic demand.

RC501 Thursday, 13:40-14:55 Track: Spanish Chair: Mariano Aguayo
Room: W2-501 Session: S-Information systems and e-operations

RC501 Analysing the Information Technology Paradox in the Supply Chain
Beatriz Minguela-Rata, Jose Fernandez-Menendez, Jose Ignacio Lopez-Sanchez, Antonio Rodriguez-Duarte, Francesco Domenico Sandulli, Universidad Complutense de Madrid, Spain

This paper studies the impact of ICT on the productivity of the activities of the firm in the supply chain focusing on the actual use of these technologies instead of on the mere ICT investment. Approaching the research goal with the theoretical framework of the Theory of the Diffusion of Technology and applying Data Envelopment Analysis Techniques to a large sample of more than 2.000 Spanish firms representing the whole Spanish economy. The results show that the biggest increase in efficiency are related to high levels of computerization of the internal logistic operations of the firms, while medium and low levels of computerization of the internal logistic operations have almost no effect on the performance of the firms. The computerization of the external logistic operations with suppliers and customers has a positive impact on the performance of the firm, independently of the level of computerization achieved. Finally the results imply that the performance improvement due to the computerization of external logistic operations is always lower than the improvements due to the intensive of ITC in internal logistic operations. Firms do not always obtain the expected ROI when they invest in IT in the supply chain. Our research confirms this to be especially true when attempting to use IT to coordinate internal activities. In this case the ROI will be high only if the firm heavily uses IT in coordination. External coordination is easier to implement as it does not need an IT intensive organization to yield positive results to the IT investment. However our research should not discourage firms from using IT for internal coordination as in the end it will yield much better performance than only using IT to coordinate inbound and outbound logistics.

RC501 ERP System Selection with Fuzzy Modelling
Jose L. Salmeron, Salvador Bueno, Victor A. Banuls, University Pablo de Olavide, Spain
Maria-Teresa Gonzalez-Zurita, University of Seville, Spain

ERP tool selection can be seen as one of the most relevant decision-making stages for an organization. It is one of the most difficult ones when an organization is trying to acquire an ERP system. This research is focused on this decision. The decision-makers see this selection as completely saturated by a wide range of factors which they must shuffle. In addition, the decision-makers must make a relevant effort to understand what the most relevant criteria are, in order to complement the decision-making process. In this sense, it is useful and efficient to determine the complexity of a problem, along with the structuring, as it offers the decision-maker a set of different possibilities by means of a clean and outlined form, in addition to helping identify factors and relationships.

This work proposes structuring the decision-making selection of ERP systems. With this purpose, the authors have applied a fuzzy-based cognitive maps research model capable of offering a definitively organized and structural outline in the acquisition of an ERP tool. The proposed model is specifically designed for ERP systems selection, as defined by ERP's experts. In addition, the proposed decision model offers a tool where the more relevant criteria, its intensities and the relationships between them are shown.

RC501 Integrated Enterprise Architecture Framework for Business and Information Technology Alignment
Llanos Cuenca, Angel Ortiz, Andrés Boza, Univesidad Politécnica de Valencia, Spain

Enterprise Architecture describes how all the enterprise components are in line with each other. The Framework of Enterprise Architecture provides an understanding of a company or a class of companies through the organization and presentation of artifacts that conceptualized and described the company, is a logical structure or diagram for classifying and organizing representation descriptive of a business or parts of a conceptual entity (Martin, 2004).

Different Enterprise Architecture have different frameworks, that justifying the need for a consistent modelling framework, which covers the entire life cycle and allows modelling under different perspectives but in an integrated mode (Cuenca et al., 2006). The literature suggests that firms cannot be competitive or successful if their business and information technology (IT)/information systems (IS) strategies are not aligned. (Boza, 2004; Avison, 2004)

This paper presents a comparison of relevant Framework for Enterprise Architecture, CIMOSA, GRAI, PERA, GERAM, IE-GIP, TOGAF, Zachman, (Cuenca et al, 2005), under their life cycle and the main Strategic Business and IT Alignment Framework, (Henderson y Vankatraman,1993; Maes,1999) after that, an Integrated Enterprise Architecture Framework (EAIF) for Business and Information Technology Alignment (BITA) is proposed, which serves as a common basis for defining integrated business models. It gathers in a single Framework, Business and Technology aspects. Different life cycle phases are defined for business and IT which guarantees their integration.

RC501 A Qualitative Decision Support Tool for Operational Managers
Jose L. Salmeron, University Pablo de Olavide, Spain
Mariano Aguayo, Rafael Del-Pozo, University of Seville, Spain

Critical Success Factors (CSF) is a method developed by Rockart to enable CEOs to recognize their own information needs so that Information Systems could be built to meet those needs. CSF has been used in several fields to evaluate performance, or determine information requirements. The point is that there is no universal procedure to collect the data and analysis for CSF. On the other hand, Critical Success Chains (CSC) are a CSF-based tool designed to help decision making in companies. CSC try to take advantage of the knowledge that exists in organizations. In this sense, they claim that each individual has unique point of views of the events. CSC applications go from Information System development proposals, to the detection of improvements in the delivery of products. The goal of CSC is the collection and creation of new ideas of CSF to improve the business process. Based on a logistic case study, our work proposes an approach to help companies to identify the key of requirements and measurements that determine its relationships, converting CSF into qualitative information using CSC approach for supporting decision-making. The main objective of this study is to offer a CSC-based visual qualitative tool for modelling CSFs.

RC503 Thursday, 13:40-14:55 Track: m-Marketing and Operations Interface Chair: Vincent Chi-Wei Li
Room: W2-503 Session: Modeling: Pricing

RC503 Optimization Problem for the Column Assignment of a Vending Machine
Junichiro Fukuchi, Gakushuin University, Japan
Hajime Itoh, Otaru University of Commerce, Japan
Toshiko Takeuchi, Gakushuin University, Japan
We investigate a method of obtaining the optimal column assignment for a vending machine. A column is a space in which the same products are held in a vending machine. We assume that demand for each product is described by the Poisson process. Two different models are considered for the selection of products. One model assumes that the demand is independent of the assortment of a vending machine. The second model assumes that a consumer selects a product according to the multinomial logit model and thus the probability of selecting a product depends on the assortment of a vending machine. The following joint replenishment policy is adapted. (i) Items are replenished when some products are sold out. The lead time is zero. (ii) All products are jointly replenished to the initial inventory level. We define the long-run profit rate by the limit of the revenue in the period [0, T) divided by the total replenishment cost in the period [0, T). Our objective is to find the column assignment that maximizes the long run profit rate. It is found that this objective function has many local maximums. We investigate the performance of a variant of the tabu search called Life Span Method (proposed by Kubo and Fujisawa, 1998). Some results on numerical experiments will be given.

RC503 Monotonicity in Revenue Management under a Discrete Choice Model of Consumers
Hideo Miki, Yasushi Masuda, Keio University, Japan
In revenue management, the market segment of business travelers plays an important role. This paper examines the monotonicity properties of expected revenue with respect to the consumers' business orientedness and the market size. The consumer behavior is described by a general discrete choice model. The control problem is to decide which subset of fare products to offer at each point in time. An example shows that an ordinary stochastic order relation in consumers' preference over the set of fare products is not sufficient for our naive intuition regarding the monotonicity to hold true. We provide sufficient conditions under which our intuition is valid.

RC503 Markdown Pricing of Seasonal Products in Retail Chains
Vincent Chi-Wei Li, Yat-Wah Wan, Kate Chao, National Dong Hwa University, Taiwan
This paper studies the markdown pricing strategy when a retailer chain sells a seasonal product with a finite planning horizon. The retailers face an uncertain demand which is stochastic and price sensitive. There is a warehouse which provides the retailers with limited replenishment during the finite selling horizon. The warehouse and the retailers all have inventory in the beginning of the aforementioned finite horizon. Each retailer can place a replenishment order from the warehouse in the beginning of each period except the first one. We consider a permanent markdown pricing approach with monotone non-increasing price. We first use dynamic programming to solve this problem. Due to the complexity of the dynamic pricing scheme, we develop several heuristics to solve this problem. Computational results will be presented.

RD202 Thursday, 15:15-16:30 Track: JIT & Lean Production Chair: Luis Fernando Nino
Room: W2-202 Session: Lean production 2

RD202 Current Issues for Internationalization of Japanese Manufacturing Companies
Kodo Yokozawa, University of Twente, Netherlands
Harm-Jan Steenhuis, Eastern Washington University, U.S.A.
Erik Joost de Bruijn, University of Twente, Netherlands
According to the literature, Japanese manufactures are facing difficulties transferring their management systems abroad, (see for an overview of the literature in Yokozawa, 2007). This research is aimed to assess the current and future international managerial issues for Japanese manufacturers. The main research questions were: what are the main problems for Japanese companies when they internationally transfer Japanese management systems? And what are the underlying causes for these problems?

In order to answer these questions, research was conducted at Japanese headquarters of 30 companies. These companies were selected mainly in the car, car-parts and electric machinery industries because they were the largest foreign direct investor in Japan in 2006 (Jetro, 2006). An open-ended questionnaire was developed for interviews with representatives of these companies. Eisenhardt's approach (1989) was partly employed to obtain advantages from both inductive and deductive approach. Although her approach is aimed at building theory from a case study, the research procedure and some of the concepts and analyzing techniques could also be used in this interview-based research to enhance the reliability and validity of the findings and in order to build a solid conceptual model to be tested.

The results show that 80 per cent of respondents indicate that they are having difficulties transferring kaizen to their overseas plants and perceive this as their biggest future challenge. It was found that there are three forces: cultural, environmental and administrative that hinders the smooth transfer of kaizen abroad. Cultural forces include language barriers and a lacking sense of teamwork. Environmental forces include high labour turnover rate and intensive job classification. Administrative forces include lack of commitment of headquarter toward kaizen. In order to facilitate the transfer of kaizen abroad, respondents perceive that corporate and individual level efforts are essential.

In conclusion, the research finding shows that Japanese manufactures are facing in particular difficulties with transferring kaizen to their overseas plants because of three major hindering forces. Respondents perceive that organizational and individual level efforts are necessary to mitigate these forces.

RD202 Customer Involvement, Modularization of Products, and Mass Customization: Their Relationship and Impact on Value to Customer and Competitiveness
Ayman Bahjat Abdallah, Anh Chi Phan, Xue Shi, Yoshiki Matsui, Yokohama National University, Japan
We use international data to examine the direct relationship between JIT production and mass customization and the indirect relationship through total quality management, total preventive maintenance, supply chain management, manufacturing strategy, organization & human resource management, and technology. We also examine the impact of lean production on customer satisfaction and competitiveness through mass customization.

RD202 Validation of a Methodology for the Implementation of Lean Manufacturing System in Selected Mexican Industrial Plants
Mariusz Bednarek, Luis Fernando Nino, Polythecnical University of San Luis Potosi, Mexico
The objective of this paper is to present the results of the validation of the methodology of implementation of Lean Manufacturing System. The methodology has been designed for industrial Mexican SMEs. In order to validate the methodology, the following elements have been developed: - Selection of a representative industrial plant from Mexican SMEs. - A sequence model to implement the methodology of lean manufacturing system. - Training required for managers and operative employees in the company. - Definition of the indicators for measurement of the results of the implementation. - Validation of the methodology through its implementation in a workshop conditions in the industrial plant. - Adjustment and continuous improvement required in the methodology.

The findings of this research are the following: 1. Validation of the methodology in real conditions. 2. Improving changes and adjustments in the methodology according to the observations through the process of validation. 3. Several indicators of the industrial plant performance improvement.

The limitations presented in this research are the following: a) Resistance of the employees involved in the implementation of lean manufacturing system. b) The validation has been limited to one industrial plant representative of Mexican SMEs and seven months time period. c) Additional validation has been developed by depth interviews with experts group. Their observations have been analyzed and included as changes required in the model.

The practical implications of this research that were identified are: The future research will concentrate on the development of a general methodology of implementation of lean manufacturing in Mexican industrial plants. The main value of the paper is the presentation of an original methodology provided to Mexican industries to make possible a positive result in lean manufacturing implementations. The methodology can be adaptable to the particular situation of these industries.

RD305 Thursday, 15:15-16:30 Track: Teaching Innovation Chair: José A. D. Machuca
Room: W2-305 Session: Teaching innovation in POM 3

RD305 About THENEXOM and its survey on Operations Management, Supply Chain Management and Service Operations Management
José A. D. Machuca, Macarena Sacristán-Díaz, Rafaela Alfalla-Luque, Antonio Moreno-Moreno, University of Seville, Spain
The European Thematic Network for Excellence in Operations and Supply Chain Management Education, Research and Practice (THENEXOM) was promoted by EurOMA in 2002 in order to extend a research project carried out in Spain on POM Teaching (Alfalla-Luque and Machuca, 2003; Machuca and Alfalla-Luque, 2003).

The basic THENEXOM's goals are two: on the one hand, to analyse the present state of Operations, Supply Chain, and Service Operations Management in European universities to identify strengths and weaknesses in order to instigate the use of better practices;

on the other hand, to tighten links between teaching, research and business practice by actively seeking to identify and remove theory-practice gaps between these three pillars of companies' competitiveness.

To achieve these goals, a census of European Operations Management faculty has been drawn up throughout the countries making up the network. This first pan-European census of OM, SCM and SOM academics has been done via the Internet, and it is currently available for the EurOMA Secretary Office. Currently, a survey is being taken of the teaching-staff, -content and -methods employed to determine the state-of-the-art of OM/SCM/SOM teaching across Europe. The draft of the questionnaire was used in a pilot survey conducted in a number of the participating countries. Once the pilot survey was completed, corrections and improvements were made in order to produce the final version of the questionnaire. The survey is being conducted via the Internet through access to the THENEXOM website (http://www.thenexom.net).

The site's homepage is not only conceived as a means of conducting tasks that are characteristic of the network (census, surveys, etc.), and as a place to assemble all the information that derives from the network (as for example, a monograph on teaching innovative practices (Machuca et al., 2004), but is also intended to be a point-of-reference for the subject both on an EU level and beyond EU borders. As such, the site contains links to scientific societies and institutions, and there is a forum where issues both relating to the network and, in the future, matters relating to the subject as a whole, can be discussed.

Although not the only ones, the direct beneficiaries of the Network are initially all academics in the field of OM, SCM and SOM working in European universities. They will directly benefit from increased knowledge of who is teaching which kinds of subject (and which methods / techniques) and undertaking what type of research. Users of the knowledge-base will have a valuable source of information. In addition, many of the partners have links with companies, which should also facilitate increased awareness of best practice within the companies and a direct transfer of knowledge. The network will provide teaching professionals with increased awareness and understanding of good practices in teaching OM, SCM and SOM so they can better integrate their research and teaching to the benefit of their students.

Initially, THENEXOM was run within the framework of the Socrates community action programme as it was approved in 2003 by the European Commission. During that period a series of meetings took place in which representatives of institutions participating collaborated to design the draft of the questionnaire, which tried to take into account different perspectives and realities from European OM academics. The survey took Socrates Tuning project methodology into account too in order that it might be of help for the convergence of Business Administration studies within Europe, in general terms, and of OM in particular.

Since January 2005 it has continued working with funding from a number of partners. The objectives sought were and continue to be ambitious, and it cannot be said problems have not arisen: quite low census figures in certain countries, a lack of commitment from some partners, and a low response rate in the survey so far. Nevertheless, the importance of the aims and objectives is a source of constant motivation for those who believe that THENEXOM can lead to a clear improvement in the teaching, research and practice of OM/SCM/SOM. Causes for some of the above mentioned difficulties have been detected and a proposal for some changes in the questionnaire that can positively influence the response rate is given.

Another of Thenexom's goals is to extend the initiative to other countries, such as the US (through POMS) and Japan (through JOMSA), where the same survey could be carried out. This would allow comparative analyses to be conducted between all three geographical areas.

RD401 Thursday, 15:15-16:30 Track: Knowledge and Technology Management Chair: Dian Yan Liou
Room: W2-401 Session: Knowledge management 3

RD401 Factors Affecting Business Process Reengineering in China
Xin James He, Fairfield University, U.S.A.
Business process reengineering (BPR) has played an important role in such developing fields as information systems, electronic business, and enterprise resource planning (ERP) systems over the past decade. The primary objective of this research is to investigate the factors affecting BPR in China as more Chinese companies realize the pervasiveness of BPR in pursuit of global competitiveness. While BPR is often considered one of the critical success factors of ERP implementation, its implementation is especially challenging to enterprises in China due to different corporate culture, economic system, and information technology infrastructure. Specifically, we first use a survey method to collect the data on 110 companies in China. Then we deploy descriptive statistics with hypothesis testing to reveal the BPR status, factor analysis to indentify a few pricial factors affecting BPR implementation, canonical correlation to scrutinize the impact of the respondents' demographics on research constructs. We find that senior management support, cross-functional communications, cross-unit project team, and training & employee education are top four critical success factors, whereas a culture that resists changes & new ideas, lack of innovation incentives to state-owned enterprises, seniority based promotion, unemployment pressure, and lack of senior management commitment are the top five major obstacles.

RD401 Proposal and Validity of Patent Evaluation Method
Koichiro Anabuki, Haruhiko Kaneta, Manabu Yamaji, Kakuro Amasaka, Aoyama Gakuin University, Japan
In this paper, a patent value evaluation method which is part of corporate strategy, namely, A-PPM (Amasakalab- Patent Performance Method) is proposed. Improvement in the patent value indicates value creation for the engineering work. Based on the keyword - strategically competitive patent- 14 component factors necessary for patent value evaluation were defined in an effort to structure a patent evaluation method for qualitatively evaluating patents. Engineers, the intellectual property department, or chartered patent agents involved in the development of patents generally have different viewpoints about patent evaluation. Therefore, by conducting the evaluation separately in order to obtain a more detailed evaluation and then integrating these evaluation results, the creation of patents of higher value can be ensured. This way, the patent Evaluation Method - A-PPM - was established to innovate intellectual property functions and thereby enhance the competitiveness of corporate strategy. Its effectiveness has also been verified at a leading corporation.

RD401 Complementarity in Innovation Strategies and Innovation Performance: Evidence from Spain
Ana M. Serrano Bedia, M. Concepcion Lopez Fernandez, Gema Garcia Piqueres, University of Cantabria, Spain
This paper aims to test the complementarity between different innovation strategies of the firm (Arora and Gambardella, 1990; 1994; Cassiman and Veugelers, 2006), as well as the effects of these strategies on the innovation performance (Hartung and Macpherson,

2000; Belderbos et al., 2006). Traditionally, the literature has identified two main ways to carry out innovations by the firms: "internal" and "external" development (Veugelers and Cassiman, 1999; Cassiman, 2004; Cassiman and Veugelers, 2006), which has been called the "make or buy" decision (Chang, 2003; Cassiman and Veugelers, 2006). More recently, the literature has addressed the study of a third innovation strategy: the cooperation strategy. Cooperation has been understood like a hybrid innovation strategy between the internal and external development (Pisano, 1990). In general terms, firms tend to combine these three innovation strategies. This fact suggests that these activities could be complementary. This is a reminiscent of the notion of "absorptive capacity" introduced by Cohen and Levinthal (1989; 1990), which postulate that a prior stock of knowledge allows firms to absorb, evaluate and utilize the scientific information outside its boundaries. Along this line, most of the empirical evidence has found consistent results with this theory (Rothwell et al., 1974; Freeman, 1991; Arora and Gambardella, 1990; 1994; Veugelers and Cassiman, 1999; Rigby and Zook, 2002; Cassiman and Veugelers, 2006).

The data used for this research are those provided by the Spanish Community Innovation Survey (CIS) for the year 2000. The survey is called the Survey on Technological Innovation in Firms and is conducted by the National Statistics Institute, NSI. Respect to the empirical study, we analyze how combining innovation strategies affects the innovation performance of the firms. To achieve this objective, we regress our measure of innovation performance (% sales from New Products) on the combinations of innovation strategies, together with other control variables selected following the literature review.

RD401 Dynamic Guanxi (Relationship) in High-Tech Firms for Knowledge Transfer and Decision Making

Dian Yan Liou, Yu Da College of Business, Taiwan

Guanxi is the lifeblood of Chinese business communities, and frequently acts as a lubricant of business activities. Although Guanxi is embedded in every aspect of Chinese social life, companies demonstrate different needs and capacity for Guanxi cultivation. Chinese firms develop Guanxi as a strategic mechanism to overcome competitive and resource disadvantages by cooperating and exchanging favors with competitive forces and government authorities. In this research we explore the role of this special relationship in knowledge management by examining the relationship between inter-firm knowledge transfer and Guanxi. Three components operationalize Guanxi: trust, relationship commitment, and communication. Although economic and social variables have created certain demographic differences between Taiwan and mainland China, citizens from both autonomous regions are same race because of the shared culture.

Using 268 Taiwanese enterprises located at three High-Tech industry clusters in Taiwan (Hsinchu Science Park, Central Taiwan Science Park, and Southern Taiwan Science Park) as the sample, data is analyzed using regression analysis with interaction terms. We intended to show that which one (trust, relationship commitment, or communication) is the main channel of knowledge transfer or some of them will be. In addition, these three elements will be checked with a positive, negative, or moderating effect upon the different channel of knowledge transfer. Several important managerial and theoretical implications are proposed.

RD402 Thursday, 15:15-16:30 Track: Invited Chair: Arvinder P. S. Loomba
Room: W2-402 Session: Supply chain risk management

RD402 Global Supply Chains and Risk: Petroleum Supply

Richard O. D. Lane, University of Queensland, Australia

The purpose of the paper is to examine risks and adjustment mechanisms in global oil supply system. The aim is not only to gain understanding of the industry but also to shed light on the theoretical adequacy of the risk management process. The paper is based on theoretical understanding of risk in supply chains derived from operations management and from published studies of the energy industry and its economics. Classic modes of dealing with uncertainty include re-engineering operations for flexibility and quick response, strategic provision of buffers, form postponement, and provision of base-load and quick response capabilities. Excess capacity and institutional flexibility are often seen as essential, while information systems are used to coordinate participants in the supply chain. Historically, forecasting in the oil industry has been notoriously unreliable. At the same time, enormous investments in plant and infrastructure are required, with very long lead times. The excess capacity that provides flexibility in the industry exists largely by historical accident. The supply system is complex, with at least two major stages in production (production and refinery), multiple participants with conflicting objectives and no dominant player. Governments pursue national and global objectives in attempting to influence market structure and infrastructure, often with different branches of government pursuing conflicting aims. Markets are based on perceptions of trends and subject to vagaries of governmental regulation at many levels. There are commercial, man-made and environmental risks and technological change. We argue the industry is a useful benchmark in understanding supply risk. It exhibits most traditional forms of risk, often in a heightened fashion. Further, it is really only comprehensible as a total system, with no one player able to determine outcomes, and long lead times. Participants not only compete but have incentives to mislead.

RD402 Managing Risk by Sorting before Product Recovery in Reverse Value Chains

Kenichi Nakashima, Osaka Institute of Technology, Japan
Arvinder P. S. Loomba, San Jose State University, U.S.A.

In this study, we examine a perspective of product recovery that portrays a value chain's primary activities in the reverse direction, for the purpose of recapturing value or proper disposal. Firms are realizing benefits from viewing value chain systems as closed-looped thus treating as an integral component of a value chain management system.

Product recovery considerations should addressed when designing and managing product value chains since they aim to minimize the amount of waste sent to landfills by recovering materials and parts from end user returns. Earlier research has analyzed single-stage product recovery systems using stochastic variability considerations, using a discrete time Markov chain and applying traditional inventory theory with consideration for disposal and return. We aim to expand this research by incorporating inspection step in the model. A two-stage product recovery system, with sorting before disassembly for product recovery, is suggested. This type of quick sorting can be made possible, for example, through installation of simple electronic devices in new products that record basic usage data and provide information about product recovery without the need for its disassembly. We analyze the attractiveness of simple sorting procedures characterized by limited accuracy just before disassembly of used products. Such a model would attempt to manage risk by curbing product recovery costs and improve information for recovered part inventory to effectively postpone production decisions. We compare expected period costs in a two-stage product recovery system that considers sorting

before disassembly with that of a single-stage model to analyze conditions under which quick sorting is economically justifiable. Also, economic attractiveness of sorting before disassembly for product recovery in reverse value chains is explored.

RD402 HRM Implications of External Risks to Firms in Supply Chain

Carol Reade, San Jose State University, U.S.A.

Terrorism has become a fact of life in international business. Terrorism presents a form of risk to business that is distinct from traditional political or country risk, since a terrorist attack on a business can occur at multiple points in the supply chain, in more than one country, simultaneously. Terrorism has direct and indirect effects on business, and has multiple consequences across all business functions of a multinational enterprise. These are nascent areas of study and our understanding of the effects of external risk on international business, particularly on supply chains, is limited. Even less well understood are the human resource management implications of external risks to the supply chain. This paper attempts to address that gap by investigating the relationship between terrorism and employee work attitudes.

This study investigates the impact of terrorism on a range of employee attitudes, including work motivation, job satisfaction, propensity to innovate products and processes, and perceptions of team and leadership competence. These relationships are worthy of investigation given that attitude toward work, team, and leadership are associated with desirable workplace outcomes such as enhanced job performance, reduced absenteeism, support of organizational restructuring, and superior customer service. Positive attitudes are crucial for meeting production targets among other organizational goals. It is proposed that external risk of terrorism is likely to negatively affect employee attitudes and behavior with important ramifications for the management of human resources within supply chain firms. The study is based on questionnaire data collected from 898 managers of domestic and foreign firms in Sri Lanka, a high-risk operating environment, across a wide range of industries. The results indicate that employee perceptions of terrorism risk largely have a negative effect on employee attitudes within supply chain firms.

RD402 Risk Management in Modular Supply Chain Structures

Arvinder P. S. Loomba, San Jose State University, U.S.A.

The objective of this study is to study the risk management in modular supply chain structures. We base our definition of modular supply chains on three-dimensional modularity concept posited by Fine (1998) work on Clockspeed, which claims that modular products not only tend to be designed and built by modular processes but also by modular supply chains. Modularity in a supply chain setting refers to the degree of non-proximity of elements measured along geographic, organizational, cultural, and electronic dimensions. A supply chain with a high degree of integrality, therefore, is one in which a manufacturer and its principal suppliers are concentrated in one geographic region, have common or interlocking ownership, share a common business and social culture, and are linked electronically. In contrast to the integral system, modular supply chains permit substitution of different versions of functional components for the purpose of creating supply chain variations with different functionalities or performance levels. It was argued that product, process, and supply chain architectures tend to be aligned along the integrality-modularity spectrum. That is, integral products tend to be developed and built by integral processes and supply chains, whereas modular products tend to be designed and built by modular processes and supply chains.

Supply chains exhibit remarkable variation, particularly based on two types of risk — demand and supply risks. Earlier research offers a framework that highlights the fact that these product or service characteristics can be used to categorize distinct supply chains, which can be served by modular structure. In this paper we consider the specific risk management strategies for modular supply chain structures and offer several research propositions. Using the research model framework provided herewith, study results and ensuing managerial insights are discussed.

RD403 Thursday, 15:15-16:30 Track: m-Supply Chain Management Chair: John J. Liu
Room: W2-403 Session: Modeling: SCM optimization 3

RD403 Supplier Selection and Order Allocation using MAUT and LP

Amir Sanayei, M. Reza Abdi, S. Farid Mousavi, Bradford University, United Kingdom

Supplier selection is a fundamental aspect of supply chain management, which closely contributes to the overall supply chain performance. Supplier selection is a complex multi-criteria problem including both quantitative and qualitative factors, which are often, assessed by using imprecise data and/or human judgments. In order to select the best suppliers, it is necessary to trade-off between the influencing factors, in which some of them may be in conflict with the others or even uncertain.

In this paper an integrated approach of Multi Attribute Utility Theory (MAUT) and Linear Programming (LP) is proposed for rating the alternative suppliers and choosing the most appropriate supplier. The MAUT method is employed to determine the supplier's utility from the decision makers' viewpoints, whereas the LP model is used to attain the optimal order quantities to be purchased from the selected suppliers while maximising total additive utility. Having identified the overall organization goal, a reasonable set of the comprehensive objectives for supplier selection process is derived. Accordingly, the degree to which these objectives are met is measured by the corresponding attributes using a supply chain operations reference (SCOR) model. The proposed supplier selection approach is demonstrated through a case study conducted in an automotive industry.

RD403 Supply Chain design based on the QFD and AHP approaches

Uche Okongwu, Toulouse Business School, France

A customer-driven supply chain management (SCM) system aims to satisfy the requirements of the ultimate customers. Its design entails identifying the key business processes which contribute to satisfying customer requirements, and then the major supply chain partners involved in the processes and which should be taken into consideration in designing the supply chain. Using two well established methods, Quality Function Deployment (QFD) and Analytical Hierarchy Process (AHP), this paper proposes a new model that would enable managers to design their SCM system.

QFD was originally used to identify and manage gaps between the functionalities of a product and the needs initially expressed by the customers. In this paper, it is used to identify and manage the key organizations (suppliers, manufacturers, distributors, carriers, and third party service providers) that are involved in various supply chain processes, in order to achieve the desired goals. Though fairly reliable, the QFD model is very sensitive to the system used in scoring the various criteria and could

lead to explosion of the results. The AHP approach enables to significantly reduce this risk of explosion. Capable of handling both qualitative and quantitative attributes, AHP is a multi-criteria decision-making method that enables to structure items into different hierarchical levels before they are compared on a pairwise basis in order to determine their relative importance. Using the AHP method also enables to take into consideration relationship factors such as trust, operational uncertainty, divergent objectives, power relations and politics, cross-cultural issues, and resistance to change. The outcome of the model helps to determine the degree of collaboration and integration and to assess the required level of interconnectivity between supply chain partners. Finally, a practical example is used to illustrate the model.

RD403 Organizing Supply Chain by Integrating of Manufacturing Planning and Control Systems

Ayako Kawai, Ryo Sato, University of Tsukuba, Japan

In order to have a smoothly running supply chain process, the whole process should be appropriately designed. Information system is one of the necessaries of business processes of today. Therefore, combination and integration of information systems in a supply chain process should be developed. It is often said that sharing information among the firms is inevitable for efficient supply chain. However, it is not clear neither what kind of data nor how should be shared. This research proposes an integration schema for a dyadic relationship between a manufacturer and its supplier.

The internal mechanism such as process structures, network structures of supply chain or information systems can easily bring complexity so behavior of whole process is difficult to predict. In this research, the whole supply chain is modeled as a discrete event system of which structure is divided into material and planning information flows. And the structural factors of the chain, that includes production-planning-and-control systems (PPCS), are defined as structural parameters. And then, experimental result for a simple supply chain process will be shown to see how these parameters affect the behavior of the chain. In the supply chain, each organization has its own PPCS. The PPCS makes sales plan, and plans production orders and purchase orders based on the planned sales data, and finally release the plans to the logistic process. This supply chain process is rather simple but yet practical.

By analyzing the experimental results, we have found the following results: - Not only planning information flow but also material flow should be optimized in order to get most effective operation of the chain; - When the structural parameters are inappropriately combined, then the behavior of the chain is complex and even catastrophic; When appropriate amount of inventories are allocated at each stock point, information sharing is found to be useful for inventory reduction; If safety stock level is not proper, the sales forecast for the supply chain should have more than 99% accuracy in order to be used for reduction of the whole inventory.

RD403 QVI Characteristics of Risk-Pooling in Port-Focused Logistics

John J. Liu, Kevin X. Li, Jiguang Laser Yuan, Hong Kong Polytechnic University, Hong Kong

We report that the two basic logistics systems, namely, the emerging port-focal logistics associated with a trade-based supply chain versus the well studied firm-focal logistics in a typical manufacturing-based supply chain, differ fundamentally in risk-pooling, the former of mutual-risk and the latter of individual-risk. So far, logistics research has largely focused on firm-based supply chains under non-mutual risk pooling, similar to that of an investor-own insurance firm. A most representative organization of mutual-risk pooling is marine mutual insurance (MMI) that has enjoyed a glory success and prestige for over 150 years. The key findings of this paper is that mutual-risk pooling can be characterized by quasi-variational inequalities (QVI) of impulse theory, and the value of mutuality is determined by degree of information asymmetry between mutual-risk pooling versus individual-risk pooling. Algorithms are developed to compute the value of mutuality by solving the QVIs. The conclusion provides a general scientific basis for both managerial strategy and competition regulation in service oriented supply chain management.

RD405 Thursday, 15:15-16:30 Track: m-Inventory Theory Chair: Tej S. Dhakar
Room: W2-405 Session: Modeling: Batch sizing and inventory management

RD405 Optimal Logistics and Inventory Policies in a Serial Supply Chain with Variable Number of Batches and Mixed Batch Shipment

Yu-Cheng Hsiao, Wen-Tsung Ho, Takming University of Science and Technology, Taiwan

This study addresses a serial multi-stage supply chain with variable number of batches and mixed geometric and equal batch shipment. The objective is to determine the optimal order quantity, the number of batches of each stage and the structure of the mixed geometric and equal batch shipment, all of which minimizes the integrated total cost per unit time. The two-stage model is constructed first, and then the two-stage model is integrated into the multi-stage model. The minimal total cost model is transformed into a maximal order quantity model to obtain the optimal structure of the mixed geometric and equal batch shipment. Moreover, three new concepts are introduced; namely, pseudo-reverse, domination and critical order quantity. The order quantity division (OQD) and recursive tightening (RT) methods are then developed to derive the optimal solutions to the subject problem. Two theorems are verified to ensure the solutions obtained by the OQD and RT methods reaching the global optimum. An example is presented to illustrate the procedures involved in the OQD and RT methods.

RD405 Stochastic Model for a Single-Vendor Single-Buyer Integrated System with Mixed Batch Shipment Policy and Variable Safety Factor

Wen-Tsung Ho, Yu-Cheng Hsiao, Takming University of Science and Technology, Taiwan

This study investigates the production and inventory problem with stochastic demand in a single-vendor single-buyer integrated system. The stochastic model is constructed, and it is controlled by both the reorder and shipping points with mixed geometric and equal batch shipment policy and variable safety factor. Then, the minimum cost model is transformed into the maximum order quantity model. Consequently, the structure of the mixed geometric and equal shipment can be easily derived. The structure of the mixed geometric and equal shipment consists of the number of batches, the number of geometric shipments, and the ratio of equal size shipments to the size of first shipment. The problem is solved by the proposed heuristic algorithm that determines the economic lot size, the structure of the mixed geometric and equal shipment, and the safety factor. An example is included to illustrate the algorithmic procedures.

RD405 Solving the Unconstrained Multi-Level Dynamic Lot Sizing Problem with a Database

Dong-Shang Chang, National Central University, Taiwan

Fu-Chiao Chyr, Chang Jung Christian University, Taiwan
Fu-Chiang Yang, National Central University, Taiwan

A multi-level dynamic lot sizing (MDLS) problem is to determine a production plan set for minimizing the sum of ordering costs, setup costs, and inventory holding costs at all operation levels in a multi-level production-inventory system. Considering a MDLS problem with T planning periods, the 2^{T-1} feasible production plans will be yielded at each level. The entire feasible production plans at level m connect with the other ones at level m+1 to construct the various production plan sets, so that the $2^{(T-1)(M-1)}$ production plan sets exist in a MDLS problem initially. In order to deal with the enormous production plan sets, the concept of forward segmented calculation is proposed for partitioning the multiple levels into a sequence of adjacent levels during the computational process, and a database is established in the hard disk for loading the data of adjacent levels. By means of the novel ideas, the computational burden for solving a MDLS problem can be abated efficiently.

In this paper, a solution procedure worked with a database is developed to optimize a large-scale MDLS problem. The solution procedure begins with generating the entire feasible production plans being encoded as a set of binary strings by computer automatically. Then a decoding procedure is used to convert binary strings into the adopted operation policies and lot sizes for computing the total cost of each feasible production plan. Finally, an efficient recursive algorithm is also exploited to simplify searching the 'true' production plan sets between adjacent levels that can be obtained by 2^{T-1} calculations; however, the original approach requires $(2^{T-1})^2$ calculations. Moreover, the proposed solution procedure has been coded as a powerful solving system by Visual Basic 6.0 to find an optimal production plan set for a MDLS problem with unconstrained levels.

RD405 Efficient Heuristics for Determining Near-Optimal Lot Sizes for MRP Systems

Tej S. Dhakar, Southern New Hampshire University, U.S.A.
Charles P. Schmidt, University of Alabama, U.S.A.
Takayoshi Tamura, Nagoya Institute of Technology, Japan

Advancements in the area of computers in the 1950s and 1960s led to the development of Material Requirements Planning (MRP) as a system for exercising coordinated control over the production and inventories of end items, intermediate items, and raw materials. Today, MRP has become a widely implemented system for production and inventory planning and control. One of the key issues in MRP, when setup costs are significant, is lot sizing for the different manufactured and purchased items. Lot sizing decisions made at any level in the bill of materials affect the requirements of items at the other levels and ultimately, the operation of the entire production system in terms of costs, inventories, capacity utilization, and customer service.

The heuristic algorithms proposed in this paper have a wide scope of application. First, because we assume a general product structure with multiple end-items, the algorithms are applicable to all kinds of product structures including serial, assembly, and distribution. Second, the independent demands are considered to occur, in addition to the end-items, for any intermediate items such as the external demand for spare parts.

The heuristic algorithms were coded in Microsoft Visual Basic and executed on a personal computer. A representative problem was drawn from each of the following systems: serial systems, assembly systems, distribution systems, general systems with one end item, and general systems with multiple end items. The test problems included a real life problem.

The two heuristic algorithms together resulted in optimal solutions in 78 % of the cases. The largest deviation from the optimal was 5.65 % and the average deviation from the optimal was only 0.49 %. Both heuristics took less than one second each to find the solution to any problem.

RD501 Thursday, 15:15-16:30 Track: Spanish Chair: Eva Martinez-Caro
Room: W2-501 Session: S-Knowledge and technology management

RD501 Integrating Knowledge and Technology for Competitive Advantage: An Analysis of Two Different Approaches

Eva Martinez-Caro, Technical University of Cartagena, Spain

The companies' need of innovating in order to achieve competitive advantages to survive in the new economy has caused that knowledge has acquired a great importance. Hence, the analysis of the tools employed by the companies to manage knowledge has become indispensable. There are numerous solutions based on the new technologies that facilitate and make feasible knowledge management. In this paper, the use of the new technologies as a valuable tool for knowledge management is proposed with the aim of providing an integrating framework based on the Nonaka and Takeuchi's model of knowledge creation. Considering that framework, how to make a practical implementation of the proposed integration is illustrated through two case studies.

The first case analyses how e-learning technologies are embedded in the knowledge management practices of the Santander Banking Group, in Spain. This group implemented e-learning technologies progressively, according to their level of successive, following three stages: initial, consolidation and globalization. Throughout those stages several tools were developed and offered through a portal called Formavia: catalogue of courses, e-trainers, simulators, groupware tools, system of individual learning plan advice, e-america program, family classroom, etc. As conclusion, e-learning was revealed as an efficient and potentially fruitful means to the creation and distribution of knowledge.

The second case analyses the implementation of a PLM (Product Lifecycle Management) system in Navantia, a Spanish publicly-owned naval shipbuilding company. The features of the PLM system were implemented gradually as well, increasing the complexity in each new project undertaken. PLM system allowed to compile, integrate and make available all of the information produced throughout all phases of the products' life cycle to everyone in the organisation, along with key suppliers and customers.

As a result of all the efforts in the implementation of new technologies, the creation and sharing of knowledge were promoted in accordance with the business strategy of both of the firms.

RD501 The Impact of e-Business on Capital Productivity: An Analysis of the UK Telecommunications Sector

Eva Martinez-Caro, Juan Gabriel Cegarra-Navarro, Technical University of Cartagena, Spain

Increasing competition leads organizations to search for more effective business strategies. Many of these have turned to information and communication technologies (ICT) as a way to cope with turbulent environments. In fact, utilizing technology and management effectively is important for a firm and is widely accepted as a mean for creating sustainable competitive advantage (Chen and Liaw, 2001).

In particular, it is widely acknowledged that companies are increasingly facing the challenge of e-business, that is, the use of internet-based tools to support their business processes (Cagliano et al., 2005). The evolution of ICT has fostered the development of powerful tools that are expected to improve firm performance dramatically, through higher levels of process efficiency and integration. Despite the initial enthusiastic expectations, it is still not completely clear how relevant these technologies are for companies and what actual benefits can be obtained. In fact, there is still poor evidence of actual implementation and effectiveness of e-business practices.

This paper aims at providing some evidence of the influence of e-business on capital productivity (CP). Productivity is an important tool for evaluating a business performance (Nachum, 1999). However, studies investigating the impact of ICT on the productivity have always led to contradictory and/or questionable results regarding the ICT benefits (Sigala, 2003).

In this study, we have considered three different types of technologies that may be associated with e-business (i.e. Internet, Groupware, and Collective Systems). In doing so, we examine the relative importance and significance of e-business on CP through an empirical investigation of 139 businesses in the UK Telecommunication sector using a hierarchical regression. The main conclusions are that there is a significant lack of use of the Internet for increasing CP by SMEs and that any improvement of CP is significantly affected by Groupware, and Collective Systems, therefore, the UK SMEs and possibly other large companies might be over-investing in the development of web sites to support Internet presence but under-investing in promoting awareness and use of these services to customers (i.e. Groupware, and Collective Systems).

RD503 Thursday, 15:15-16:30 Track: m-Marketing and Operations Interface Chair: Rick So
Room: W2-503 Session: Modeling: Marketing and operations interface

RD503 Behavioral Experiments on Dual Sales Channel Management
Murat Kaya, Sabanci University, Turkey
Ozalp Ozer, Stanford University, U.S.A.
Kay-Yut Chen, Hewlett Packard Laboratories, U.S.A.
Manufacturers have increasingly been selling through direct online channels (i.e. selling directly to consumers through their own web sites) alongside traditional retail channels. We address a manufacturer's problem of managing dual (direct and retail) sales channels when the channels compete in service.

We develop a three-stage game-theoretic model of the strategic interaction between the manufacturer and the retailer. At stage 1, the manufacturer determines the wholesale price. At stage 2, the manufacturer and the retailer engage in a simultaneous-move operational decisions game. The retailer determines the product availability level in his store and the manufacturer determines the delivery lead time in the direct channel. At stage 3, based on a detailed choice model, a random number of consumers determine which channel to buy from. We identify optimal dual channel strategies for the manufacturer, and analyze how these strategies change with respect to changes in the environment.

We complement our analytical work with an experimental study to investigate whether the analytical model makes reasonable predictions of human behavior. Our experiments with human decision makers reveal that (1) The manufacturers can anticipate the outcome of the subsequent stages of the game, and set the wholesale price accordingly at stage 1; (2) Nash equilibrium is successful in predicting the qualitative characterization of the simultaneous-move game outcome at stage 2. However, subjects' decisions exhibit significant deviation from equilibrium predictions due to behavioral factors. We identify risk aversion as an important behavioral factor, and we extend the analytical model to account for risk aversion.

RD503 Optimal Promotion Decision Balancing Control of Promotion Effectiveness and Competency in a Market
Hisashi Kurata, International University of Japan, Japan
Promotion is a critical strategic tool for businesses to remain profitable in a highly competitive market. Manufacturers have two promotion strategies: one is consumer promotion that targets end-customers directly. The other is trade promotion that targets retailers by expecting them to use the offered promotion budget to encourage end customers to buy the manufacturer's products. A manufacturer can perfectly control consumer promotion, whereas trade promotion inherits an agent problem since a retailer usually pockets some of the promotion money received.

Formulating a two-stage supply chain model of a retailer and a manufacturer, we explore how a manufacturer should allocate its promotion effort between trade and consumer promotion by balancing control of promotion effectiveness and competency in a market. We also analyze how an optimal promotion decision will interact with several key business factors, such as production cost efficiency, brand loyalty, potential market size, and so on. Finally, we propose business implications regarding promotion strategies for a supply chain.

RD503 A Stochastic Approach to Diffusion Model with Asymmetric Influence
Naomichi Suzuki, Masatoshi Tanaka, Kazuhiro Kasai, Kijung Sung, Matsumoto University, Japan
A diffusion model with innovators and imitators is formulated by the use of the generalized birth process with immigration. The immigration process corresponds to the behavior of innovators and the birth process to that of imitators. In our formulation, both of the immigration rate and the birth rate have time dependence. The Bass model is derived under the assumption that the ratio of the immigration rate to the birth rate is constant. In this case, the probability distribution reduces to the negative binomial distribution. The meaning of the parameters is different from the original Bass model. We can decompose the sales up to time t into that by the innovators and that by imitators. Some model functions for sales are derived in our model, and data analyses are also done. Furthermore, we investigate the behavior of our model when the immigration rate has different time dependence from the birth rate.

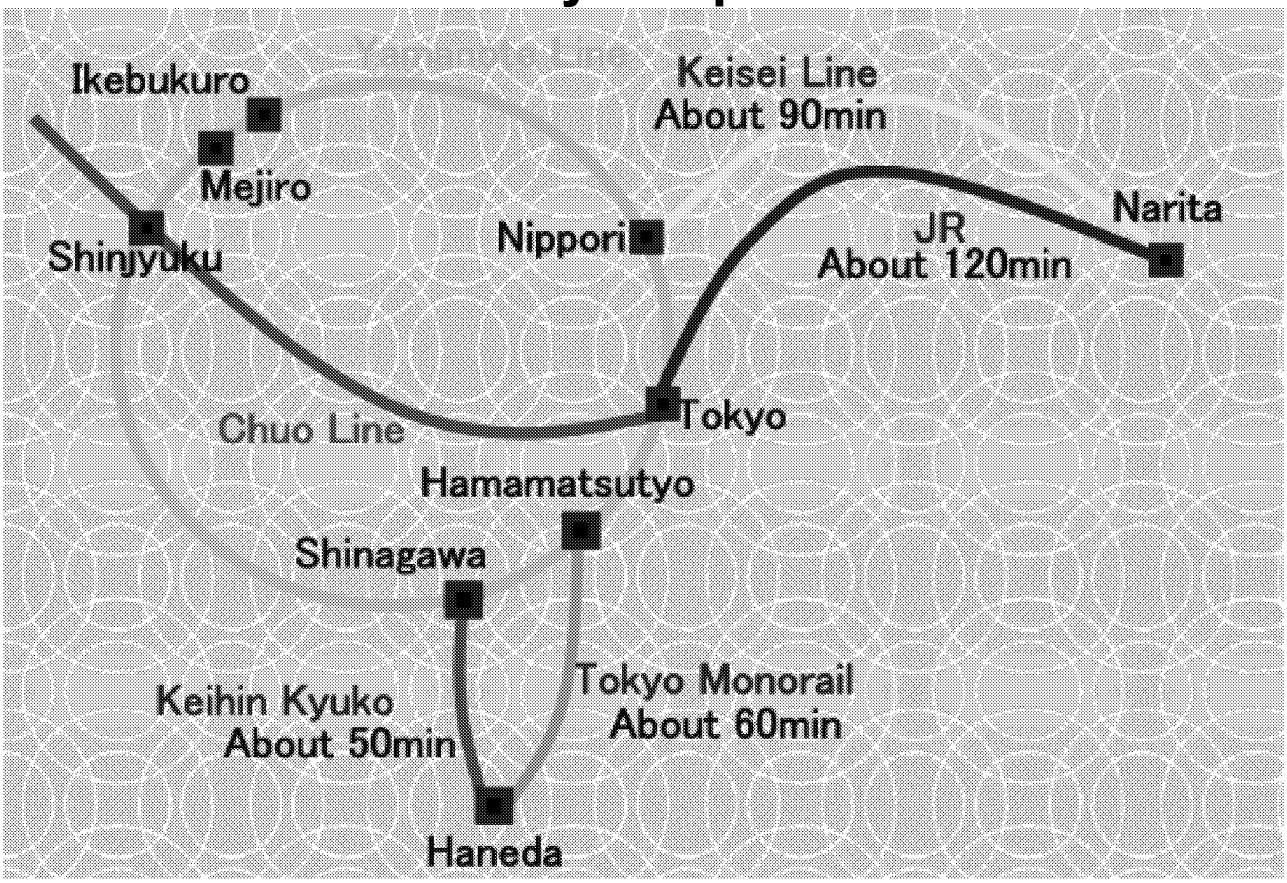
RD503 The Effect of Supply Reliability with Joint Marketing and Inventory Decisions
Rick So, Shaoxuan Liu, Fuqiang Zhang, University of California - Irvine, U.S.A.
This paper studies the impact of supply reliability on a retail firm's performance under joint marketing and inventory decisions. The firm sells a product in a single selling season and can exert marketing effort to influence consumer demand. In the first part of the paper, we characterize the firm's optimal decisions and demonstrate that a more reliable supply leads to a higher profit for the firm. In the second part, we quantify the value of improving supply reliability and investigate how different product characteristics may affect this value. We find that, all else being equal, the maximum unit cost a firm is willing to pay to increase supply reliability may

either increase or decrease in product price. Thus, it is not necessarily true that emerging technologies for improving supply reliability should first be adopted for products with the highest unit contribution margin. However, a product with a lower marketing cost function always benefits more than a product with a higher marketing cost function. This finding suggests that the priority of adopting new technologies should be given to situations where the firm can effectively induce greater demand through promotional effort. These results provide useful insights into how firms should make investment decisions on new technologies to improve supply reliability.

■Session Chair Index

■Author Index

Tokyo Map



How to get to Narita International Airport

1) Limousine bus (orange color)
Time required: approx. 90 minutes or longer, depending upon traffic conditions (congestion, etc.)
Cost: approx. 3,000yen

2) Narita Express (N'EX) (operated by JR East)
Time required: slightly less than 90 minutes
Cost: approx. 3,000yen

3) Airport Narita Rapid Service (operated by JR East)
Time required: slightly less than two hours
Cost: approx. 1,500yen

4) Keisei Skyliner (operated by Keisei Electric Railway)
Time required: slightly less than 90 minutes
Cost: approx. 2,000yen

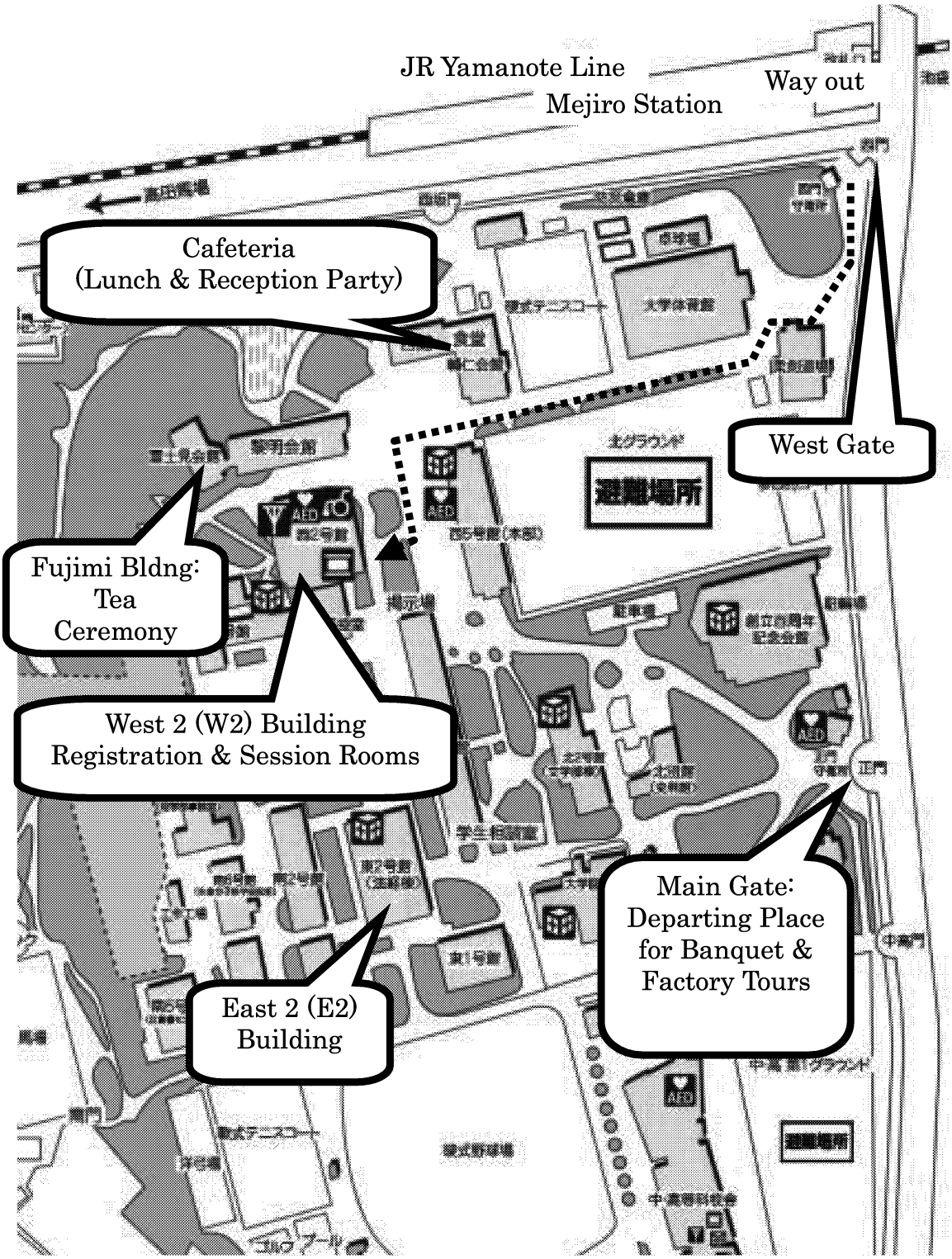
5) Keisei Express (operated by Keisei Electric Railway)
Time required: slightly more than 90 minutes
Cost: approx. 1,000yen

For more details of transportation services, please refer to the following websites:

1) Limousine bus - www.limousinebus.co.jp/
2), 3) JR East - www.jreast.co.jp/
4), 5) Keisei Electric Railway - www.keisei.co.jp/

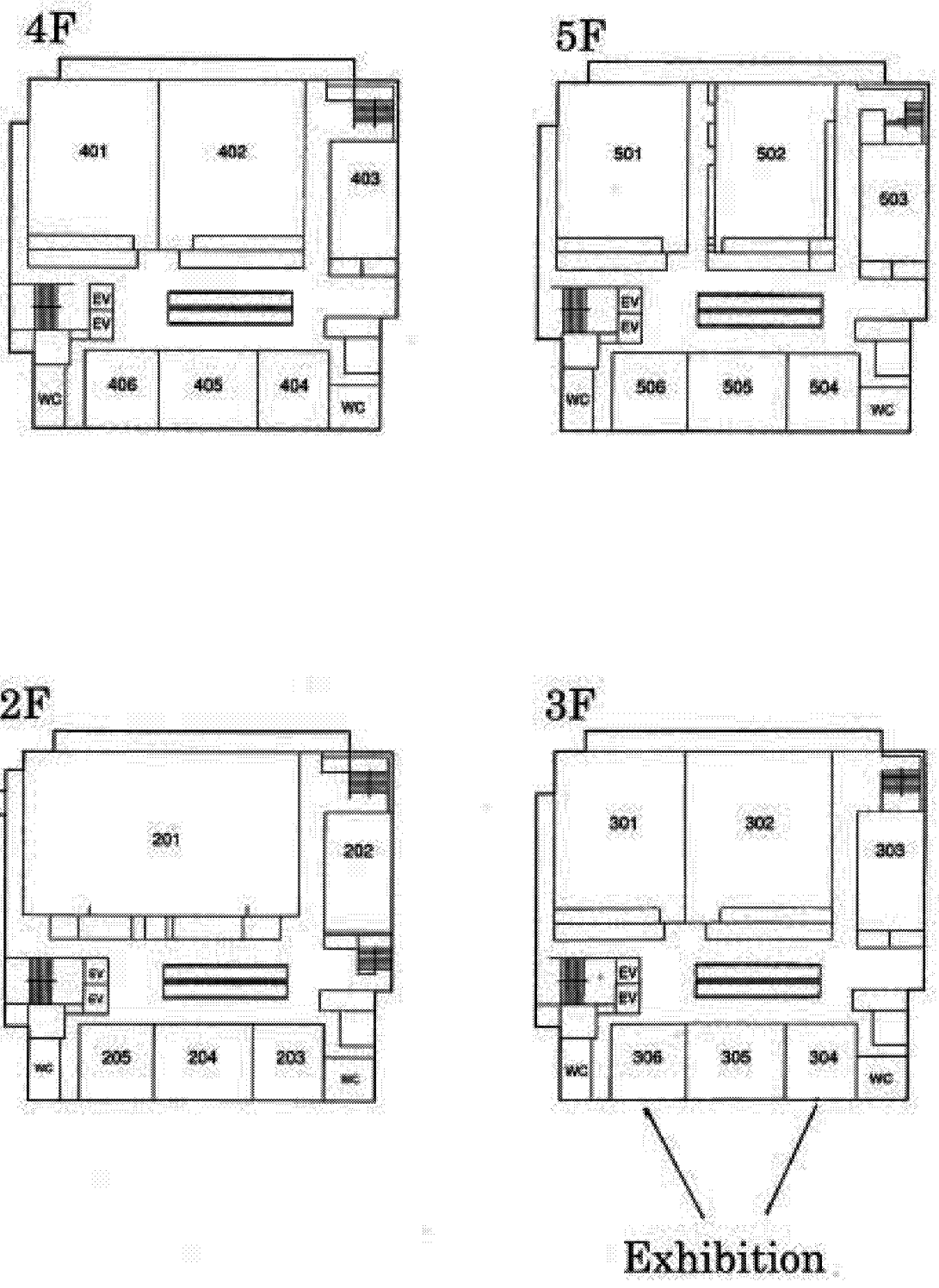
Gakushuin University Campus Map

http://www.gakushuin.ac.jp/ad/kikaku/english/location/index4a.html



A convenience store “Seven Eleven” is on the second floor of the cafeteria building.

West Building 2



POM Tokyo 2008 SESSION SCHEDULE

West-2 Building, Gakushuin University

Plenary Sessions (Building West 2 Room 201)

TP201 Tuesday 12:40-13:30 Architecting the Supply Chain for Value Creation by Hau L. Lee
WP201 Wednesday 12:40-13:30 Research in Service Operations – Challenges and Directions by Chris Voss
RP201 Thursday 12:40-13:30 Always Aiming Higher by Yukihisa Hirano

Room	TA Tuesday 8:30-9:45	TB Tuesday 10:05-11:20	TC Tuesday 13:40-14:55
W2-202	New product development 1	New product development 2	New product development 3
W2-301	Product-service systems 1	Product-service systems 2	Health care management 1
W2-302	invited-High Performance Manufacturing 1	invited-High Performance Manufacturing 2	invited-High Performance Manufacturing 3
W2-303	Empirical research on marketing interface	Marketing and operations interface	invited-Global transfer in East Asia
W2-305		Empirical research on HRM	HRM systems
W2-401	Empirical research on mfg strategy 1	e-operations 1	e-operations 2
W2-402	Empirical research on SCM 1	Empirical research on SCM 2	Tutorial: 7/11Japan: SCM and product innovation
W2-403	m-Sustainability	invited, m-Production & inventory management	m-Distribution systems design
W2-405		m-Jobshop scheduling	m-JIT
W2-501	S-Lean production	S-Quality management	S-Service OM
W2-503	m-Vehicle routing problem 1	m-SQC 1	m-SQC 2

Room	WA Wednesday 8:30-9:45	WB Wednesday 10:05-11:20	WC Wednesday 13:40-14:55	WD Wednesday 15:15-16:30
W2-202	Lean concept	Lean perspectives	Empirical research on quality management 1	Empirical research on quality management 2
W2-301	Health care management 2	invited-Service OM 1	invited-Service OM 2	invited-Service OM 3
W2-302	Case research on mfg strategy 1	Case research on mfg strategy 2	Manufacturing strategy framework	International OM 1
W2-303	Sustainability and social responsibility	Environment and suppliers	Green operations	Remanufacturing and recycling
W2-305	Cost management 1	Cost management 2	Performance measurement	Evaluating sourcing
W2-401	e-commerce 1	e-commerce 2	Tutorial: Using secondary data in OM research	Information systems 1
W2-402	Empirical research on SCM 3	SCM framework	Case research on SCM 1	Case research on SCM 2
W2-403	m-Sharing risk and return in SCM 1	m-Sharing risk and return in SCM 2	m-Evaluation of port/terminal operations	invited, m-SCM
W2-405	m-New scheduling model 1	m-New scheduling model 2	m-Scheduling algorithms	m-Capacity and inventory management
W2-501	S-Manufacturing technology	S-SCM 1	S-SCM 2	S-Purchasing management and strategy
W2-503	m-New approaches to QM & maintenance 1	m-New approaches to QM & maintenance 2	m-Vehicle routing problem 2	SCM practices

Room	RA Thursday 8:30-9:45	RB Thursday 10:05-11:20	RC Thursday 13:40-14:55	RD Thursday 15:15-16:30
W2-202	Perspectives on quality management 1	Perspectives on quality management 2	Lean production 1	Lean production 2
W2-301	Mass customization	invited-Finance and operations interface	Tutorial: Science TQM – Toyota's new strategy	
W2-302	International OM 2	International OM 3	Empirical research on mfg strategy 2	
W2-303	invited-Panel: RFID	RFID 1	RFID 2	
W2-305	Manufacturing technology and ergonomics	Teaching innovation in POM 1	Teaching innovation in POM 2	Teaching innovation in POM 3
W2-401	Information systems 2	Knowledge management 1	Knowledge management 2	Knowledge management 3
W2-402	invited-Disaster management	Case research on SCM 3		invited-Supply chain risk management
W2-403	m-Simulating SCM	m-SCM optimization 1	m-SCM optimization 2	m-SCM optimization 3
W2-405	m-Inventory policies	m-New formulations for inventory management	m-Production and inventory management	m-Batch sizing & inventory management
W2-501	S-Teaching innovation in POM	S-New product development & knowledge mgmt	S-Information systems and e-operations	S-Knowledge and technology management
W2-503	m-Project management	m-Forecasting	m-Pricing	m-Marketing and operations interface

m-: Sessions on mathematical modeling, S-: Sessions in Spanish, invited-: Sessions invited to organize,
Tutorial: Tutorial sessions, Panel: Panel discussion session, All others are contributed sessions.

JOMSA Japanese Operations Management and Strategy Association

オペレーションズ・マネジメント＆ストラテジー学会

Background

Operations Management is to contribute to the firm, environment, and society through the efficient and effective management of operations in product development, procurement, production, distribution, and sales. The Japanese production management concepts such as JIT and TQM have been widely applied throughout the world, and its fundamental ideas are now incorporated into a research and teaching discipline of Operations Management.

Mission and purpose

The mission of JOMSA is to play a central role in the research and education of operations management in Japan, and is to promote both interdisciplinary research of various engineering fields related to production and managerial research for decision makings in operations with global perspectives. JOMSA also promotes diverse fields related to operations such as supply chain management and service sciences. The purpose of JOMSA is to further the understanding of manufacturing management principles and to establish an academic discipline of operations management that will lead to the development of a new made-in-Japan theory of manufacturing.

Networking

JOMSA is a place in Japan to exchange information on research, teaching, and practices of operations management including operations strategy. JOMSA also commits to promoting an alliance with Production and Operations Management Society (POMS), European Operations Management Association (EurOMA), and operations management related academic societies in Asia, and aims for contributing globally to the advancement of the academic discipline and the industry.

Representatives of founders

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