

1	Friday, May 4, 8:30-10:00 Room: Brasserie Session: Open Innovation and R&D Outsourcing	Track: Prod Innov, 1	Chair: Christian Terwiesch
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007-0100: Innovation Contests and Multi-Agent Problem Solving

Christian Terwiesch, Wharton School, United States

Yi Xu, University of Miami, United States

In an innovation contest, a firm (the seeker) facing an innovation related problem (e.g., a technical R&D problem) posts this problem to a population of independent agents (the solvers) and then provides an award to the agent that has generated the best solution. In this paper, we analyze the interaction between a seeker and a set of solvers. Prior research in Economics suggests that having many solvers work on an innovation problem will lead to a lower equilibrium effort for each solver, which is undesirable from the perspective of the seeker. In contrast, we establish that the seeker can benefit from a larger solver population as he obtains a more diverse set of solutions, which mitigates and sometimes outweighs the effect of the solvers' under-investment in effort.

007-0303: The Butterfly Effect: Modularizing Risk in Distributed Innovation Presenting

Edward Anderson, University of Texas at Austin, United States

Nitin Joglekar, Boston University, United States

We explore distributed innovation decisions from a systems perspective. This approach enables us to link the architectural, behavioral, competitive, and demand risks through feedback mechanisms. We argue that decisions underlying such innovation structures are susceptible to the butterfly effect: path dependent amplification of small uncertainties due to feedback and dynamic complexity can lead to unintended consequences. One way to combat these uncertainties is through modularizing risk.

007-0102: An Empirical Analysis of Software Auctions

Christian Terwiesch, Wharton School, United States

Elena Krasnokutskaya, University of Pennsylvania, United States

We study software auctions as organized by a leading market provider for such services. Potential buyers can post software projects and wait for coders to submit bids for them. Our focus is on how buyers choose which coder will be awarded the project. We are particularly interested in the role of coder location.

007-0330: The Effects of Problem Structure and Team Expertise on Brainstorming Effectiveness

Stylianos Kavadias, Georgia Institute of Technology, United States

Svenja Sommer, Purdue University, United States

Since Osborne (1957) group brainstorming has acquired a central role during the ideation stage of many product development projects. The reason is its widely claimed effectiveness in identifying solutions to product design problems. Yet, the psychology literature has repeatedly and through a significant number of experiments pointed out a strong disagreement with this assertion (e.g. Paulus 2000). In this paper we revisit the two different arguments and develop a formal model for the group brainstorming task. We find that depending on the problem structure (complexity of the landscape of solutions) and the team variation in knowledge expertise there may be cases where brainstorming is effective and others where it is not. The introduced formalization allows us to propose an experiment that could enrich the existing psychology literature.

2	Friday, May 4, 8:30-10:00 Room: Continental Session: Demand Management in Supply Chains	Track: Supply Chn, 1	Chair: Elias Kirche
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007-0727: Impact of Manufacturing Overhead on Order Management in a Two-Level Supply Chain

Elias Kirche, Florida Gulf Coast University, United States

Rajesh Srivastava, Florida Gulf Coast University, United States

Order management has received increased focus in the Operations Management literature recently. With advances in technology and availability of Advanced Planning Systems (APSS), firms have extended their collaboration with customers and suppliers in order to improve service levels and profits. APSS allow firms the ability to do order management in real time with improved synchronization of resources and the potential to incorporate real-time costing. Additionally, the increased focus of firms on their supply chains has changed the nature of overhead costs as a percentage of total manufacturing costs. At the same time labor content is diminishing due to increased outsourcing. We evaluate the impact of overhead cost structure on the order management process in terms of profitability and service levels. Specifically, we consider the impact on real-time order management in an assemble-to-order environment for a two-level supply chain using a commercially available APS.

007-0297: Connecting Sales and Procurement: Creating Customer-Driven Product Substitutions to Manage Demand Uncertainty

Feng Cheng, IBM Research, United States

Markus Ettl, IBM Research, United States

Pu Huang, IBM Research, United States

Karthik Sourirajan, IBM Research, United States

We describe an integrated supply/demand planning method that aims at creating a financially viable product portfolio based on customer preferences. We formulate an optimization model that determines build volumes and new product configurations for up-selling, alternative-selling and down-selling to avoid costly inventory overages and shortages under stochastic demand. To model customer preferences, we use a price sensitivity parameter that determines the incremental price that the customer is willing to pay for an alternative product, and a quality sensitivity parameter that determines the customer's valuation of a product. The proposed model connects the interaction of customers and sales teams to the procurement and manufacturing capabilities of a firm. We exploit the problem structure and develop a decomposition procedure to efficiently solve industry-size problems. We highlight the advantages of the proposed method through numerical experiments with realistic production data.

007-0728: Order Management and Opportunity Costs in an Integrated Supply Chain*Rajesh Srivastava, Florida Gulf Coast University, United States**Elias Kirche, Florida Gulf Coast University, United States*

The use of advanced planning systems (APSs) has provided firms the ability to synchronize operations with suppliers and engage in real-time order management. The system is efficient in order management and in the allocation of resources with real time accounting, as well as in the determination of real time profits. However, order management rules incorporated in such systems may not generate the best results due to the failure to consider opportunity costs associated with orders size, product contribution margin, production capacity, inventory levels, order due dates and other production parameters. In this study, we incorporate opportunity costs in our order management decision rule and compare with existing rules from the literature which considers only capacity or contribution margin of each individual order.

007-0535: “Shrinking Demand”: Competition Between Two Supply Chains*David Dilts, Vanderbilt University, United States**Surya Pathak, Vanderbilt University, United States*

This research investigates a simple model of competition between two supply chains, each consisting of an assembler, a tier-1 and a tier-2 supplier. While the tier-1 suppliers act as information barriers, tier-2 supplier is common to both the SC's and supplies a basic material. The two assemblers sell a differentiated product (highly specialized / generalized) and have separate price driven demand curves. They compete for the supply of the base material as the tier-2 supplier cannot supply the entire market demand. The tier-2 supplier follows a simple strategy of supplying in full to the SC that offers a higher price. With the help of a simple discrete event simulation we investigate the effects of different strategies that the assemblers could use to ensure higher demand and profitability. We particularly analyze the model from an evolutionary angle and identify if any patterns of behavior is observed in this simple system.

3	Friday, May 4, 8:30-10:00 Room: Executive Session: New Optimization Approaches for Supply Chain Problems	Track: Opt Models, 1	Chair: Jiawei Zhang
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007-0566: A Stochastic Programming Duality Approach to Inventory Centralization Games*Xin Chen, University of Illinois, United States*

A class of cooperative games arising from inventory centralization is studied in this paper. The optimization problems corresponding to the inventory games are formulated as stochastic programs. We observe that the strong duality of stochastic linear programming not only directly leads to a series of recent results concerning the non-emptiness of the cores of such games, but also suggests a way to find an element in the core. We also study a newsvendor game with quantity discount ordering cost.

007-0567: Duality Approaches to Economic Lot Sizing Games*Jiawei Zhang, New York University, United States*

We use duality to analyze economic lot sizing games with concave ordering cost. The standard formulation of the corresponding optimization problem is a concave minimization problem and hence linear programming duality does not directly apply. However, we present a new formulation for the problem and construct a dual of it without a duality gap. We show that when both the inventory holding cost and backlogging cost are linear functions, there exists an optimal dual solution that defines an allocation in the core. An interesting feature of our approach is that it is not necessarily true that every optimal dual solution gives a core allocation.

007-0559: Supply Chain Design Under Stochastic Supply Disruptions*Lian Qi, University of Missouri-Rolla, United States*

We study an supply chain design problem that includes one supplier, one or more retailers, and customers. We determine the locations of retailers and the assignments of customers to retailers using an integrated model. Random disruptions at both the supplier and retailers are considered. Analytical and numerical studies reveal the impacts of disruptions at the supplier and retailers on the location and assignment decisions. The numerical experiments also provide conditions under which cost savings from considering supply disruptions at the supply chain design phase are significant.

007-0562: Approximate Dynamic Programming for Inventory Routing*Diego Klabjan, University of Illinois at Urbana-Champaign, United States*

An inventory controller serves several customers and at each point in time the controller must decide which customers to replenish and how much with trucks of limited capacity. Based on infinite dimensional linear programming we develop an algorithm for computing optimal policies.

4	Friday, May 4, 8:30-10:00 Room: Far East Session: Problems at the Production Marketing Interface	Track: Mkt-Opns, 1	Chair: Sanjay Kumar
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007-0476: Decision Making at the Production Marketing Interface Using Advanced Planning Systems*Sanjay Kumar, XLRI Jamshedpur, India*

In current environment of increased customer responsiveness, and the availability of real time data through ERP systems, the paper studies impact of ERP add-ons (APOs) on decision making at the interface of sales and marketing and production. Use of APO allows for higher availability of analytics and processed information in decision making at the production marketing interface. Tradeoffs required by various players comprise a complex decision making process, and the impact of APOs on the process is studied.

007-0473: A Knowledge Based View on Product Development: Managerial Concerns at the Marketing-Operations Interfaces*Bhaskar Basu, ICFAI Business School, India*

Sanjay Kumar, XLRI Jamshedpur, India

Rapid product development is a strategic objective of manufacturing firms due to continuous innovation in product and process technology, coupled with time-to-market pressure. The knowledge based view in strategy has extended resource-based reasoning by suggesting that knowledge is the primary resource underlying new value creation and competitive advantage. The authors view the tacit and explicit knowledge exchanged by individuals and groups in the product development phase to be very critical for sustaining competitive advantage in the marketplace. The marketing-operations interfaces in the product development phase are a major cause of conflict that has maximal impact on the customer and can potentially jeopardize the firm's survival. In this study, the authors develop a generic knowledge classification framework for product development and apply it specifically to the marketing-operations interfaces. Such a classification framework help reveal gaps in the literature and some important unanswered research questions.

007-0508: Internationalization of the Firm and Supply Chain Perspective in Corporate Strategic Response to Competitive Market Situ

Prashant Salwan, IIM Indore, India

A company goes international numerous reasons namely export market, consumers abroad, leveraging domestic risks, in countries development and increasing stakeholder value. If we look at the corporate strategic perspective, it is difficult to keep the long term issues such as R&D and minimizing production costs out of it's purview. Indian pharmaceutical and automobile component companies are gaining international orientation not only for low cost R&D but also for long term increase in value chain through better supply chain management. Strategically, SCM is not only about management of raw materials and logistics, but also inseperable in cultivation of R&D as part of the supply chain. Using international sourcing for increasing domestic competitiveness and updating R&D is a niche strategy today. The study points to a trend in making the supply chain perspective a part of corporate strategic response to competitive market requirements.

007-0461: Models for Effects of Manufacturing Marketing Environment on Manpower Planning

Venkataramanaiah Saddikuti, IIM Indore, India

Shrinking margins and rapid changes in technology are forcing organizations world wide to realign their manufacturing as well as marketing practices. Many industries like computers, telecommunications, digital cameras, health care, auto mobile, and auto component manufacturers are experiencing reduced product life cycles, shortage of skilled work force, demand volatility, and market competition. We present a framework that balances significant trade-offs that help managers in crafting a strategy for the induction of relevant workforce such that output is in line with market demand. We considered various issues like operator skill levels, learning ability, wages, product life cycle issues, market demand, and manufacturing process details. From the preliminary study it is found that meeting ramp-up in demand at different stages of product life cycle using mixed workforce is very complex and needs scientific approaches, which are built on some simple analytical approaches.

5	Friday, May 4, 8:30-10:00 Room: French Session: Incentives and Information in Inventory Models	Track: PIMs, 1	Chair: Annabelle (Qi) Feng
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007-0664: A Game Theoretic Approach for the Evaluation of Delayed Incentives in Supply Chains

Moutaz Khouja, The University of North Carolina at Charlotte, United States

Jing Zhou, The University of North Carolina at Charlotte, United States

We analyze the use of consumer rebates by a manufacturer in a decentralized two-stage supply chain. A consumer's valuation of the rebate is a random variable. There is a fixed processing cost per rebate redeemed. The redemption probability increases in the value of the rebate. We analyze two cases. First, the manufacturer keeps the wholesale price unchanged when introducing the rebate. Second, both the wholesale price and the rebate are endogenous. In both cases, the retailer determines the retail price as a Stackelberg follower. Our findings show that 1) The rebate always increases the retailer profits, 2) the manufacturer's profit most likely increases but not always, 3) the optimal rebate value increases with the effective fraction at a decreasing rate, and 4) rebates exacerbate the double marginalization problem. We compare different cases and also examine certain incentive schemes to mitigate the double marginalization problem.

007-0690: Strategic Information Management Under Leakage in a Supply Chain

Manu Goyal, University of Maryland, United States

Krishnan Anand, University of Pennsylvania, United States

In practical settings, material and information flows are intertwined, calling for their joint optimization to maximize supply chain efficiency. We analyze one such setting where material and information flows intersect through the mechanism of information leakage (non-consensual sharing of information), and study its effect on the joint determination of material flows (the order quantities) and information flows (acquisition and dissemination of demand information) in a vertical contract.

007-0748: Strategic Interactions Between a National Brand Supplier and a Retailer who has the Potential to Introduce a Store Brand

Stephen Gilbert, University of Texas at Austin, United States

Yusen Xia, Georgia State University, United States

Liwen Chen, The University of Texas at Austin, United States

We consider a single supplier sells a branded product through a single retailer, whose efforts can influence the flow of customers. Additionally, the retailer may be able to introduce its own store brand that can provide low end competition to the branded product. We first identify conditions under which the supplier can benefit from the introduction of the store brand. Subsequently, we show that when the store brand does not benefit the supplier of the national brand, it may be beneficial for him to commit to maintaining a sufficiently low wholesale price that the retailer would have no incentive to introduce its own brand.

007-0705: Partially Observed Inventory Systems: The Case of Rain Checks

Ruixia Shi, University of Texas at Dallas, United States

Alain Bensoussan, University of Texas at Dallas, United States

Metin Cakanyildirim, University of Texas at Dallas, United States

Suresh Sethi, *University of Texas at Dallas, United States*

In many inventory control contexts, inventory levels are only partially (i.e., not fully) observed. This may be due to non-observation of demand, spoilage, misplacement, or theft of inventory. We study a periodic review inventory system where the unmet demand is backordered. When inventory level is nonnegative, the inventory manager does not know the exact inventory level. Otherwise, inventory shortages occur. The inventory manager issues rain checks to customers. The shortages are fully observable via rain checks. The inventory manager determines the order quantity based on partial information. The objective is to minimize the expected total discounted cost over an infinite horizon. This problem has an infinite dimensional state space. We use the methodology of the unnormalized probability to establish the existence of optimal feedback policy when the periodic cost has linear growth and the discount factor is sufficiently small.

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Friday, May 4, 8:30-10:00 **Room:** Garden

Track: Education, 1

Chair: F. Robert Jacobs

Session: Workshop: Teaching Supply Chain Management in the Core Operations Management Course

007-0021: Teaching Supply Chain Management in the Core Operations Course

F Robert Jacobs, *Indiana University, United States*

Over the past few years, we have seen an increase in interest in covering supply chain management concepts in the core operations course. In this session, we give our thoughts on what topics to include in this type of course and how to organize a 13 week core course. A new book that concisely covers these topics is now available from McGraw-Hill.

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Friday, May 4, 8:30-10:00 **Room:** Green Room

Track: SC Tech, 1

Chair: Pedro M. Reyes

Session: RFID-I

007-0301: Quality of Process Execution Based on Individualized Sensor Data

Jun Shu, *Penn State University, United States*

Russell Barton, *Penn State University, United States*

The continuous advancement of information technologies provides new opportunities to control and improve the quality of business processes. A class of data we call individualized real-time trace data (e.g. RFID data) identifies the status and history of individual entities as they move through execution processes. Individualized trace data provide opportunities to monitor the progress of an item through a supply chain or other process. The monitoring provides further opportunities to control (i.e. fine tune) the execution processes. Although quality control is widely used in manufacturing, its use in supply chains is practiced ad hoc, rather than rigorously defined. We develop a mathematical framework that we call SIT Space to examine individualized trace data. Using this framework, we propose several generic quality measures for the progress of items through a supply chain and design new methods to monitor these measures.

007-0291: Impact of RFID-Point of Sale Data Sharing: An Experimental Study

Pedro Reyes, *Baylor University, United States*

We examine how the impact of RFID-point of sale data sharing on ordering decisions in a two-echelon supply chain may help reduce the bullwhip effect. Theoretical studies have shown that accessibility to point of sale data can dampen the bullwhip effect. We study this phenomenon from a behavior examination in the content of a simple, serial supply chain that is subject to stochastic demand and information time-lags. Using a controlled simulation experiment, we find that RFID-point of sale data does help dampen a component of the bullwhip effect. Of obvious practical importance; RFID has been the subject of intense discussion and research since the Wal-Mart and U.S. Department of Defense mandates. We discuss the implications of our work and identify future research needs.

007-0193: Effects of Inventory Inaccuracy in Joint Marketing and Inventory Decisions

Shaoxuan Liu, *University of California, Irvine, United States*

Kut So, *University of California, Irvine, United States*

Fuqiang Zhang, *University of California, Irvine, United States*

This paper analyzes the impact of supply uncertainty due to inventory inaccuracy in a retail environment. A firm sells a product in a single period and needs to make both marketing effort and stocking quantity decisions. Due to inventory inaccuracy, the available inventory to meet demand is a random fraction of the stocking quantity. We first study how the distribution of the availability factor affects the optimal decisions and the expected profit of the firm. Then we demonstrate the adverse effect of an uncoordinated decision making mechanism under which the marketing decision ignores the underlying inventory inaccuracy or its variability. Finally, we use our model to quantify the benefits of emerging technologies such as RFID to improve inventory accuracy. We illustrate how the profit margin of the product and relative improvement in inventory tracking accuracy can affect the value of adopting such technologies.

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Friday, May 4, 8:30-10:00 **Room:** Oak

Track: Supply Chn, 14

Chair: Nagihan Comez

Session: Supply Chain Models

007-0553: The Effects of Inventory Misplacement on Supply Chains: An Analytical Exploration

Almula Camdereli, *Georgetown University, United States*

Jayashankar Swaminathan, *University of North Carolina at Chapel Hill, United States*

Inventory misplacement is a major operational inefficiency and is prevalent in many industries. In this paper, we explore the effects of increasing the proportion of inventory availability at the retailer on the profits of the retailer and the manufacturer in vertically integrated, uncoordinated and coordinated bi-laterally decentralized supply chains. We assume that the retailer is subject to demand distributed according to a general distribution. Further, we explore the cases where a random fraction of items gets misplaced in the aforementioned settings.

007-0345: Replenishment Decisions Under Quantity Discounts and Explicit Transportation Considerations*Aysegul Toptal, Bilkent University, Turkey*

Transportation is a significant activity of supply chain operations, and consideration of transportation with inventory replenishment decisions can lower the total costs and bring competitive advantage in the market. In this study, we model the transportation costs of a supply chain entity who faces quantity discounts from his/her suppliers. By examining the structural properties of the underlying cost function, we present optimal solution algorithms. The analysis of the replenishment decisions for the buyer in this setting further leads to interesting results for coordination problems in more complex settings, such as single vendor, multiple buyers facing transportation costs and capacities.

007-0647: Life Cycle Channel Coordination*Xiuli He, University of Texas at Austin, United States**Genaro Gutierrez, University of Texas at Austin, United States*

We analyze the dynamic interactions in a decentralized distribution channel, composed of a manufacturer and a retailer, to launch an innovative durable product (IDP) whose underlying retail demand is influenced by word-of-mouth from past adopters and follows a Bass-type diffusion process. The retailer (she) has alternative uses for the critical resources that are essential to sell the manufacturer's new product. The word-of-mouth influence creates a trade-off between immediate and future demand/ profits, resulting in a multi-period dynamic supply chain coordination problem. Our analysis shows that the manufacturer and retailer may have conflicts regarding their trade-offs and preferences between immediate and future profits. We characterize equilibrium pricing strategies and the resulting sales and profit trajectories, and propose that revenue sharing contracts can coordinate the IDP supply chain throughout the entire planning horizon and arbitrarily allocate the channel profit.

007-0224: Investing in Forecast Collaboration*Mumin Kurtulus, Vanderbilt University, United States**Beril Toktay, Georgia Institute of Technology, United States*

Motivated by the mixed results of collaborative forecasting initiatives in the consumer goods sector, this paper investigates the conditions that favor the establishment of collaborative forecasting between a supplier and a retailer. We consider a two-stage supply chain where a single supplier sells to a single retailer who faces the newsvendor problem. Both the supplier and the retailer have forecasting capabilities and both can exert costly effort to improve the quality of their local demand forecasts. We assume that the supplier and the retailer exert effort independently and then pool their local forecasts to form a single shared demand forecast. We characterize conditions under which collaborative forecasting is sustainable. Our results have implications concerning the appropriateness of investing in collaboration technology to extract and use information from both parties in a supply chain.

9	Friday, May 4, 8:30-10:00 Room: Panorama Track: Trans Log, 1 Chair: Jose A Gobbo
	Session: Distribution Center and Warehousing Management

007-0185: Logistic Platforms: Proposal of an Implantation Methodology*Fabio Souza, Sao Paulo State University, Brazil**Walter Silva Costa, Sao Paulo State University, Brazil**Jose Gobbo, Sao Paulo State University, Brazil*

A way to integrate logistics activities is by developing logistic platforms. A logistic platform is the place where everything concerning logistics efficiency is gathered, receiving logistics zones for undertakings and infrastructures of transport and storage, thus improving the competitiveness, making possible the logistics activities, de-bureaucratizing and hastening trade operations. The objective of this study is to develop a logistic platform implantation methodology. To carry it out, an exploratory and qualitative study was led using case study techniques. The strategy used was the study of sites in Brazil that implanted, with relative success, a logistic platform. It was intended to develop a methodology based on existing literature and case studies, which permitted to identify and map the steps of an implantation and the modus operandi of a platform.

007-0257: The Logistics Function in the Fashion Sector. An Analytical Approach*Jesus Garcia-Arca, University of Vigo, Spain**Ana Mejias-Sacaluga, University of Vigo, Spain**Jose Carlos Prado Prado, University of Vigo, Spain*

The paper presents the main results of a project with a two-fold objective: to determine the extent to which the logistics function is developed in companies of the fashion sector and, the design of an improvement plan in the field of logistics to increase competitiveness. To do so, in-depth analysis of the logistics function and supply chains in nine Spanish companies of the fashion sector (all of them significant companies in European markets and in some cases worldwide) is carried out, taking into account both structural and organizational aspects, all this in keeping with the complexity and uncertainty of the fashion sector's supply chain (characterized by a product with a short life cycle, high volatility, low predictability, and a high level of impulse purchase). In this context, the concept of best practices is used.

007-0227: Aviation Safety Program Outcomes: When Successful Implementation*Stephen Swartz, University of North Texas, United States*

Vehicle mishaps are costly in dollars, public opinion, and human life. Fleet operators spend considerable time and effort attempting to reduce mishaps. This is particularly true in aviation operations, where the costs in human life, equipment, and goodwill are considerable. The largest aviation fleet operator in the world (United States military) has implemented safety programs based on the principles of Risk Management. The purpose of this research was to determine whether this implementation has had any effect on fleet safety. Analysis was conducted on annual and quarterly mishap rates, quarterly flight mishap rates, and individual mishap data using comparison of means testing, discontinuous piecewise linear regression, and goodness of fit testing. Results showed that the successful implementation of the Risk Management program did not effectively reduce mishap rates. In addition, evidence suggests that mishap rates increased immediately after program implementation. It is suggested that decentralized risk management approaches to flight safety may not be appropriate.

10	Friday, May 4, 8:30-10:00 Room: Parisian Session: Empirical Research in Health Care	Track: Emp Res, 1	Chair: Christian Terwiesch
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007-0097: Reserving Operating Room Time for Cardiac Care

Marcelo Olivares, University of Pennsylvania, United States

Christian Terwiesch, Wharton School, United States

We analyze the OR reservation procedure at a large US teaching hospital. We derive optimal reservation policies and show a good empirical fit with the actual behavior of the hospital.

007-0334: The Impact of Workgroup Collaboration on Patient Mortality

Ingrid Nembhard, Harvard University, United States

Amy Edmondson, Harvard University, United States

Jeffrey Horbar, Vermont Oxford Network, United States

Anita Tucker, University of Pennsylvania, United States

The healthcare industry has traditionally relied on advances in technology to drive patient care improvements. However, recently the healthcare literature has begun to recognize the importance of managerially-based improvements, such as collaboration across disciplines and unit leadership. In this paper, we test whether higher levels of unit leadership and collaboration among care providers are associated with lower risk-adjusted patient mortality in intensive care units. Our data support the hypothesis linking higher levels of collaboration with lower mortality rates. There is no relationship between ratings of nursing leadership and mortality. Finally, higher mortality rates occurred on units where physicians rated collaboration higher than did nurses on that unit.

007-0099: The Impact of Work-load on Service Worker Productivity: An Empirical Analysis

Diwas KC, The Wharton School, United States

Christian Terwiesch, Wharton School, United States

We study the productivity of healthcare workers in two settings. First, we measure at what speed patient transporters are able to fulfill demand for moving patients around in the hospital. Second, we look at the cardiac care unit and its ability to fulfill demand for heart surgery procedures. In both settings, we demonstrate that there exists an interesting interaction between system work-load and worker productivity.

007-0617: Determinants of Supplier Termination - A Manufacturing Firm's Perspective

Rachna Shah, University of Minnesota, United States

Hojung Shin, Korea University, Korea, Republic of (South Korea)

Can suppliers avoid being terminated? While numerous supplier management articles focused on the importance of supplier rationalization and retention, few studies have examined the antecedent factors that lead a manufacturing firm to terminate its relationship with its key supplier. We use Transaction Cost Economic Theory and Socio-Political Theory to identify factors that increase a manufacturing firm's propensity to terminate its relationship with its key supplier and switch to another supplier. Using survey data from 290 manufacturing firms and structural equation modeling, we find that factors identified by previous research such as extent of collaboration, trust, commitment and supplier know-how do not significantly influence a manufacturer's decision to terminate its key supplier(s). Instead, (lack of) personal familiarity and dissatisfaction with the key supplier are the most critical determinants. These results challenge behaviorally based supplier management literature and have important implications for both supplier and manufacturing firms.

11	Friday, May 4, 8:30-10:00 Room: Patio Session: Panel Discussion	Track: Mass Cust, 1	Chair: Joel Goldhar
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007-0382: Profit Impacts of Investments in FMS/CIM Technology - A Panel Discussion

Joel Goldhar, Illinois Institute of Technology, United States

Kathryn Stecke, University of Texas at Dallas, United States

Many manufacturing firms made large investments in Robotics and Flexible Manufacturing Centers and Systems tools and technology/Advanced Manufacturing and CAD/CAM/CIM software during the 1990's. Sufficient time has elapsed to accurately judge the impacts of those investments on business profitability and on a variety of strategic and organization variables. This Panel will invite Executives from firms that have a history of major investments in manufacturing flexibility technology to join with Academics who have studied the economic, process design, strategic, and organizational issues impacted by investments in Advanced Manufacturing Technology. With participation from all attendees, the goal will be to develop a retrospective look at the original justification and expectations of the investments when they were made, the subsequent impacts, and some ideas for future research in this area.

12	Friday, May 4, 8:30-10:00 Room: Terrace Session: Managing Healthcare Operations	Track: Health Care, 9	Chair: Berit Helgheim
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007-0230: Efficiency and Standardization in Managing the Healthcare Supply Chain

Jeremy Meacham, Jackson State University, United States

Jack Crumbly, Jackson State University, United States

As health care organizations become more competitive, wise investments in supply chain management are keys to success and survival. An efficient supply chain is extremely important for enhancing the competitiveness of any operation. Cost effective transportation, reduced levels of inventory, and decreased wastage directly add to the bottom line and thus increase profitability. In the world of healthcare purchasing, pricing discounts and incentives are based on volume. Cost savings hinge on standardization. Clinicians must agree to standardize particular supplies and use the same item across hospital systems. A structural equation model is hypothesized using the following constructs: Diverse Skill Sets, Shared Knowledge, Collective Ambition, Supply Chain Management Team Process Outcomes, and Supply Chain Performance Outcomes. The current theoretical paper looks into some of the important determinants of Supply Chain Management Teams that can help managers in healthcare organizations develop and utilize an efficient supply chain.

007-0273: Production Models in Elderly Health Care in Norway

Birgithe Sanbaek, Molde University College, Norway

Berit Helgheim, Molde University College, Norway

In Norway the health care is public financed and driven. However, elderly people are served by local communities and hospitals by region public corporations. This two level system split the responsibilities for production of services for elderly people and the nursing homes tend to send the patients for hospitalizations. Considering the fact that nursing homes already have physicians as well as nurses, the question one might ask is whether this is the most cost efficient way of treating these patients. Further, researchers claim treatment in hospitals may not improve the outcome of various diseases, it may actually be better if they are treated at the nursing homes. In this paper we do a descriptive study of elderly patients in hospitals in order to develop alternative production models of health care services to elderly people.

007-0474: A Human Reliability Approach to Clinical Risk Management (CRM): Methodological and Cultural Issues

Federica Turra, University of Padova, Italy

Chiara Verbano, University of Padova, Italy

Safety in medicine is a developing field. The paper deals with the identification and description of new human reliability methodological and cultural developments in medical sector, adapting existing techniques which are well established in the industry sector and have potential applications in Italian healthcare organisations. We carried out a literature review to classify all techniques in current or recent use in an international and national context. We identified some guidelines, which are useful for the development of a new CRM methodology, based on Human Reliability Analysis (HRA). The gathered qualitative data were analysed by groups of experts, through structured focus group discussions, group interviews and with in-depth individual interviews. It is envisaged that this could be a framework for other healthcare systems wishing to develop sustainable processes for managing the generation and application of HRA methods alongside hospitalisation processes.

13	Friday, May 4, 8:30-10:00 Room: Vista Session: Multi-item Inventory Analysis	Track: Inv Mgmt, 1	Chair: James Bradley
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007-0738: Stocking Products with Independent and Overlapping Demand Streams

Xinxin Hu, Indiana University, United States

Valya Kuskova, Indiana University, United States

Hans Heese, Indiana University, United States

Many retailers bundle products in packages to increase customer value and sales. However, customers often create their own packages: if cookies are out of stock, a customer who needs both cookies and milk might decide against buying milk alone, thus avoiding to wait in line at the cashier before having to visit another retailer for the cookies anyway. We consider a retailer's optimal stocking decisions for two products in the presence of customer-created bundles. We provide necessary and sufficient conditions for the optimal stocking quantities, and we conduct an extensive computational study to determine the value of considering customer-created bundles in making stocking decisions.

007-0223: A Joint Replenishment Inventory Model with Transportation Costs: A Study in the Retail Grocery Industry

Pamela Donovan, Air Force Institute of Technology, United States

Philip Evers, University of Maryland, United States

Joint replenishment policies, designed to coordinate the ordering of multiple items, can reduce inventory costs by synchronizing ordering decisions and enable greater transportation economies through larger shipments. This study extends the existing joint replenishment literature by incorporating transportation costs. A fully specified model was developed taking into account the cost disadvantage of over-declared shipments. Based on the performance of the Full model, a Truck heuristic was proposed to fill a truck with each order. By varying the model parameters, the study demonstrated the large impact transportation costs had on total inventory costs and the viability of the Truck heuristic, even for moderate differences in transportation rates. A simulation study tested violations of the demand normality assumption and found that while the Full model suboptimized the order interval and base stock levels under non-normal demand conditions, the cost penalty was only 2 percent above expected costs.

007-0631: Dynamic Inventory Allocation Under Imperfect Information and Capacitated Supply

Maher Lahmar, University of Houston, United States

Sylvana Saudale, Bayer Technology Solutions, United States

We consider a distribution system composed of a limited-capacity supplier that serves a set of customers exhibiting stochastic demand. The supplier information is limited to the inventory level observed at the currently visited customer and the previously observed inventory levels at all other customers. The supplier follows a fixed routing and sequentially decides on how much stock to allocate to each customer. We formulate the problem as a Markov Decision Process and discuss optimal replenishment policies. We provide managerial insights on the value of dynamic decision making and information availability in the replenishment of such distribution systems. We benchmark the performance of myopic solution approaches to that of the optimal solution procedure. Finally, we develop and test the quality of efficient decomposition-based heuristics that can solve for the homogenous customers case.

007-0009: Last-Time Buy Decisions with Multiple Products and Multiple Parts*James Bradley, College of William and Mary, United States**Hector Guerrero, College of William and Mary, United States*

"Life-cycle mismatch" occurs when part life cycles are shorter than the life cycles of products in which they are used. "Last-time buys" are one response to part obsolescence where a quantity of parts is purchased to sustain manufacture of a product over its remaining life. We extend prior work, which focuses on one product with one obsolete part, by deriving closed-form solutions and heuristic policies for (1) one product with multiple obsolete parts and (2) many products that share an obsolete part. Our simply-computed heuristics perform quite well even for product life-cycles with nonstationary stochastic demand.

14Friday, May 4, 10:30-noon **Room:** Brasserie**Track:** Prod Innov, 2**Chair:** Nitin Joglekar**Session:** Technology Commercialization and Startup Operations**007-0245: The Role of Informational Spillovers on Competitive R&D Search***Stylianos Kavadias, Georgia Institute of Technology, United States**Nektarios Oraopoulos, Georgia Institute of Technology, United States*

This paper explores the structural features of R&D consortia, that is collaborative efforts which revolve around university research centers or specialized R&D labs. We consider the informational spillovers that arise when research centers disseminate the knowledge they generate, to explain how R&D spillovers emerge. We draw upon a case study conducted in a major engineering lab, and we attempt to "open the black box" of R&D spillover creation as the latter is treated deterministically in economics. We develop a model that accounts for the strategic interactions between the consortium participants as they conduct R&D. The latter is modeled as repeated exploration trials for new technological solutions, whereas the former considers that firms compete in similar market segments. We find that R&D spillovers are strongly path dependent, and that future R&D explorations depend on past research findings. Still, successful past outcomes may deter the exploration of the same scientific domain.

007-0542: Technology Standardization and Marketing Expenditures for New Products*Moren Levesque, University of Waterloo, Canada**John Angelis, Case Western Reserve University, United States*

This paper focuses on a technology adoption decision, whereby the new technology affects the way in which customers interact with the product. The technology adoption decision is unobvious due to tradeoffs between a likely change in number of new sales and in the level of difficulty for acquiring sales from a rival firm that do not adopt the technology. We formulate a game-theoretic framework to investigate the conditions under which the two firms should adopt the new technology, taking into account this adoption's influence on advertising expenditures. We make recommendations as to when a firm and its rival should focus on technology standardization as opposed to technology diversification.

007-0078: Process Investment Decisions of an Entrepreneur Firm Under Competition*Nitin Joglekar, Boston University, United States**Sinan Erzurumlu, University of Texas at Austin, United States**Fehmi Tanrisever, University of Texas at Austin, United States*

When to invest in process improvement that can induce revenue growth, instead of conserving cash and reducing the potential for bankruptcy, is a dilemma faced by many entrepreneurial firms early in their lifecycle. We examine production quantity and cost-reducing R&D investment decisions in a two period model. The startup's objective is to maximize its total two period discounted profits, subject to the threat of bankruptcy. In the first period, the startup launches a product and creates a market. In the next period, a rival enters this market and engages in quantity competition. The setting is characterized by uncertainty -- prior to the second period the startup makes assumptions about the distributions for return on process investment and the rival firm's variable cost. Results show that uncertainty and anticipated growth rates affect process investment decisions crucially. We relate our findings with observations from case studies in startup companies.

007-0299: A Taxonomy of Operating Capabilities of Young Firms in the U.S. Medical Devices Industry*Jane Davies, Boston University, United States**Mark Frohlich, Indiana University, United States*

It is commonly recognized that young firms play a key role in economic growth. However, there appears to be little empirical research that examines how such firms manage their operations and what capabilities they stress at times of growth. Focusing on the medical devices industry, this study developed a taxonomy of young firms by determining their allocation of operating resources to exploitation and exploration activities, then examined whether these operating strategies effected the subsequent survival of the business. The cluster analysis identified that there are four distinct groupings of young firms, namely homesteaders, pioneers, mavericks and carpetbaggers. Each emphasized a different set of operating capabilities. While the analysis did not demonstrate a simple link between the clusters and the survival of the business, it did determine that entrepreneurs, stakeholders and investors should not discount specific profiles of operating capabilities when considering the present or future performance of young firms.

15Friday, May 4, 10:30-noon **Room:** Continental**Track:** Supply Chn, 2**Chair:** James O'kane**Session:** Simulation Modeling in Supply Chains**007-0605: Developing Simulation Components for Supply Chain Modeling.***Pavel Albores, Aston Business School, United Kingdom**Peter Ball, Cranfield University, United Kingdom*

Jillian MacBryde, University of Strathclyde, United Kingdom

Modeling supply chains is generally a complex and time consuming task. One way of working around this is to have re-usable pre-defined components that represent typical activities in supply chains. The paper presents the application of this principle to the modeling of e-business processes and analyzes how the approach can be extended to supply chains. A new methodological approach is presented for the development of static (templates) and dynamic (components) re-usable simulation models. An analysis of the level of granularity at which these components have the potential to make the bigger impact is described. The research contributes to the knowledge of components and re-use theory in simulation and gives practitioners mapping guidelines and offers a way of breaking the barrier for the use of simulation.

007-0572: Short Life Cycles and Supply Chain Responsiveness

Darwin Davis, University of Delaware, United States

Hemant Kher, University of Delaware, United States

Dynamic environments characterized by frequent technology changes or frequent innovations in product features may also have short product life cycles. Short life cycles pose challenges in the form of high demand uncertainty throughout the life cycles and the potential for obsolete product at the end of the life cycles. In such circumstances a responsive supply chain which can quickly respond to changing demand volume can be a source of competitive advantage. In this simulation study we investigate the effectiveness of various operational methods of providing supply chain responsiveness. Measures of effective performance include the percentage of lost sales and the percentage of the supply chain output that becomes obsolete.

007-0499: Dependency Between Information Sharing and Supply Chain Process Performance

Martin Poiger, Vienna University of Economics and Business Administration, Austria

Gerald Reiner, University of Neuchâtel, Switzerland

It is commonly accepted that information sharing has a positive impact on supply chain performance. On the other hand some research has shown that a reduction of lead times has a higher impact than information sharing. We want to show that there is a strong dependency between these two aspects and no contradiction. Therefore a quantitative empirical model is built to show how information sharing, realized by vendor-managed inventory can reduce lead times and thereby improve overall process performance. In particular we jointly investigate the impact of improved forecasting (reduced forecast error), enhanced replenishment policies and shorter supply chain on average inventory, bullwhip effect and service level. A combination of discrete event-driven simulation and rapid modeling is used to model and analyze data from a real supply chain from the electronic industry, where the manufacturer and distribution center are located in different European countries.

007-0409: Impact of Inventory Policy Consistency on the Three-stage Supply Chain Performance

Liang-Chieh Cheng, University of Houston, United States

This paper contributes knowledge to effective supply chain management from a new perspective – the consistency of supply chain inventory policy combinations. Selection of inventory policies by individual supply chain partners has a profound impact on logistics performance. Consistent upstream and downstream inventory policies imply similar routines and norms of operation and decision making processes; in contrast, inconsistent inventory policy combinations imply otherwise. In extant supply chain literature, to what extent consistent vertical inventory policy combinations can impact inventory performance, however, remain not fully examined by researchers. Based on economic order quantity and economic order interval models, this paper develops simulation models and examines the impact of inventory policy consistency on the performance of a three-stage supply chain (i.e., a reseller-vendor-manufacturer triad). Simulation results indicate that combinations of different inventory policies demonstrate significant bullwhip effects. Additionally, synchronized inventory management practice outperforms all other inventory policy combinations.

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Friday, May 4, 10:30-noon **Room:** Executive

Track: Opt Models, 2

Chair: Harihara Natarajan

Session: Solution Methods for Complex Distribution and Procurement Planning Problems

007-0269: An Optimal Branch and Bound Algorithm for the Separable Piecewise Linear Concave Cost Allocation Problem

Gerard Burke, Georgia Southern University, United States

We consider a problem encountered by a central purchasing organization for a major office products distributor. The purchasing organization must source a quantity of a particular resale item from a set of capacitated suppliers. Each supplier offers an incremental quantity discount purchase price structure. The purchaser's objective is to obtain a quantity of a required item at minimum cost. The resulting problem is one of allocating order quantities among an approved supply base and involves minimizing separable piecewise linear concave cost functions. We develop a branch and bound algorithm that arrives at an optimal solution by generating linear knapsack subproblems whose solutions are feasible to the master problem.

007-0699: Allocating Procurement to Multiple Capacitated Suppliers: A Continuous Knapsack Problem with a Concave Separable Cost Function

Gerard Burke, Georgia Southern University, United States

Joseph Geunes, University of Florida, United States

Edwin Romeijn, University of Florida, United States

Asoo Vakharia, University of Florida, United States

We consider a problem in which a producer must procure a quantity of raw materials from a set of capacitated suppliers. Each supplier offers a quantity discount price structure, and the producer seeks to obtain its required materials at minimum cost. The resulting problem takes the form of a continuous knapsack problem involving the minimization of separable concave functions. We identify practical special cases of this NP-Hard problem that are polynomially solvable, and provide a fully-polynomial-time approximation scheme for the general problem.

007-0696: Solution Methods for the Generalized Assignment Problem with Flexible Demands

Joseph Geunes, University of Florida, United States

Chase Rainwater, University of Florida, United States

Edwin Romeijn, University of Florida, United States

We consider a revenue-maximizing generalized assignment problem in which there is flexibility in the requirements associated with each demand. That is, there is a range of acceptable requirement levels for each candidate assignment and the chosen level affects revenue in a linear way. We propose a greedy heuristic and analyze its asymptotic performance under a probabilistic model. In addition, we consider an exact branch-and-price algorithm approach.

007-0698: Delivery Fee Design for Logistics Partnerships

Harihara Natarajan, University of Miami, United States

Anantaram Balakrishnan, The University of Texas at Austin, United States

Manufacturers and distributors are developing close partnerships in order to serve their customer needs quickly and efficiently. To build and sustain such distribution partnerships, firms must properly negotiate the terms of collaboration and interaction with partners. Compensation schemes play an important role in fostering such collaborations. Motivated by a problem facing a large building-products manufacturer, this paper proposes an optimization model to determine delivery fees, using fee tables, for a manufacturer's distribution partners. To solve this optimization model effectively, we develop an approach that exploits the special structure of the problem to obtain near-optimal solutions in a reasonable amount of time. Specifically, we develop an extended formulation and identify valid inequalities to strengthen the LP-relaxation of the original model and apply an LP-based heuristic. Our computations illustrate the effectiveness of the model and the solution approach.

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Friday, May 4, 10:30-noon Room: Far East

Track: Mkt-Opns, 2

Chair: Saibal Ray

Session: Pricing and Operational Decision Making Under Uncertainty

007-0679: Pricing and Production Planning Under Supply and Demand Uncertainty

Burak Kazaz, University of Miami, United States

Motivated by the challenges faced by agricultural businesses, this study examines the joint pricing and production decisions under supply and demand uncertainty. Using a two-stage stochastic program with recourse, the firm initially leases farm space to grow fruit. However, its realized supply fluctuates due to weather conditions and diseases. Later, the firm has the flexibility to purchase additional supplies from other growers at a unit purchasing cost that changes with realized supply (the lower the supply, the higher the unit purchasing cost). We consider two different modeling approaches regarding the time that prices are set. In the Early Pricing model, prices are determined when the leasing agreement is made, and in the Postponed Pricing model, prices are set after the supply is realized. The study determines the optimal sale price and production quantities for each of these models and provides managerial insight as to their behavior.

007-0648: Pricing and Inventory Control with Two-Sided Uncertainty: Water Distribution in Southern California

Claire Tomkins, Stanford University, United States

Thomas Weber, Stanford University, United States

We develop an inventory and pricing control model for application to a large intermediary operating in the public sector, the Metropolitan Water District of Southern California (MWD). We extend the results in the extant literature to the case of two-sided uncertainty without backlogging. In keeping with earlier results, the optimal policy can be characterized as a base-stock-list-price policy. The application of the model to MWD provides a number of policy insights, including differing optimal policy responses to increases in storage, or holding, costs vs. increases in shortage costs, the impact of supply and demand uncertainty on the optimal policy and system payoffs, and the impacts of correlated demand and supply uncertainty. Our paper aims to both extend the current literature on joint inventory and pricing control models and to draw attention to the application of these models to public pricing problems, which has not, to date, received significant attention.

007-0479: The Effect of Demand Uncertainty on Price Matching Guarantees

Arcan Nalca, McGill University, Canada

Tamer Boyaci, McGill University, Canada

Saibal Ray, McGill University, Canada

Price-matching-guarantees (PMGs) are offers by firms whereby they assure that they will match any lower price offered by the competition for the same merchandise. Early economics literature illustrates that PMGs lead to tacit collusion and monopoly prices. However, in today's competitive environment firms reserve the right to check the availability of the product at the competitor location and decline to match the lower price if the product is not available there. When demand is uncertain, verifying the availability of the product leads to a game where firms simultaneously compete on prices and order quantities. We build a duopoly newsvendor competition model and investigate the effects of demand uncertainty on PMGs and the effect of PMGs on newsvendor competition. The equilibrium solutions are compared under three scenarios; i) firms offer PMGs but don't verify the availability, ii) firms offer PMGs as well as verify availabilities, iii) firms don't offer PMGs.

007-0551: Joint Optimization of Retail Price and Shelf Space Allocation with Stochastic Demands

Chase Murray, SUNY - Buffalo, United States

Debu Talukdar, SUNY - Buffalo, United States

Abhijit Gosavi, SUNY - Buffalo, United States

We present a joint optimization model for the multi-product retail pricing and shelf space allocation problem in which demand for each product is a stochastic function of the prices of all products. It is assumed that each product has a finite set of market prices from which to select. We consider an objective function that incorporates a retailer's profit generated from sales, as well as its opportunity costs for unsatisfied demands and holding costs for unsold inventories. Our solution approach combines a well-established meta-heuristic for searching the state space of feasible prices and a model-specific heuristic that exploits the structure of this problem to determine near-optimal allocation levels for fixed prices. Theoretical results regarding the properties of the model and numerical examples for problems of practical size are provided.

007-0081: Supply Chain Management 2010 and Beyond: Mapping the Future of the Strategic Supply Chain*Robert Vokurka, Texas A&M University - Corpus Christi, United States*

This paper reports on the results from a workshop conducted at Michigan State University that brought together operations and supply chain experts to identify and prioritize the issues facing supply chain managers in the coming years. The participants included both academics from universities with strong operations programs and supply chain practitioners. The participants identified sixteen gaps between where organizations are today and where they need to be five years from now.

007-0082: Supply Chain 2010 and Beyond: Using A Delphi Study to Identify the Critical Issues*Steven Melnyk, Michigan State University, United States*

This paper presents the results from a Delphi study that was used to identify the important issues facing operations and supply chain managers today and those they will face five years from now. The Delphi technique was used to obtain a reliable consensus from a group of experts including both operations faculty and supply chain practitioners. The results from the Delphi were used as a basis for discussion at a workshop held at Michigan State University with the same group of experts. Supply chain disruptions and supply chain risk along with leadership within the supply chain were viewed as very important five years from now.

007-0083: Closing the Gaps Between Supply Chain Performance Today and in 2010 and Beyond*Rhonda Lummus, Iowa State University, United States*

Supply chain managers will face significantly different issues five years from now from those they face today. Operations and supply chain experts at a workshop at Michigan State University developed research and education agendas that are required to close the gap between today's performance and the issues facing supply chains in the future. Specific research topics will be outlined in this paper along with required changes in operations and supply chain curriculum from both universities and professional societies such as APICS.

007-0084: The New Strategic Supply Chain*Joseph Sandor, Michigan State University, United States*

This paper will provide a managerial perspective on the challenge of going from supply chain performance today to the strategic supply chain management that will be required in the future. The environment of the future will be more complex and require long-term thinking. Senior executives must understand how operations delivers value across the supply chain. Using the results from a workshop including operations and supply chain experts at Michigan State University, an agenda for practitioners will be discussed.

007-0746: A Primal-Dual Algorithm for the Dynamic Lot-Sizing Problem with Multi-Mode Replenishment*Sandra Eksioglu, Mississippi State University, United States*

The classical economic lot-sizing problem assumes that a single supplier and a single transportation mode are available in replenishing inventory. This paper studies an extension of this problem where several suppliers and transportation modes are available. The decision making process in this case involves identifying (i) timing of an order; (ii) choice of shipment modes; and (iii) order size for each mode. We formulate this problem as a mixed-integer program. We provide an additional formulation of the problem by redefining its decision variables and show that the dual of the corresponding LP-relaxation has a special structure. We take advantage of the structure of the dual problem to develop a primal-dual algorithm that generates tight bounds for this problem. Computational results demonstrate the effectiveness of the algorithm.

007-0205: Production Planning Under Uncertainty in Textile Manufacturing*Suleyman Karabuk, University of Oklahoma, United States*

Textile manufacturing consists of yarn production, fabric formation and finishing and dyeing stages. The subject of this study is the yarn production planning problem, although the approach is directly applicable to the fabric production planning problem due to similarities in the respective models. Our experience at an international textile manufacturer indicates that demand uncertainty is a major challenge in developing yarn production plans. We develop a stochastic programming model that explicitly includes uncertainty in the form of discrete demand scenarios, and captures the trade off between inventory carrying costs and changeover costs. We illustrate the benefits of a stochastic programming approach over a deterministic one and share our initial application experience.

007-0745: A Decision Rule for Coordination of Inventory and Transportation in a Two-Stage Supply Chain*Burak Eksioglu, Mississippi State University, United States**Ismail Capar, Mississippi State University, United States*

A two-stage supply chain with two distribution centers and two retailers is analyzed. Each member of the supply chain uses a (Q, R) inventory policy. Each distribution center is able to serve both retailers, but with different transportation cost structures. The retailers are identical and face independent Poisson demand. Both distribution centers place orders to an outside supplier with unlimited capacity. A decision rule that allows retailers to compare the expected cost of ordering from both distribution centers is developed. Four different ordering policies, including the one based on the proposed decision rule, are compared with respect to total cost and service level.

007-0191: RFID in the Warehousing Industry – An Update*Barbara Osyk, University of Akron, United States**Bindiganavale Vijayaraman, University of Akron, United States*

In August 2004 we first surveyed members of the Warehousing Education and Research Council to find out if they were implementing RFID technology and what challenges they were facing. The results indicated that a high percentage of respondents were not currently considering RFID technology. A number of concerns still existed and even among adopters there was skepticism about the potential for RFID to deliver a positive ROI in the near future. Given the extension of the RFID mandates and the continuing interest in RFID, what has changed in the last 2-1/2 years? We are updating our study and once again surveying WERC members to find out. Is there increased interest? Are companies beginning to see a positive ROI? What other benefits are they realizing from their RFID implementation? What new challenges are they facing? We report on preliminary results from our updated survey.

007-0190: When Does RFID Make Business Sense for Managing Supply Chains?*Ertunga Ozelkan, University of North Carolina at Charlotte, United States**Agnes Galambosi, University of North Carolina at Charlotte, United States*

Radio frequency identification (RFID) is believed to change how supply chains operate today. While RFIDs promise for improved inventory visibility and automation in inventory management is making many supply chain players hopeful for increased sales and reduced operating costs, these benefits do come at a cost and involve risks. This presentation will discuss a return on investment analysis that captures RFIDs cost and benefits, and quantify the financial risks of implementing RFID for various business sizes and products with different profit margins to understand when RFID makes business sense.

007-0187: RFID in Supply Chains: Accelerating Adoption*Divakar Rajamani, University of Texas at Dallas, United States*

RFID presents a great opportunity for leaders to take their supply chain performance to a superior level. However, it does not come without risks which could delay the adoption of this technology. In this paper, we review some of the opportunities presented by RFID and a few key strategies to accelerate RFID adoption.

007-0583: Metrics for Agribusiness Supply Networks*Natercia Carona, Fundacao Getulio Vargas, Brazil**Joao Csillag, Fundacao Getulio Vargas, Brazil**Susana Pereira, Fundacao Getulio Vargas, Brazil*

The agribusiness has become important in the last decade especially in the meat market. However, new risks such as bird flu, though being a business opportunity for some countries, raise some concerns in the consumer market. Therefore the challenge for agribusiness is to invest and improve supply chain performance and management. In the academic field new studies are needed that analyze the efficiency level of the networks exposed to global markets. Considering that managing implies the definition of performance metrics, this study presents a review of the literature of performance measurements for the agribusiness and establishes gaps considering new global scenarios. We expect the results to contribute to a better understanding of the agribusiness supply chain performance and its challenges.

007-0358: A Conceptual Thinking of Global Supply Network (GSN) in the Food Industry: Towards Architecture & Reconfiguration*Pichawadee Kittipanya-ngam, University of Cambridge, United Kingdom**Yongjiang Shi, University of Cambridge, United Kingdom**Mike Gregory, Institute for Manufacturing, University of Cambridge, United Kingdom*

Food industry is considerably complex and fragmented by reasons of a large amount of product varieties and mix, its specific product characteristics (i.e. perishability, temperature control), and a large number of participants with different size of firms. Coupled with globalisation trends, food industry becomes even more vulnerable and dynamic because of turbulent global environment (food standard restrictions, public policies and sustainability, international trade policies, WTO agreements, global competition, animal diseases, terrorists) and the demanding consumer preferences. However, to date, there are a few qualitative literature on GSN architectural models for the purpose of (re)structure and (re)configuration, particularly in the food industry where global environment is extremely dynamic. Therefore, this paper aims to study 'how food GSNs are constructed and reconstructed' under global business environment. The preliminary findings of the GSN architecture and its system in the food industry are presented through case studies with international food manufacturers in Thailand and UK.

007-0353: Supply Chain Issues for the Export of Perishable Food Products from Canada to Mexico*Ron McLachlin, University of Manitoba, Canada*

This paper reports on a study of the export of perishable food products from Canada to Mexico, via rail and/or road. The study addresses issues, problems, and constraints, plus effective supply chain management practices and other conditions favorable to the successful export of perishable products. The methodology follows a case-based approach to the systematic analysis of mainly qualitative data. Data were collected primarily through on-site, recorded interviews. These were conducted with managers from Canadian exporters and transport firms, covering the major regions of the country, as well as managers from various Mexican importers of perishable products, mostly at Mexico City locations. Where applicable, the interviews were augmented by a brief questionnaire, company documents, observations, and website information. The paper concludes with recommendations for current Canadian exporters and those considering similar exports, along with a discussion of the major themes discovered.

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Friday, May 4, 10:30-noon **Room:** Panorama
Session: Empirical Study for Logistics Services

Track: Trans Log, 2

Chair: Donald P Warsing

007-0117: Logistics Service Level and Behavioral Intentions of Retailers: An Empirical Study of the Soft Drink Industry

Cig Gonçalves-Filho, Fumec University, Brazil

Gustavo Souki, Fumec University, Brazil

In a competitive scenario, recent modifications in the structure of consumer markets suggest that market channels and retailers are gaining more power when compared to producers and manufacturers. Logistics has been pointed out as a possible differentiation factor that could add competitive advantage to a firm. In despite of these facts, studies that aim to explore the behavioral intentions of retailers as consequences of logistics service level are scarce. A survey with 360 respondents (retailers) validated the scales of Logistics Service Level Quality and Behavioral Intentions. Applying Structural Equation Modeling, the results revealed the relations among Logistics Service Level, Satisfaction and Behavioral Intentions of retailers. The study also proposes the development of a Logistics Service Quality Index, that enables the measure of service level in an aggregate form, allowing comparisons among competitors and more effective control of service level.

007-0402: Modeling Truck Rates Using Empirical Data

Michael Kay, North Carolina State University, United States

Donald Warsing, North Carolina State University, United States

We develop a model to provide general estimates of less-than-truckload (LTL) truck rates for transporting goods between origin-destination (O-D) pairs located anywhere in the continental United States. The estimate is developed from actual tariff-based rate tables and enables easy comparison of LTL and truckload (TL) rates. The model is normalized to reflect average industry rates and to allow rate estimates to be adjusted to current economic conditions using the Producer Price Index for LTL service. The weighted absolute relative error of the model is 11.93%, which is achieved by incorporating a rational polynomial function of the shipment density, based on an analysis of the residuals from a simpler initial model. Finally, we demonstrate the use of the rate model in a mode choice (LTL versus TL) decision to minimize combined transportation and inventory costs, and we describe a number of follow-on applications of the model.

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Friday, May 4, 10:30-noon **Room:** Parisian
Session: Retail Supply Chain Management

Track: Emp Res, 2

Chair: Nicole DeHoratius

007-0314: Selling to Godzilla: The Financial Impact of Being a Major Supplier to Wal-Mart

Taylor Randall, University of Utah, United States

Michael Lemmon, University of Utah, United States

Perry Solheim, University of Utah, United States

The popular press is littered with suggestions that strong retailers such as Wal-Mart exert undue influence on their suppliers. Theory, however, is conflicted in its predictions about the influence of a major customer on the economic performance of suppliers. We explore the accusations of popular press and the competing predictions of theory using a sample of suppliers from Wal-Mart Corporation. On average, we find little association between the influence of Wal-Mart as a major customer and the performance of suppliers. Rather we find that firms developing significant relationships with Wal-Mart are different from industry peers before entering the relationship. On average these firms outperform industry peers. However, in cross sectional analysis we find some evidence that supplier power relative to Wal-Mart does have an association with supplier performance.

007-0104: Incorporating Margin and Inventory Endogeneity in Firm Level Sales Forecasting

Saravanan Kesavan, Harvard University, United States

Vishal Gaur, New York University, United States

Ananth Raman, Harvard University, United States

The aggregate sales, inventory, and gross margin for a retailer are interrelated due to operational reasons. While examples from practice and models in the theoretical literature tend to look at each possible relationship between pairs of variables in isolation or in some combination, the data obtained from practice are the joint outcome of all of them being manifested simultaneously. In this paper, we propose a simultaneous equations model to represent these dependencies, and apply this model to forecast sales. We use publicly available financial data for our analysis. We show that firm-level sales, inventory and margin have a triangular relationship with each variable affecting the other two variables. We also find that forecasts from our model are more accurate than those from financial analysts.

007-0089: Execution in Retail Supply Chains: Vendor-Retail Relationships

Nicole DeHoratius, University of Chicago, United States

Susan Kulp, Harvard Business School, United States

Researchers and managers alike have been touting the benefits of supply chain coordination. Such benefits include information sharing for improved supply chain visibility, joint planning, and improved physical flow of products through the supply chain. Despite these benefits, few manufacturers and retailers have developed the partnerships needed for such coordination to occur. The magnitude of distribution center receiving errors highlights this gap between theory and practice. Using data collected from one distribution center of a large retail chain with more than 700 stores, we show that 8% of the orders received from manufacturers were incorrect and resulted in a delay in distribution. We categorized the types of receiving errors observed and discuss the root cause of these disruptive events.

007-0500: Inventory Management of a Fast-Fashion Retail Network

Felipe Caro, UCLA, United States

Jeremie Gallien, Massachusetts Institute of Technology, United States

Fast-fashion retailers (e.g. Zara, H&M) have met some success responding to volatile demand trends through frequent introductions of new garments produced in small series. An important associated operational problem is the allocation over time of a limited amount of inventory across all stores in their network. We present stochastic and deterministic models developed in collaboration with a large fast-fashion retailer (Zara) to address this challenge, then discuss the implementation and impact of this work based on empirical data collected from a pilot run during the Fall-Winter season 2006.

24	Friday, May 4, 10:30-noon Room: Patio Session: Mass Customization: Case Study	Track: Mass Cust, 2	Chair: Vishwanath G Hegde
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007-0384: An Investigation on the Role of Customer Order Decoupling Point Analysis on Mass Customisation Strategies

Soroosh Saghiri, The University of Greenwich, United Kingdom

Concentrating on the role of supply chain decoupling point, this paper introduces different levels of customisation and mass operations, and different types of mass customisation. It argues that in each mass customisation type, operations strategy in upstream and downstream of the decoupling point can be varied. Consequently, operations strategy in different types of mass customisation have been studied, and examined. Two case studies have been concentrated in this study. A variety of products with different levels of customisation have been considered. Analytical comparison is done on these products and on the employed mass customisations. This analysis is an endeavour to organise mass customisation operations strategy across the supply chain. Results are used in development of a conceptual model for different mass customisation strategies.

007-0599: Effective Supply Chain Management Through Tailored Postponement Strategy

Nan Wang, University of Cambridge, United Kingdom

Yongjiang Shi, University of Cambridge, United Kingdom

Postponement strategy is an effective approach to address mass customization. However, misuses of postponement could result in increasing lead time and production cost. Hence, there is a need for a better understanding and implementing the strategy. The paper investigates the roles of postponement strategy in different apparel chains through multiple case studies. It indicates different postponement strategies are required in different situations, and the position of decoupling point in a supply chain can be important. A conceptual framework is developed after cross case analysis. It will help companies to choose and build appropriate postponement strategies according to different types of product. It suggests that there is a linkage between characteristics of product and postponement strategy. The response capability to changing customized requirements is therefore varied. Furthermore, the practice of postponement in the apparel industry could also inspire other industries.

007-0389: How Agility and Postponement Tackle Supply Chain Uncertainties

Soroosh Saghiri, The University of Greenwich, United Kingdom

Agility has been recognised as a supply chain strategy, which encounters volatile marketplaces with high product variety and short product life cycle. In postponement, value adding activities are delayed until a customer order arrives. This leads to reduction of risk and uncertainties of production and carrying inventory. Different types of postponement try to provide supply chains with flexibility and quick response capability against a variety of market and supply volatilities. This study tries to test the positive role of postponement on agility. In that respect, a survey study in manufacturing sector has been conducted which covers large number of companies each with different levels of agility and different applications of postponement. Analysis of the relationships between agility and postponement explores how they could manage uncertainties throughout the supply chain.

25	Friday, May 4, 10:30-noon Room: Royal Session: Information Systems and Managing Quality	Track: Qual Mgmt, 2	Chair: Eitan Naveh
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007-0171: Is More Necessarily Better? The Effect of a Management Information System on Performance

Eitan Naveh, Technion – Israel Institute of Technology, Israel

Utilizing the information overload approach, we explored the effect of management information systems supporting product and service quality on performance. Traditionally, information flow has been viewed as curvilinearly linked with outcomes such that an inflection point can be reached; from this point on, more information equals information overload. We studied information overload under conditions that differentiate between flow of information related to control and learning and organizations' contextual factors of uncertainty and quality climate. Results demonstrated that depending on uncertainty, linear projection replaces traditional curvilinear projection, and information flow is associated with higher performance as the quality climate rises.

007-0459: The Impact of ERP Information Quality on Decision-Making

Arun Madapusi, University of North Texas, United States

Ching-Chung Kuo, University of North Texas, United States

Richard White, University of North Texas, United States

In today's dynamic business environments, access to real-time and high quality information has become a necessity for the survival of firms. To meet their information and decision-making needs, firms worldwide are implementing enterprise resource planning (ERP) systems. However, the failure of firms to proactively embrace an information and decision quality strategy has resulted in poor quality information from ERP systems degrading decision-making quality, thereby resulting in sub-optimal business performance. In this research study we develop a framework that firms can use to assess the information quality of their ERP systems as well as examine the impact of information quality on their decision-making effectiveness. The critical success factors (CSFs) that impact the relationships between ERP implementation status and information quality, and information quality and decision quality, are also identified so that firms can focus on these CSFs and reap the benefits of improved information quality and hence better decision-making outcomes.

007-0302: A Six Sigma Project in the Retail Industry: Using RFID Technology to Reduce Inventory Shrinkage

Ximena Patrick, University of Houston, United States

Jamison Kovach, University of Houston, United States

The negative impact on bottom line performance due to inventory shrinkage costs the retail industry billions of dollars each year. Additionally, shrinkage due to shoplifting by amateurs is on the rise; hence, retail operations are continuously searching for cost effective methods to prevent such losses. One technology that has shown great potential in the area of inventory management is radio frequency identification (RFID). To examine the potential for RFID in reducing inventory shrinkage, we perform an experimental study considering electronic tagging systems within a major apparel retail operation. In this project we utilize the Six Sigma methodology as a framework for improvement and examine the implications of the use of this technology in other areas.

007-0762: Analyzing the Role of Information Technologies in Quality Management

Cristobal Sanchez-Rodriguez, York University, Canada

Information technology (IT) and quality management (QM) have significantly impacted most organizations and each has been widely researched. However, there is little well-founded empirical research on the relationship between the two, particularly on the way in which different ITs support different QM initiatives. This paper presents an initial investigation of such relationships based on a sample of 234 Spanish manufacturing firms. The results from the multiple regression analyses suggest that there exists a relationship between type of QM initiatives and type of IT used. Practical implications and guidelines for managers focus upon leveraging these relationships as a competitive weapon.

26	Friday, May 4, 10:30-noon Room: State Session: Pricing Decisions in Retail Operations	Track: Games, 2	Chair: Rui Yin
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007-0164: A Model of Consumer Inertia with Applications to Dynamic Pricing

Xuanming Su, University of California, Berkeley, United States

Consumers often wait until the last minute before making a purchase. This indicates strategic behavior if they can secure a last-minute discount. Yet, consumers sometimes wait even when this implies higher prices and lower availability. We adopt a behavioral approach towards this phenomenon and study its implications on dynamic pricing strategies.

007-0729: Dynamic Pricing of Seasonal Products in the Presence of Strategic Consumers

Yossi Aviv, Washington University, United States

Dynamic pricing practices are gaining popularity in the retail industry, and have engendered a growing body of academic research in recent years. When applying dynamic pricing techniques to fashion-like products, sellers need to account for characteristics of the sales environment, including the scarcity of goods, demand uncertainty, and strategic (forward-looking) consumer behavior. In this presentation, we present a model developed to study the optimal pricing of finite inventory in the presence of strategic customers that time their purchases in anticipation of future discounts.

007-0072: The Implications of Customer Purchasing Behavior and In-store Display Formats

Christopher Tang, UCLA, United States

Rui Yin, UCLA, United States

Consider a retailer announces both the regular price and the post-season clearance price at the beginning of the selling season. Throughout the season, customers arrive in accord with a Poisson process. In this paper we analyze the impact of two types of customer purchasing behavior (either myopic or strategic) and two common in-store display formats (either display all available units or display one unit at a time on the sales floor) on the retailer's optimal expected profit and optimal order quantity.

27	Friday, May 4, 10:30-noon Room: Terrace Session: Improving Healthcare Operations	Track: Health Care, 10	Chair: Sakesun Suthummanon
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007-0426: Process Improvement at Outpatient Drugs Department in Songklanagarind Hospital Through Computer Simulation

Nikorn Sirivongpaisal, Prince of Songkla University, Thailand

Sakesun Suthummanon, Prince of Songkla University, Thailand

Wanatchapong Kongkaew, Prince of Songkla University, Thailand

This research has the objective to improve the performance of outpatient drugs department in Songklanagarind Hospital, Prince of Songkla University by using simulation for analysis and experimental designs for improvement. Developed simulation model was used both for studying the current performance of the system and for experimenting on different alternatives aiming to improve the operation performance of the department. About model construction, each process in work station was studied and real data were collected. The model was developed with simulation and was validated under the opinion of the department manager and statistical method. Different combinations of operating conditions were analyzed. The experimentation through simulation identified factors which can effect the decreasing of prescription's flow time through the process, which will improve the quality of service. However, economic analysis must be evaluate the pay-off of this improvement project.

007-0252: Applications of Cost Minimization In a Teaching Hospital*Sakesun Suthummanon, Prince of Songkla University, Thailand**Nikorn Sirivongpaisal, Prince of Songkla University, Thailand*

The objective of this article is to explore the feasibility of the application of cost minimization analysis in a teaching hospital. The investigation is concerned with the development of cost per admission and cost per patient day models. These models are further used for determining the value of the length of stay that would minimize cost per patient day (projected length of stay) and for estimating the costs. The top five Diagnosis Related Groups (DRGs), obtained from a teaching hospital in South Florida, with the highest volume are selected for the study. The cost models are fitted to the data for an average R2 value of 85.36%, and a Mean Absolute Percentage Error value of 13.1%. Based on 8,703 admissions for the selected DRGs, the total cost per year and the cost per patient day are decreased by approximately 7.63% and 4.02%, respectively.

007-0424: Investigation of the Relationship Among Quality, Productivity, and Cost of Quality for a Service Organization*Sakesun Suthummanon, Prince of Songkla University, Thailand**Nikorn Sirivongpaisal, Prince of Songkla University, Thailand*

This research examines the impact of the Cost of Quality components (internal failure, external failure, appraisal, and prevention) on the quality and total productivity in a radiology department at a teaching hospital. The multiple regression analysis is employed to investigate the relationships. The results confirmed the contemporary theory that quality and total productivity are directly related. The research indicates that the relationship between quality and failure cost is negative, while the appraisal cost has a direct relationship with internal failure cost. This study also found that there are strong relationships between quality and internal failure cost. The research implied that as appraisal cost plus prevention cost increases, failure cost decreases, quality as well as total productivity improves.

28	Friday, May 4, 10:30-noon Room: Vista Session: Case Studies in Inventory Management	Track: Inv Mgmt, 2	Chair: Nicole DeHoratius
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007-0487: Strategic Global Sourcing: Towards the Creation of a Toolkit for Informed Decision Making*Marco Busi, Strathclyde University, United Kingdom**Peter Ball, Cranfield University, United Kingdom*

This paper describes work at the Centre for Business Process Outsourcing aimed at developing a toolkit supporting informed sourcing strategy-making. The toolkit rationale and background will be briefly presented. The focus will then be on discussing three major outcomes of the research so far: the global sourcing process model, the project management checklists and the IT-enabled outsourcing module. The authors will report on the knowledge generated and the work done to develop the main concepts behind the aforementioned outcomes -as a combination of literature study and experience gathered in sourcing projects with manufacturing companies and service providers-; and to implement the concepts in the IT-enabled module –carried out in partnership with a service provider expert in supply chain optimisation-. This paper contribution lies in the attempt it makes to fill the gap concerning the lack of usable theories and tools to support sourcing decision making in today's global environment.

007-0428: Inventory Management of Farm Poultry Feed*Nikorn Sirivongpaisal, Prince of Songkla University, Thailand**Sakesun Suthummanon, Prince of Songkla University, Thailand**Chosita Khunagornniyomrattana, Prince of Songkla University, Thailand*

This research has the objective to improve the inventory system in a poultry farm, located in the south of Thailand. This farm faced an important inventory replenishment problem. They have two kinds of poultry food which are for chickens 1-18 days old and for chickens 19-40 days old. Since poultry food has a limited shelf life, the longer it is stored, the lower the quality of the food, which can affect the health of the farm's poultry. In the planning stage, aiming to reduce the total inventory cost, an inventory model was built based on the historical demand data. Then computer simulation was exploited to demonstrate the performance of the inventory model before its implementation. This model can help management to decide how much to order and when to order the items. After implementation, total inventory cost is expected to reduce by 15 percent.

29	Friday, May 4, 1:30-3:00 Room: Brasserie Session: Knowledge, Learning & Intellectual Capital 1: Learning from Operational Failures in Healthcare and Banking	Track: Prod Innov, 3	Chair: Anita Tucker
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007-0512: Top Management's Focus of Attention and Organizational Learning from Errors*Rangaraj Ramanujam, Purdue University, United States**Donna Keyser, RAND Corporation, United States**Carl Sirio, University of Pittsburgh, United States**Debra Thompson, Pittsburgh Regional Healthcare Initiative, United States*

A multi-method case study of four hospitals explored whether and how the focus of attention of top management influenced organizational learning from medication errors. We conducted 58 interviews with top management team members, participated as observers in 70 hours of internal meetings about medication errors, and directly observed medication administration processes in 12 different patient floors. Overall, the structures and processes that enable organizational learning (specific goals and metrics, organization-wide awareness about them, formal routines for data analysis and problem solving, and resources to implement corrective actions) were consistently observed only with respect to issues that received frequent (daily) top management attention e.g., cost reduction. Medication error reduction received comparable attention only in two of the hospitals, also the ones where we observed significantly more instances of learning from medication errors. The implications, for organizational learning, of making error reduction both a strategic as well as an operational priority are discussed.

007-0127: Learning Orientation as a Predictor of Medical Treatment Errors

Eitan Naveh, Technion - Israel Institute of Technology, Israel

Tal Katz-Navon, The Interdisciplinary Center, Israel

Zvi Stern, Hadassah Hebrew University Medical Center, Israel

Every organization is confronted with employee errors. In order to eliminate errors, organizations emphasize a learning-orientation, which refers to the importance given within the organization to increasing each employee's level of knowledge and competence, improving employee performance, and understanding of work processes. The study explored the concepts of learning-orientation, autonomy, and voice, and the interactions among them, as predictors of errors, using the example of resident physicians' medical errors. Errors made by 126 residents in a three-month period were tallied. Although in the literature employee autonomy is expected to have a positive effect on performance, results demonstrated that such relationships exist only when learning-orientation was high. When learning-orientation was low, there were curvilinear relationships between the level of employee autonomy and the number of errors in which highest and lowest levels of autonomy were associated with many errors.

007-0711: Surgeon, Surgical Team, and Surgery-Recovery System Knowledge Generation and Learning in a Hospital

David Moore, Klicnet.org, United States

Nile Hatch, Brigham Young University, United States

Learning curves of surgeons, surgical teams, and the surgery-recovery system of a hospital are analyzed using data collected over a five year period. We explore potential interactions between surgeons, surgical teams, and the surgery-recovery system learning processes. How is individual knowledge created through team interactions and through interaction within the surgery-recovery system? How do individuals influence the development of team and surgery-recovery system knowledge? And how do current rates of learning and levels of performance of surgeons, surgical teams, and the surgery-recovery system influence future rates of learning and levels of performance for surgeons, surgical teams, and the surgery-recovery system within a hospital?

007-0338: Operational Failures and Organizational Learning: The Moderating Role of Process Complexity and Management Control System

Manpreet Hora, University of Western Ontario, Canada

Organizations struggle to reduce the impact of operational failures on firm performance. Research suggests that organizations reduce the probability and severity of operational failures by learning from the failures that occur frequently. However, very little is known about how firms learn from infrequent, yet high impact, operational failures. We investigate the conditions that strengthen or weaken the relationship between infrequent operational failures and organizational learning. We examine the effect of process complexity and management control systems on learning from infrequent operational failures. Drawing on unit-level panel data from a multinational bank, we find that the degree of process complexity and the amount of investment in control and monitoring systems moderate the relationship between infrequent operational failures and organizational learning. Our findings have important implications for learning from infrequent operational failures.

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Friday, May 4, 1:30-3:00 **Room:** Continental
Session: Empirical Studies in SCM

Track: Supply Chn, 3

Chair: Soumen Ghosh

007-0390: Elevated Service Offering in Service Value Networks: Building Dynamic Capability

Renu Agarwal, Macquarie University, Australia

Willem Selen, Macquarie University, Australia

Service organizations create new service offerings that are the result of collaborative arrangements operating on a value network level. This leads to the notion of "elevated service offering", implying new or enhanced service offerings which can be eventuated as a result of partnering, one that could not be delivered on individual organisational merits. Thus organisations are faced with important challenges and opportunities, which calls for strategic focus. This research transcends current industry boundaries and is based on an empirical study in the telecom industry in Australia. This paper provides an integrated view of the outcomes of elevated service offering in a collaborative environment and focuses on the theory and concepts of the dynamic process of capability building. In a continual search for competitive advantage, a suite of constructs are found to be instrumental to partnering eg. organisational learning, entrepreneurial alertness, innovative capacity, and collaborative agility.

007-0195: Flexibility: Combining Firm, Inter-firm, and Supply Chain Perspectives

Mark Stevenson, Lancaster University, United Kingdom

Martin Spring, Lancaster University, United Kingdom

Supply chain management requires that we look beyond the flexible factory to the flexible supply chain. Yet most empirical research into supply chain flexibility is actually conducted at the firm-level, failing adequately to explore inter-organisational flexibility or the role of services in the total supply network. This empirical study, across a network of sixteen manufacturing companies and six service operations, examines the interplay between flexibilities at the levels of the firm, dyad, and wider network. Supply chains appear to provide flexibility via dynamic combinations of some firms that are more flexible, and some that are deliberately inflexible. The research finds: the relative importance of flexibility and responsiveness vary with supply chain position; certain companies are particularly important to flexibility; manufacturing and service operations create flexibility in similar ways; risk and the longevity of change affect the approach taken to creating flexibility. This has managerial implications, e.g., for developing (intra)inter-firm capabilities.

007-0395: An Empirical Investigation of the Relationship between Product Nature and Supply Network Strategy

Sonia Lo, University of Melbourne, Australia

Damien Power, University of Melbourne, Australia

This study investigates the relationships between product nature and supply network strategy. Product nature has been identified by Fisher (1997) as a crucial factor in affecting the selection of supply network strategy. According to Fisher (1997), firms providing functional and innovative products are suitable for efficient and responsive supply network respectively. The mismatch results in serious business problems. Fisher's model has been widely discussed in the past decade. However, very limited empirical work was found yet in validating it. This study seeks to fill this gap. A questionnaire survey was conducted to examine whether Fisher's framework reflects appropriately current business environment. The result indicates that the association between product nature and supply network strategy is not significant. A hybrid strategy (pursuing both efficiency and responsiveness) is employed by most firms irrespective of the nature of product they provide.

007-0519: The Impact of Congruence Between Outsourcing Drivers and Competitive Priorities on Performance

James Kroes, Georgia Institute of Technology, United States

Soumen Ghosh, Georgia Institute of Technology, United States

The outsourcing of elements of supply chain processes is now an integral component of the operationalization of a firm's competitive business strategy. While the purported goal of outsourcing is usually to derive a competitive advantage in the marketplace, it is not clear whether the outsourcing decisions of firms are always strategically aligned with their overall competitive strategy. We use primary data to assess the different outsourcing drivers currently utilized by 233 domestic manufacturing firms making outsourcing decisions. We then use structural equation modeling to evaluate the strategic alignment between a firm's outsourcing drivers and its competitive priorities and assess the impact of the outsourcing alignment on supply chain and business performance.

31	Friday, May 4, 1:30-3:00 Room: Executive Session: Operations Scheduling	Track: Opt Models, 3	Chair: H. Neil Geismar
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007-0293: A Stochastic Programming Model for Scheduling Call Centers with Uncertain Arrivals

Thomas Robbins, Pennsylvania State University, United States

Terry Harrison, Pennsylvania State University, United States

We consider call center scheduling in an environment where arrival rates are highly variable and the call center is subject to a global service level agreement. This paper is motivated by a firm where call volumes exhibit significant day of week and time of day variability, and are also subject to random shocks: external events that create spikes in call volume. We formulate the problem as a mixed integer stochastic program and show that the stochastic formulation calculates a higher cost optimal schedule than a model which ignores variability. However, the expected cost of this schedule is lower. We find that the stochastic model is tractable and provides a significant reduction in the expected cost of operation. The stochastic model allows the manager to make informed risk management decisions by evaluating the probability that the SLA will be achieved.

007-0568: Competitive Agent Scheduling with Controllable Processing Times

Joseph Leung, New Jersey Institute of Technology, United States

Michael Pinedo, New York University, United States

Guohua Wan, University of Macau, Macao

We consider several competitive agent scheduling problems with controllable processing times, where two agents A and B compete for a single machine to process their jobs. Several different objective functions for the two agents are considered, including the total flow time plus compression cost, and the maximum lateness plus compression cost. We furthermore show how our results relate to scheduling with available constraints, and to crashing in project scheduling.

007-0123: Robotic Cells with Parallel Machines

H. Neil Geismar, Prairie View A&M University, United States

Chelliah Sriskandarajah, University of Texas at Dallas, United States

Michael Pinedo, New York University, United States

The combination of parallel machines and multiple dual gripper robots has become more prevalent in modern manufacturing with robotic cells. However, there has been no previous study of the design and scheduling challenges faced by managers who employ these complex cells. We quantify the benefit of implementing dual grippers in cells with multiple robots. We then address configuration decisions by comparing different implementations of multi-robot cells to show that the method of exchanging parts between robots (shared machines versus transfer stations) has little bearing on the throughput. In contrast, we demonstrate that the assignment of processing stages to robots can have a significant effect on a cell's potential throughput. We also analytically establish the optimality of a particular cyclic sequence of robot moves for each of the different configurations of robotic cells with one or more dual gripper robots and parallel machines.

32	Friday, May 4, 1:30-3:00 Room: Far East Session: Product Quality and Inventory Strategies for Effective Supply Chain Management	Track: Mkt-Opns, 3	Chair: Michael Fry
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007-0491: Demand and Price Implications of Quality Investment and Inspection Policies in a Supply Chain

Murat Erkoc, University of Miami, United States

Haresh Gurnani, University of Miami, United States

We consider a decentralized supply chain where market demand depends on the supplier's quality investment and the buyer's inspection policies. The supplier moves first and chooses the quality level and the wholesale price, whereas the buyer sets the inspection policy and the resale price. Higher quality and inspection can enhance demand through improved consumer perception. Building quality increases costs for the supplier and inspection is costly for the buyer. However, they reduce external and internal failure costs caused by defective products. We derive the optimal inspection policy for the buyer as a function of supplier quality, wholesale price, and cost of inspection. The supplier chooses the optimal quality/price pair that leads to inspection only if cost of quality is above a certain threshold. This threshold decreases with inspection cost and accuracy. Interestingly, our analysis reveals that demand enhancing effect of inspection can in fact lead to lower in-built product quality.

007-0368: Implications of Product Lifecycle and Channel Structure Upon Optimal Investment in Durability

Sreekumar Bhaskaran, Southern Methodist University, United States
Stephen Gilbert, University of Texas at Austin, United States

We investigate how the use of intermediaries in the channel of distribution affects a manufacturer's investment in the durability of a product. Depending upon the product and technology lifecycles, the nature production technology and manufacturing costs, we find that a manufacturer can have an incentive to invest more in durability when he sells through intermediaries than when he sells directly. This contrasts with existing results that indicate that the use of intermediaries generally discourages manufacturers from increasing other dimensions of product quality. We also explore how this incentive to invest in durability is affected by the intensity of competition among the dealers. Because competition between dealers have an impact on both channel efficiency and consumer expectations, increased dealer competition could increase or decrease a manufacturer's incentive to invest in product durability. These results have important implications for manufacturers in different industries.

007-0087: Product Quality Choice, Competition, and Supply Chain Design

Mark Ferguson, Georgia Institute of Technology, United States
Stylianos Kavadias, Georgia Institute of Technology, United States

We explore the interplay between product design choices and their effect on the supply chain transactions. We develop a normative model that highlights the drivers for the different industrial settings and we consider end product markets with quality sensitive heterogenous consumers.

007-0060: Supply Chain Dynamics Under Extended Warranty Sales

Hans Heese, Indiana University, United States

Consider two competing manufacturers selling their products through the same retailer. If this retailer derives profits from extended warranty sales, the manufacturers face a dilemma in setting their base warranties. While they have incentive to increase their warranties to make their products attractive to consumers, the retailer might prefer selling lower-warranty products to enhance sales of extended warranties. We develop a stylized model to determine and analyze optimal manufacturer and retailer strategies in this setting. Consistent with the ongoing decline in warranties for products that are sold through independent retailers, we show that these dynamics exert downward pressure on manufacturer warranties. Rather than pitching the extended warranty at the checkout after customers have selected a certain product, we find that retailers can often benefit from inducing simultaneous consideration of product and extended warranty characteristics, for example by posting extended warranty information right on the product shelf.

3	Friday, May 4, 1:30-3:00 Room: Florentine Session: Take Back Legislation	Track: Sustain Ops, 4	Chair: Atalay Atasu
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007-0741: Efficient Take Back Legislation

Luk Van Wassenhove, INSEAD, France
Miklos Sarvary, INSEAD, France
Atalay Atasu, INSEAD, France

Product and waste take-back is becoming more regulated by countries to protect the environment. Currently, collection and recycling targets are set collectively for an industry (influenced by lobbying.) Such regulation puts an economic burden on firms, while creating fairness concerns and missing its primary target: environmental benefits. This research discusses the economic and environmental impacts of such legislation and identifies efficiency conditions. It is shown that the right policy would (i) make producers responsible for their own waste to avoid fairness concerns and (ii) favor eco-design producers to create stronger environmental benefits. Furthermore, the efficiency of take back systems is also driven by environmental classification of products, the industry structure and the end-user tendency to participate in take-back programs.

007-0271: Automotive Remanufacturing: The Challenges European Remanufacturers are Facing

Margarete Seitz, Capgemini Deutschland GmbH, Germany

Remanufacturing has been branded as the process of transforming used, worn out or broken parts and components into an 'as good as new' condition. However, in Europe, remanufacturing has been undertaken by generally small and independent automotive remanufacturers. This research shows that larger, European remanufacturers have struggled to set up large-scale and automated remanufacturing operations. There are only a handful of large automotive remanufacturers in Europe trying to replicate mainstream manufacturing processes within their recovery plants. This article outlines the major issues and obstacles European remanufacturers are facing, focusing on large-scale, OEM remanufacturers. The research demonstrates that high product variation and high scrap rates contribute to parts management issues. Further obstacles arise in the form of return forecasting and engine pricing. This article explains the causes of these issues, their effects and how they might be overcome.

007-0034: The Impact of Yield Uncertainty in Remanufacturing

Michael Galbreth, University of South Carolina, United States
Joseph Blackburn, Vanderbilt University, United States

The condition of the used products acquired by remanufacturers is often highly variable. Acquisition and sorting policies can be used to manage the complexity that used product condition adds to remanufacturing operations. In this paper, we analyze scenarios in which condition is dichotomous, as well as more complex condition distributions. For each distribution type, we present simple deterministic yield models for optimizing the acquisition and sorting decisions. We then present more complex (but more realistic) stochastic yield models of these problems. By comparing the solutions to the models in numerical studies, we observe the benefits of incorporating yield uncertainty into these decisions. We find that the simplifying assumption of deterministic yield is often reasonable, as it results in near-optimal solutions. For situations in which exact stochastic yield solutions are desired, we present approaches for finding the optimal solution to the stochastic yield problem.

007-0231: Sustainable Supply Chain Networks and Transportation

Anna Nagurney, University of Massachusetts at Amherst, United States

Zugang Liu, University of Massachusetts at Amherst, United States

Trisha Woolley, University of Massachusetts at Amherst, United States

In this paper, we show how sustainable supply chains can be transformed into and studied as transportation networks. Specifically, we develop a new supply chain model in which the manufacturers can produce the homogeneous product in different manufacturing plants with associated distinct environmental emissions. We assume that the manufacturers, the retailers with which they transact, as well as the consumers at the demand markets for the product are multicriteria decision-makers with the environmental criteria weighted distinctly by the different decision-makers. We derive the optimality conditions and the equilibrium conditions which are then shown to satisfy a variational inequality problem. We prove that the supply chain model with environmental concerns can be reformulated and solved as an elastic demand transportation network equilibrium problem. Numerical supply chain examples are presented for illustration purposes. This paper, hence, begins the construction of a bridge between sustainable supply chains and transportation networks.

34	Friday, May 4, 1:30-3:00 Room: Fountain Session: Operations Strategies for Process Improvement	Track: Ops Strat, 3	Chair: Amelia Carr
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007-0233: An Empirical Investigation of RFID Implementation in the Healthcare Sector

Amelia Carr, Bowling Green State University, United States

Inge Klopping, Bowling Green State University, United States

Hokey Min, Bowling Green State University, United States

Man Zhang, Bowling Green State University, United States

This study examines the role of information technology in the healthcare sector. Many healthcare providers indicate that information technology is vital to their operations and invest extensively in various technologies. In particular, we find that many hospitals are implementing wireless systems to support a number of information technology applications. While the implementation of RFID technology is not widespread in the healthcare facilities we initially examined, many organizations are preparing for it and some are actually using it. This study reports on findings based on a number of field interviews and a survey of healthcare facilities located in the U.S.

007-0418: A Methodology for Valuing Water Option Contract of Eastern Route of South-to-North Water Transfer

Huimin Wang, Hohai University, China

Li Zhang, Hohai University, China

Yin Liu, Hohai University, China

Chen Huang, Hohai University, China

We consider water option contracts issued by water users along Eastern Rout of South-to-North Water Transfer that can be exercised many times during its lifespan as a new method of water resources allocation, which can increase the value of water resources. According to the fact of Eastern Rout, we construct a system for water option exchange, establish a stochastic model to determine water prices based on stochastic models of supply and demand, and simulate the process of this stochastic water price. We use dynamic programming method to value water option contract from the point of view of a water user, and describe the optimal exercise strategy. Our numerical results indicate that, in a deregulated market of Eastern Rout of South-to-North Water Transfer, water option contracts can help alleviate water supply problems associated with spikes of price and demand and reduce the cost of water resources allocation.

007-0666: Optimal and Approximate Vendor Selection Mechanisms

Mahesh Nagarajan, University of British Columbia, Canada

We model the problem faced by a buyer who has to select from one of N sellers who possess private information that is unknown ex-ante to the buyer and ex-post not contactable using an infinite dimensional linear program. These programs are difficult to solve. We use inner approximation techniques and duality to characterize optimal and close to optimal selection mechanisms. We compare several plausible schemes, negotiations, auctions, and a combination of these mechanisms.

35	Friday, May 4, 1:30-3:00 Room: French Session: Inventory and Capacity Management	Track: PIMs, 3	Chair: Metin Cakanyildirim
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007-0335: Strategic Capacity Acquisition in Two-Echelon Large Scale Assembly Networks with Commonality and Limited Flexibility

Shailesh Kulkarni, University of North Texas, United States

Hong Qin, University of North Texas, United States

We consider large-scale assembly networks with component commonality and demand uncertainty. Through a combination of numerical experiments and analytical exposition wherever possible, we derive the optimal capacity acquisition in such networks. The underlying structure of our model is a newsvendor network and we investigate the sensitivity of optimal solutions to key input parameters. Finally, we consider risk-aversion and study its impact especially when coupled with limited flexibility in the network.

007-0703: Average Cost Inventory Problems with Backorders and Lost Sales

Arnab Bisi, Purdue University, United States

Maqbool Dada, Purdue University, United States

Yanyi Xu, Shanghai University, China

In an (R, T) system, an order is placed every T periods to bring the inventory position up to the base stock R. We consider a system in which demand is accepted in such a way that backorders as well as lost sales may occur. In particular, we accept demand until the inventory position reaches a threshold K. Our objective is to find the optimal values of R and K which minimize the long-run average cost per period. We establish the stationary distribution of our system and develop regularity conditions that assure that the cost function is unimodal in R and K. Additionally, we compare our system against (R, T) systems in which demand during stockouts is fully backordered or lost.

007-0663: An Inventory Sharing and Allocation Method for a Multi-location Service Parts Logistics Network with Time-based Service Levels

Erhan Kutanoglu, University of Texas at Austin, United States

We consider a model to allocate stock levels at warehouses in a service parts logistics network. The network is a two-echelon distribution system with one central warehouse with infinite capacity and a number of local warehouses, each facing Poisson demands from geographically dispersed customers. Each local warehouse uses a potentially different base stock policy. The warehouses are required to satisfy time-based service targets: Certain percentages of demand need to be satisfied from facilities within specified time windows. These service levels depend on the distance between customers and the warehouses, and also on the part availabilities at the warehouses. The warehouses share their inventory to increase achieved service levels, i.e. when a local warehouse is out of stock, demand is satisfied with an emergency shipment from another warehouse. The problem of finding minimum-cost stock levels is an integer nonlinear program. We develop an enumeration-based method which adapts an existing inventory sharing model from the literature, prioritizes the warehouses for emergency shipments, and makes use of a lower bound. The results proposed inventory sharing strategy results in considerable cost reduction when compared to the no-sharing case and the method is efficient for the considered test problems.

007-0691: Optimal Ordering Policies for Stochastic Inventory Problems with Information Delays

Qi Feng, University of Texas at Austin, United States

Alain Bensoussan, The University of Texas at Dallas, United States

Metin Cakanyildirim, University of Texas at Dallas, United States

Suresh Sethi, University of Texas at Dallas, United States

Information delays exist in inventory systems when it takes time to collect, process, validate, and transmit demand data. A general framework is developed in this paper to describe the information flow in an inventory system with information delays. We characterize the sufficient statistics for defining optimal decisions. When the ordering cost is linear, the optimality of a state-dependent base-stock policy is established even when information delays are allowed to cross over time. Additional insights into the problem are obtained via a comparison between our models and models with stochastic order lead times. We also show that inventory can substitute for lack of information and vice versa.

36	Friday, May 4, 1:30-3:00 Room: Garden	Track: Education, 3	Chair: Gary Thompson
	Session: Workshop: Teaching Masters Level Service Operations Management course		

007-0503: Teaching Masters-Level Service Operations Management

Gary Thompson, School of Hotel Administration, Cornell University, United States

Richard Metters, Emory University, United States

We present our approaches for teaching masters-level Service Operations Management courses. Syllabi and other course materials will be available. Audience participation, through questions and sharing of personal experiences, is encouraged.

37	Friday, May 4, 1:30-3:00 Room: Green Room	Track: SC Tech, 3	Chair: Bih-Ru Lea
	Session: Technology Enhanced Supply Chains		

007-0015: Information Systems and Supply Chain Agility in the Chinese Automotive Industry

Yi Wu, Warwick Business School, United Kingdom

Jannis Angelis, University of Warwick, United Kingdom

Studies have shown the importance of agility in managing supply chains in volatile markets, and the recognition of information systems as a competitive tool in supply chain management. However, little research has been done on the impact of information systems on supply chain agility. This study explores impact and role of information systems in realising value in agile supply chains in several operational dimensions, such as flexibility, speed and innovativeness. This is tested in the Chinese automotive industry, which for competitiveness is dependant on supply chain performance and requires supply chains with fast market response. The research extends the existing literature by indicating operational values driven by information systems in achieving agility and calls for understanding information technology position in supply chain agility.

007-0265: An Exploratory Study of Electronic Logistics Marketplaces and its Impact on Customised Logistics

Yingli Wang, Cardiff University, United Kingdom

Andrew Potter, Cardiff University, United Kingdom

Mohamed Naim, Cardiff University, United Kingdom

Despite the wealth of literature on e-marketplaces, research on e-marketplaces in logistics, especially transport is scarce (Kaplan and Sawhney 2000, Goldsby and Eckert 2003). Electronic Logistics Marketplaces (ELM) refers to an electronic hub using web-based systems that link shippers and carriers together for purpose of collaboration or trading. Our research aims to evaluate different types of ELM and its impact on the performance of customised logistics through an international scoping study. Multiple case study approach is adopted and data has been collected from shippers, transport companies and the technology providers using interviews, quantitative data analysis and process mapping. The research reveals that such business model is at its infancy stage but with huge potential for growth in optimising supply chain networks and enabling the provision of customised logistics. Appropriate configurations of information system, process and collaborative arrangement are proposed.

007-0556: Profiles for the Development and Use of Information Systems in Collaborative Supply Chain Relationships

Sami Sarpola, Helsinki School of Economics, Finland

Sanna Laukkanen, Helsinki School of Economics, Finland

The purpose of this study is to seek profiles for the manner in which companies develop and use information systems to support collaborative supply chain relationships. Case study approach is adopted here to analyze empirical data collected from eight collaborative buyer-supplier relationships. As the results of the study three profiles – internal foci, external foci, and supply chain foci – emerged from the case study data to represent the manner in which the companies were found to develop and use information systems to support collaborative supply chain relationships. The findings of the study emphasize that companies should pay attention to the foci of their information systems development and use in order to ensure that they are able to provide sufficient support for their collaborative supply chain relationships.

007-0753: Enhancing Supply Chain Management with A Text Mining Enhanced Stakeholder Monitor

Bih-Ru Lea, University of Missouri - Rolla, United States

Wen-Bin Yu, University of Missouri - Rolla, United States

This research proposes a stakeholder monitor framework utilizing a software agent based system with text/data mining techniques to monitor stakeholders within a supply chain. The objective of the proposed framework is to predict possible changes in service features, critical capacity, technology trends through timely identification, collection, and utilization of influential news in technology movement and new product/service development from key participants of a supply chain. Software agent architecture is utilized for dynamic news retrieval to capture real time development of potential new technologies and to intelligently interact with and alert human users. Text mining techniques are utilized to capture key terms and linguistic patterns that describe potential new technologies. By utilizing both text mining and data mining techniques, the proposed framework can be used to identify cutting edge information technology, forecast the future technology needs, and cope with customer expectations and stakeholder capabilities and supports.

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Friday, May 4, 1:30-3:00 **Room:** Oak
Session: Supply Chain Framework

Track: Supply Chn, 16

Chair: Sherry L. Avery

007-0372: Empirical Study of the Relationship Between Production and Operations Management and Supply Chain Management Literatures

Francois Charvet, Ohio State University, United States

Martha Cooper, The Ohio State University, United States

John Gardner, SUNY College at Brockport, United States

After more than two decades of history, a considerable body of academic literature has emerged on supply chain management (SCM). Quantitative, bibliometric tools can help gain insights into the status of SCM theory, its cross-disciplinary nature, and the state of development of the SCM area of study. Specifically, what role is played by production and operations management (POM) in the development of SCM? How do base disciplines compare in their relative contributions? Is there evidence of convergence or divergence in supply chain thought? In this study, citation and co-citation methods are used to examine publication patterns across journals and disciplines, map the intellectual structure of SCM, and identify and characterize key clusters or groupings. POM emerges as a strong contributor to the SCM literature, with a noteworthy focus on operations research (e.g. Lee, Padmanabhan, and Whang, 1997; Lee, So, Tang, 2000). The groupings are classified and further research opportunities suggested.

007-0538: 4PLs' as "Orchestrators" of Logistics Networks

Asoo Vakharia, University of Florida, United States

Alessandra Cozzolino, Universita di Roma La Sapienza, Italy

In the present business environment – where firms disaggregate their productive system – a new role played by some of the most developed logistics providers is emerging. They operate in the market (especially B2B) delivering fully integrated services for the whole supply chain. Unlike traditional operators – that merely execute strategic and operative activities decided by the customer – the logistics provider, on whom this research is focused, is a player integrated in the whole production-distribution system able to both organize and guide part or the whole logistics process on behalf of its customers. Thus, the research emphasizes how the role played by them is sharply developing aiming to be a central point in the governance of the logistics network. Therefore, the goal of this work is to define the main characteristics of this category of logistics providers and, then, to investigate their "orchestrator" role in the network.

007-0569: A Theoretical Perspective for Supply Chain Management Research

Sherry Avery, University of Texas at Arlington, United States

Supply Chain Management (SCM) is a critical component of a firm's success and a topic of high interest to many academic disciplines. There are currently many different theories being used to study supply chains. The purpose of this article is to provide an overview of the current research on SCM theory and identify theories that can be useful in explaining supply chain phenomena.

007-0543: The Location Routing Problem with Intermediate Storage Facilities*Stephen Hill, The University of Alabama, United States**John Mittenenthal, The University of Alabama, United States*

We introduce and analyze the Location Routing Problem with Intermediate Storage Facilities (LRP-IF). The LRP-IF is a complicated product distribution, facility location, and vehicle routing problem encountered during work with a large magazine publisher and distributor. The problem is an extension of the Warehouse Location Routing Problem. We propose a mixed-integer formulation for the LRP-IF and attempt to solve a practical instance of the problem to optimality via a commercially-available solver. Several heuristic solution approaches for the problem are developed and tested. Problem extensions, additional applications, and future work are discussed.

007-0740: Service Based Approach for Supply Chains with Multiple Transportation Modes*Deniz Ozdemir, Universidad Autonoma de Nuevo Leon, Mexico**Eloir Blanco, Universidad Autonoma de Nuevo Leon, Mexico*

We consider a global supply network management problem with multiple products, where periodic demand of nonidentical stocking locations are satisfied via multiple transportation modes. The basic contribution is to incorporate the unexpected delays in Marine terminals due to increased traffic. In the first part of the study, we formulate the problem as mixed integer problem to find an optimal assignment of routes and transportation modes to maximize the fill rates in stocking locations, where freight will be delayed if terminals are overloaded. In the second part, we extend the formulation to stochastic case. In a simulation study, the impact of terminal congestion is demonstrated for different scenarios.

007-0248: An Integrated Decision Scheme to Develop, Evaluate and Revise Forwarders' Shipment Plans*Yulai Wan, Chinese University of Hong Kong, Hong Kong**Wai Hung Wong, Chinese University of Hong Kong, Hong Kong**Lawrence C Leung, Chinese University of Hong Kong, Hong Kong**Yer Van Hui, City University of Hong Kong, Hong Kong*

Air freight forwarders are responsible for assigning agents to various shipping activities so that shipments can be delivered on time. Since uncertainties are involved in the shipping process, reliability – the probability of delivering the shipment on time – should be considered in shipment planning. We propose a three-phase decision scheme for shipment planning. In phase one, a tentative shipment plan is found by solving a mixed 0-1 LP model under deterministic environment. In phase two, a simulation model is built to test the reliability of the plan from phase one. The tentative plan is revised in phase three if its reliability does not reach a target level. This decision procedure will be performed iteratively until an acceptable plan is obtained. Shipment portfolios with different sizes are examined. Lastly, we conclude the effectiveness of the decision scheme and draw managerial implications.

007-0533: A Review of the Literature on Mass Customization: Looking Backward and Forward*Anant Deshpande, University of Texas, Pan American, United States**Hale Kaynak, University of Texas, Pan American, United States*

Mass customization (MC) is a strategy for providing required products or services to customers at high volumes and reasonably low costs. The purpose of this paper is to review the literature on MC to determine the current state of research and to identify future research directions. First, this study systematically reviews relevant literature and identifies how research has progressed in MC. Second, the study analyzes the relationships between different components of an MC strategy (i.e. postponement, modularity and customer relations). Last, this research ties the MC literature into a unifying whole that enables the construction of a theoretical framework for MC.

007-0323: Form Postponement: a Decision-Making Perspective*Cipriano Forza, Università di Padova, Italy**Fabrizio Salvador, Instituto de Empresa, Spain**Johnny Rungtusanatham, University of Minnesota - Twin Cities, United States**Alessio Trentin, Università di Padova, Italy*

Form Postponement (FP) is the deferral of product differentiation activities through changes in the product and/or manufacturing and distribution process. We contend that when FP is meant to reduce the forecasting windows associated to product differentiation activities, it is more appropriately defined as the deferral of master scheduling decisions. We elaborate on this concept, proposing a notion of FP from a decision-making perspective, and develop an operational procedure to identify and quantify all opportunities for FP relative to a given product family. We demonstrate that each forecasting window associated to a product differentiation activity can be divided in two components, one related to the forecasting and master scheduling process and the other related to product and process redesign. We empirically illustrate that the former component, neglected in the literature, can account for more than 50% of the total potential for FP within a product family.

007-0452: Driving as a Flexible Manufacturing Method for Mass Customization of Individualized Sheet Metal Products*Daniel Scherer, Technische Universität München / Institute for Metal Forming and Casting, Germany**Hartmut Hoffmann, Technische Universität München / Institute for Metal Forming and Casting, Germany**Mathias Golle, , Germany**B. Lohmann, Technische Universität München, Institute of Automatic Control, Germany*

S. Weber, *Technische Universität München-Institute of Micro and Medical Device Technology, Germany*

T.C. Lueth, *Technische Universität München-Institute of Micro and Medical Device Technology, Germany*

Driving sheet metal is one of the oldest manufacturing techniques. Contrary to techniques like deep drawing, driving does not require expensive one-geometry-only forming tools. This method enables companies to produce a large variety of individual products with a small, inexpensive C-frame press, a so-called kraftformer machine, using universal tool sets. To use driving of sheet metal as the process of choice for cost-effective manufacture of individualized sheet metal products, the grade of automation of the forming process has to be increased. The multitude of influence factors, e.g. thickness and geometry of the sheet, forming forces, friction, strain hardening, and their influence on the process have to be identified and evaluated. This paper provides general information about the qualification of driving as a manufacturing concept for mass customization of Individualized sheet metal products and results of the analysis of automatically produced sheet metal products.

007-0139: The Relationship Among Functional Integration, Mass Customization, and Plant Performance

Gensheng Liu, *University of Memphis, United States*

Rachna Shah, *University of Minnesota, United States*

Roger Schroeder, *University of Minnesota, United States*

This article investigates the contribution of functional integration to mass customization, as well as mass customization's impact on internal and external plant performance. A conceptual model was constructed to show the relationships among functional integration, mass customization, operational performance, and customer satisfaction. Structural equation modeling is applied to analyze the model with empirical survey data. The results indicate that functional integration has significant positive impact on mass customization, which has direct impact on operational performance. Mass customization's impact on customer satisfaction is not direct, but is mediated by operational performance.

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Friday, May 4, 1:30-3:00 **Room:** Pavilion
Session: Enterprise Process Models

Track: Opns-IT, 1

Chair: Paul Pittman

007-0782: Enterprise Modeling for the Development Process of Open-source ERPs

José Rodrigues, *Universidade Estadual Paulista, Brazil*

Renato Campos, *Universidade Estadual Paulista, Brazil*

Rogério Carvalho, *CEFET, Brazil*

The adoption of ERP systems by small and middle-sized companies may not be possible due to their cost. At the same time, when adapting ERP to the company's particular needs, the user keeps depending on the developers due to the lack of access and knowledge of the respective code. Free and open-source software may promote advantages to the enterprises. However, for its adoption it is necessary the development of techniques and tools in order to facilitate its implantation and code maintenance, targeting adaptations. This article emphasizes the importance of defining modeling architectures and reference models for the development and maintenance of open-source ERPs. Some guidelines used in the ERP5 project are described.

007-0585: Holistic Project Scheduling using Critical Chain Methodology with a Heuristic Approach to Resource Constraint Resolution & PERT Buffering

Robert Ash, *Indiana University Southeast, United States*

Paul Pittman, *Indiana University Southeast, United States*

Critical Chain Methodology (CCM) has gained popularity among practitioners and credibility by inclusion within the Project Management Institute body of knowledge (PMBok). This, despite the fact that academics continue to publish accounts of its flaws. Program Evaluation and Review Technique (PERT), however, continues to languish among practitioners and receives no mention within PMBoK. This paper presents extensions to basic PERT that make it appropriate for the resource constrained situation where activity durations are uncertain. The paper demonstrates the strength that PERT brings to project scheduling when combined with CCM (CCM/PERT), while maintaining CCMs simplicity of application. The paper demonstrates the superiority of the proposed CCM/PERT methodology over basic CCM. CCM/PERT provides: a sound method for setting buffered due dates, the project manager with superior information about the probability of hitting a buffered due date, the project manager with information for scheduling non-critical tasks.

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Friday, May 4, 1:30-3:00 **Room:** Royal
Session: Quality Management in Education

Track: Qual Mgmt, 3

Chair: Helene Caudill

007-0544: The Use of Non-Business Quality Improvement Paradigms

Douglas Stewart, *University of New Mexico, United States*

Kurt Nolte, *University of New Mexico / School of Medicine, United States*

One challenge when developing a quality improvement program in a non-business context is that the terminology is often foreign to the team members who will implement the program. The approach taken to remedy this situation has typically been to institute a training program that indoctrinates the team members in the business paradigm and teaches them how to apply it to their context. There are inherent difficulties with this approach. There is an alternative – within disciplines outside of business it is possible to identify existing problem solving and resolution paradigms that can be used to capture the essence of the quality improvement process within a familiar paradigm already in use by the team members. This paper details our development of a parallel quality paradigm for the Research Compliance group at the University of New Mexico's Medical School, and generalizes our experiences to other non-business systems.

007-0593: Students' Perceptions of Quality in the Classroom

Helene Caudill, *St. Edward's University, United States*

There are numerous definitions of academic quality, but the one that I believe affects student satisfaction and faculty reputations most often is the perception of what students believe to be "quality in the classroom." With this definition in mind, I have sought to understand how students define academic quality. Over the past three years I have asked undergraduate students in my operations management classes two questions: (1) "How would you define/describe academic quality?" and (2) "What factors would you consider most important in determining quality in the classroom?" The answers to these questions from 140 students reveals that the professor's credentials, including professional experience and education, rate as the factor most often associated with quality in the classroom. Surprisingly, the use of technology ranked as one of the lowest factors affecting students' perceptions of classroom quality.

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Friday, May 4, 1:30-3:00 **Room:** State
Session: Managing Demand, Supply and Revenues

Track: Games, 3

Chair: Avi Giloni

007-0721: Revenue Management for Facilities Where Customers Wait For Service

Phil Troy, Les Entreprises TROYWARE, Canada

Avi Giloni, Yeshiva University, United States

We apply and characterize revenue management approaches to state dependent and independent toll mechanisms, in context of facilities with multiple servers in which customers are served on a first come first served basis. We do so both with and without assuming that facilities have the ability to perfectly differentiate customer groups, the former to determine an upper bound of what is possible, and the latter to determine what is plausible. For purpose of analysis we rely on a simple (M/M/S/I) queueing model, and the assumption that customer waiting costs are non-decreasing in the time they wait. However, we do not assume that revenue is continuously differentiable nor do we assume that revenue is concave as a function of the job submission rate. We compare the effectiveness of state independent toll based revenue management to that of the state dependent based case.

007-0710: Demand Forecasting Model with Financial Indicators and Experts Input

Nikolay Osadchiy, New York University, United States

Vishal Gaur, New York University, United States

Sridhar Seshadri, New York University, United States

We investigate the relationship between the volume of retail sales and the state of the economy, characterized by the return on an aggregated financial index. We propose two models in which sales is the function of the sales' forecasts generated by financial analysts, the term of the forecast and the return on the index over the term of the forecast. We test validity of both models on a panel data of sales forecasts evolution for 214 retailers, over 10 years, each year containing multiple forecasts of varying terms. Our model is useful for demand forecasting, inventory management and hedging demand risk.

007-0739: Optimal and Approximate Vendor Selection Mechanisms

Mahesh Nagarajan, University of British Columbia, Canada

We model the problem faced by a buyer who has to select from one of N sellers who posses private information that is unknown ex-ante to the buyer and ex-post not contactable using an infinite dimensional linear program. These programs are difficult to solve. We use inner approximation techniques and duality to characterize optimal and close to optimal selection mechanisms. In this process, we compare several plausible schemes, negotiations, auctions, and a combination of these mechanisms.

007-0772: A Learning Environment for Engineers Using a Business Game

José Rodrigues, Universidade Estadual Paulista, Brazil

Renato Campos, UNESP, Brazil

Ariane Scarelli, UNESP, Brazil

Tatiana Satie, UNESP, Brazil

The virtual market is a model of industrial enterprise that produces four products. This model was created to improve learning in a number of fields of engineering, especially that related to industrial engineering. The first project developed is a business game that was projected in two basic modules. The first is the environment of the game, in the Internet. In that place players can download the game manual, make decisions and receive the results of those decisions and as well as other tasks necessary to make the game useful for learning. The second is a system that processes the players' decisions. The two modules are connected by text archive created by both of them. This paper presents the main characteristics of the game and possibilities of its use in degree, post-degree and university complementary learning

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Friday, May 4, 1:30-3:00 **Room:** Terrace
Session: OM in Healthcare: NPD, Scheduling, and Policy Decisions

Track: Health Care, 2

Chair: David M. Dilts

007-0527: Utilizing the Medical Professional in the Development of Radical Medical Innovations

Joshua Johnson, Belmont University, United States

Conventional wisdom suggests that the best new product development (NPD) strategy is to be close to the customer, the medical professional. However, other research suggests this may hinder the development of radical products. We investigate the conditions under which medical professionals should be involved during the NPD process. We model the relationship between the inputs from medical professionals and business performance of the radical innovation. The model includes: the technology and market information obtained, the phase of the NPD process in which the information is obtained, and the firm's organizational learning. We evaluated the model with survey data from managers responsible for product development in medical device markets (N=152). Results show that the usefulness of market and technology information varies with the stage of the NPD process. Customer input improved business performance for firms with favorable organizational learning characteristics, especially information dissemination and utilization.

007-0529: Extending Product Scheduling and Sequencing Research Into the Clinical Trial Development Supply Chain*David Dilts, Vanderbilt University, United States**Steven Cheng, Vanderbilt University, United States*

Sequencing and scheduling theories have been successfully applied in a variety of industries, yet little of this knowledge has been translated on the processes needed to design and activate medical clinical trials. Dilts and Sander (2006) investigated the opening of clinical trials and have concluded that there are numerous opportunities throughout the clinical trial development supply chain that involve multiple agents and organizations. Hence, there are opportunities to integrate and collaborate efforts so that both the quantity and quality of clinical trials available are improved. In this paper, we show that the knowledge-based healthcare supply chain is plagued with the same dilemmas as those found in the manufacturing environment and that past theories and principles from operations management, particularly those involved with sequencing and scheduling, can be applied to improve overall system performance.

007-0531: Implications of Policy Decisions on the Evolution of a Healthcare Supply Network*Surya Pathak, Vanderbilt University, United States**David Dilts, Vanderbilt University, United States*

A healthcare supply network consisting of pharmaceutical firms, insurance firms, patient population, and the government is a dynamically evolving system with complex interaction webs. Behavior of such a complex web emerges over time driven by interactions between local decision making of individual nodes and the global policies set in the environment. We investigate such interactions using the UFSNE framework; specifically grounding the relationships within a predator-prey context and addressing two high level questions: 1) Given a set of policies and the dynamic interactions who is a predator and who is a prey 2) and do these roles reverse over time? We use an agent based simulation methodology to simulate the interactions and evolution. We hope to observe significant patterns of evolution that will aid us in understanding the dynamism in the healthcare web.

007-0743: Adapting the Theory of Inventive Problem-Solving (TRIZ) for Healthcare Mistake-Proofing Applications*John Grout, Berry College, United States*

In new applications of mistake-proofing, like health care, methodologies are needed to facilitate the invention of novel approaches to error reduction. Altschuller examined a large number of Russian patents in order to propose a general theory of inventive problem-solving known by its Russian acronym: TRIZ. The centerpiece of this theory is a large table that links inventive trade-offs (or "contradictions") with clever methodologies for ameliorating those trade-offs. Initial attempts to apply this methodology in health care suggest that some adaptation of TRIZ is needed. Adapting TRIZ concepts to health care errors involves linking an error typology to solution methodologies already in use mistake-proofing health care processes. A table that summarizes these links and suggests methods of reducing human medical errors will be presented.

45Friday, May 4, 1:30-3:00 **Room:** Vista
Session: Inventory System Metrics**Track:** Inv Mgmt, 3**Chair:** James Robison**007-0166: Innovative Inventory Classification Cubical Model***Vinod Goyal, Shiva Institute of Management Studies, India*

Inventory is a double edge weapon. Shortage of inventory leads to loss of production and its excess leads to the loss of profitability. Proposed new innovative inventory classification model is a unique three-dimensional model maintaining balance between excess & shortage of inventory; using available classifications (ABC, VED, FSN) coupled with a fourth parameter (SAP) resulting in 27 or 81 classifications. It maintains balance between excess & shortage of inventory. This model proposes minimum inventory carrying costs by adopting policy of building inventory during growth and monitoring inventory during declining phase of business. Productivity is improved with assured availability of requisite materials. Little scope for inter-departmental conflicts result in better productivity. Profitability is improved by reduction in inventory cost via optimization of inventory level and utilizing normal credit available from suppliers.

007-0394: Forecasting Strategies of a Multi-Echelon Supply Chain Facing Coordinated and Uncoordinated Demand*Deepak Iyengar, University of Kentucky, United States**Shashank Rao, University of Kentucky, United States*

Accurate forecasts lead to optimum inventory levels within the supply chains. The complexity to forecast demand in multi-echelon supply chains may lead to forecasting strategies which may vary when compared to simple supply chains. This research paper analyses the optimum forecasting strategies used by multi-echelon supply chains when faced with coordinated and uncoordinated demands from final consumers. Different demand distributions are used to check for the robustness of the results. The Beer Game has been adapted to run the simulation for this study.

007-0445: Newsboy Problem with Random Yield*Divya Tiwari, Indian Institute of Management, Bangalore, India**Janat Shah, Indian Institute of Management, Bangalore, India*

Random yield here is defined as an occurrence when a random percentage of goods ordered/produced would be available for production/sales. This work proves that in a newsboy environment with random demand and random yield, multiple productions runs reduce the total cost. The total cost reduction is a function of the cost parameters (ordering cost, holding cost, salvage cost and unmet demand penalty cost) and the distribution parameters of the demand and yield uncertainty. The non-intuitive result is that even when the ordering/production cost in previous periods is higher, it is optimal to start producing earlier and stocking the inventory. The findings are especially relevant for products with high failure rates or very low yields, for example, during trial runs for new products.

46Friday, May 4, 3:30-5:00 **Room:** Brasserie
Session: New Product Development**Track:** Prod Innov, 4**Chair:** Debasish Mallick

007-0505: Implementation of Lead-User Method: An Analysis of Critical Success Factors

Zeljana Piccolotto, University of Padova, Italy

Roberto Filippini, University of Padova, Italy

A large body of research has shown that users play an important role in the development of new products. The question of how to integrate customers in the NPD process has been widely discussed. Various concepts have been developed and are being tried out. One of the best known is the Lead-User approach. This paper starts with an accurate literature review on this issue. We find that, in contrast to theories and empirical studies, little is known about critical success factors of the implementation of the method in product innovation process. The present paper attempts to address this gap by taking an exploratory multiple-case study of industrial firms. The preliminary results shed light on this topic. They should be of interest to academics and NPD managers.

007-0045: New Product Development Tools: Contingencies and Project Performance.

Changyue Luo, New Mexico Institute of Mining and Technology, United States

Debasish Mallick, University of St. Thomas, United States

Roger Schroeder, University of Minnesota, United States

Although NPD process tools, such as CAD, PDM, QFD, are becoming popular, users often report mixed results. Using a cross industry survey of 238 NPD projects across eight countries, we explore the effects of various environmental and project specific factors on the application of these tools and project performance.

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Friday, May 4, 3:30-5:00 **Room:** Continental
Session: Coordination Through Transshipment

Track: Supply Chn, 4

Chair: Holly S. Lutze

007-0668: Transshipment Between Two Competing Retailers

Nagihan Comez, University of Texas at Dallas, United States

Kathryn Stecke, University of Texas at Dallas, United States

Metin Cakanyildirim, University of Texas at Dallas, United States

We study a decentralized system of two retailers selling a substitutable product. In case of a stock-out, an item can be transshipped to a stocked-out retailer from the other one. Customers can also move with a demand overflow probability. The model is characterized by two decisions: the transshipment and the initial replenishment decision which is a game. Our work combines pooling and demand substitution in a single model, where retailers use transshipment voluntarily under demand overflow.

007-0792: Inventory Policy for Decentralized Supply Chain with Transshipment and Restricted Batch Size

Manish Mathur, Indiana University, United States

Puneet Mathur, Indian Institute of Management Bangalore, India

This research finds an inventory control policy for downstream of an outbound decentralized supply chain with multiple stockyards, allowing for transshipments, and replenishment constrained by batch size. A numerical analysis using Nelder-Mead Derivative-Free Search Algorithm is presented to find the optimum inventory levels for each stockyard. The context is a large automobile manufacturing company with widespread independently owned stockyards in various locations, receiving goods from single plant. Replenishment is constrained by batch size of single consignment, posed by available transportation units (e.g. trailers). Replenishment can be one batch size or multiple. Transshipment is allowed to control backorder costs where stockyards get stock from nearby stockyards, if available. The requesting stockyard pays a premium for transshipment. Transshipment is limited due to transshipment costs. An equilibrium exists due to constant interactions between stockyards. Transshipments are requested and fulfilled when predetermined inventory levels are crossed.

007-0634: Optimal Control of Exchange Transactions with Markov-Modulated Demand

Maher Lahmar, University of Houston, United States

Nilesh Kulkarni, Sysco Co., United States

Transshipments among firms supplying substitutable products can mitigate the impacts of uncertainty and enhance the overall supply chain efficiency. High-volume two-way systematic transshipments, known as exchanges, are common in gas and chemical industries. In this work, we consider a two-location make-to-stock system where systematic exchanges are controlled by a central agent. We model the system as a finite horizon discounted dynamic program with Markov-modulated demand and characterize the optimal production and inventory policies for such a system. Using extensive numerical analysis, we present the sensitivity of our results to different cost parameters and demand patterns and provide managerial insights on the management of exchange transactions. Finally, we present an approximate dynamic programming approach to solve for large size problems and provide numerical results on the quality of our solution approach.

007-0052: Services Supply Chain Management: A Conceptual Framework and Research Agenda

Mihalis Giannakis, Warwick Business School, United Kingdom

There is a generally accepted conviction that the supply chain management literature is dominated by studies in industrial markets or studies that deal with the supply chains of goods, even though service industries account for more than 70% of GDP in most countries and on average 50% of the final value of goods is made up by services. The few studies that deal with the study of service supply chains take a monolithic approach to the service sector and the various different services. Service offerings however vary considerably from one another (Ellram 2004, Sengupta 2006). The business context and structural and infrastructural characteristics of utility services for example are completely different to those of management consulting. This paper develops a conceptual framework for studying service supply chains. It draws insights from transaction cost economics and social theory and takes into account the peculiar characteristics of services across several service industries.

007-0222: Production Scheduling Optimization in the Casting Industry using Genetic Algorithms*Raul Landmann, University of the Region of Joinville, Brazil**Evario Bittencourt, University of the Region of Joinville, Brazil**Ademir Demétrio, University of the Region of Joinville, Brazil**André Steuernagel, University of the Region of Joinville, Brazil*

This paper presents the use and results of production scheduling in the casting industry with the application of GAs. In casting, there are two important and linked production phases: melting and molding. In foundries there are several molding lines with different capacities that produce unequal molds, which are poured with molten metal derived from one or more melting centers. To make the best use of melting capacity, to promote a high efficiency of foundry operations and reduce the energy consumption, the molds should be produced in an optimum sequence, searched in a large number of combinations. The results demonstrated that the GAs to solve this problem is adequate, in comparison with the results of application of other heuristic methods.

007-0780: Heuristic Scheduling of Serial-Batch Processor System for Cycle Time Reduction*Abdullah Cerekci, Texas A&M University, United States**Amarnath Banerjee, Texas A&M University, United States*

Batch process control is an important issue in semiconductor manufacturing, which may become a bottleneck with ineffective dispatching policies. This paper presents a real-time scheduling heuristic for a production unit consisting of a serial processor feeding a batch processor. In this multiple product batching problem, our objective is to reduce the average waiting time in the batch processor's queue. Our automated policy uses downstream information to schedule the next lot in the serial processor when the batch processor is busy. When the batch processor is idle, it uses upstream information to decide whether to start the batch process or wait for another arrival of any type existing in the serial processor's buffer. The problem setting allows the selection of the next arriving lot type to the batch processor out of available types at the serial processor to reduce the average cycle time. Simulation is used to test the performance.

007-0209: Heuristics for Determining the Number of Warehouses for Storing Non-Compatible Products*Chuda Basnet, University of Waikato, New Zealand**John Wilson, Loughborough University, United Kingdom*

In this paper we discuss a version of the classical bin packing problem, where the objective is to minimise the number of warehouses needed to store given items, each with some space requirements. In this version, some of the items are incompatible with each other, and cannot be stored together. We apply some newly developed heuristics to this problem and compare the results with other available algorithms. The computational results are presented and indicate that higher quality solutions can be obtained using the new heuristics.

007-0059: Product Line Design and Production System: Variety, Capacity Investment, and Risk Pooling*Dennis Yu, Clarkson University, United States**Sergio Chayet, Washington University in St. Louis, United States**Panos Kouvelis, Washington University in St. Louis, United States*

We investigate the interactions between a firm's choices of product line design and production capacity investment facing a heterogeneous consumer market. The products are differentiated by design quality which affects the capacity investment in a convex increasing manner. The firm may choose to invest in dedicated facility or flexible facility to produce either single product or differentiated products. We show that product variety helps the firm to enlarge market coverage and increase revenue collection. The production capacity is not necessarily decreasing in capacity investment cost, and the choice of capacity actually moderates both of the market coverage and production congestion effect. We also show that it is not always beneficial for the firm to adopt production flexibility even though flexibility provides opportunities to offer product variety. The production congestion effect and loss of product profit margin can diminish the benefit of capacity pooling.

007-0288: Advance Orders and Market Segmentation in a Multi-product Supply Chain*Holly Lutze, University of Texas at Dallas, United States**Ozalp Ozer, Stanford University, United States*

We consider a generalized model of a multi-product manufacturer with multiple retail customers. Retailers place advance orders, thereby accepting a particular demand lead time. We explore how advance orders impact the inventory costs of the larger supply chain and how the manufacturer may share benefits with retailers to encourage advance orders. When the manufacturer sells to multiple retailers, we determine an optimal menu of demand lead times and corresponding payments that maximize her benefit from advance orders. By choosing among these menu options, retailers segment themselves according to the service level each provides his end customers. We further explore the impact of postponement on inventory costs and optimal contract parameters.

007-0713: Competing on Time: A Framework to Optimize Dynamic Time-to-Market Decisions*Ozalp Ozer, Stanford University, United States**Onur Uncu, Stanford University, United States*

In this presentation, we outline the challenges and uncertainties associated with bringing a new product to market. To do so, we focus on a major global high-technology company located in the Bay Area and discuss their challenges related to new product introductions. The high technology industry is characterized by lightning speed in technology innovation, intense competition, relentless price erosions and notorious initial production yields. We present our Operations Research based modeling framework that is used to help this global high-technology company make effective time-to-market decisions. We characterize an optimal policy for market timing, an optimal policy for production decisions and how and why they are amenable for implementation.

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Friday, May 4, 3:30-5:00 **Room:** Florentine

Track: Sustain Ops, 5

Chair: Harold Krikke

Session: Service and Information Aspects of Product Recovery

007-0667: Enabling Technologies for Product Recovery Strategies Under the WEEE Directive

Rob Zuidwijk, Erasmus University Rotterdam, Netherlands

Harold Krikke, Tilburg University, Netherlands

In this paper, we discuss possible responses by industry to market opportunities and challenges posed by regulations. We consider the establishment of proper recovery strategies in terms of product design and recovery operations, under specific market conditions, technological possibilities, and EU Directive requirements. We define four progressive scenarios. In the base scenario, the present day WEEE directive is imposed, featuring recycling targets and hazardous waste restrictions. We then consider a scenario in which post shredding technologies are allowed to contribute to the WEEE directive targets. We continue with a scenario in which remanufacturing is a recovery option besides recycling, and we conclude with a scenario in which all collected product are designed for recovery. The four scenarios are studied under different information levels related to the availability of product data. We apply the analysis on a revisited case study on the recovery of computer monitors.

007-0655: Service Logistics with a Trade Off Between Last Time Buy and Phase Out Repair

Harold Krikke, Tilburg University, Netherlands

Erwin van der Laan, Erasmus University, Netherlands

This research deals with closed loop supply chains for plant control systems. Traditionally a mainframe market, the OEMs are nowadays developing desktop-based systems as an alternative to the existing mainframes in the field. Customers may go along with upgrades and phase out the old systems or they may not (or partially). At some point in time the OEMs stop their service and outsource it to a 3rd party repair firm. Almost always, there is the opportunity to produce a last batch of service parts, the so called last time buy. Alternatively, the repair firm may wait for phase-out returns and use these as a cheaper source for spares. Secondly, repairs may be pushed or pulled through the reverse system. The aim of this contribution is to investigate the different policies that can be followed.

007-0693: The Role of Installed Base Information in Service Logistics Operations

Muhammad Jalil, Erasmus University Rotterdam, Netherlands

Rob Zuidwijk, Erasmus University Rotterdam, Netherlands

Moritz Fleischmann, RSM Erasmus University, Netherlands

Jo. van Nunen, Erasmus University Rotterdam, Netherlands

Many of the challenges in spare-part logistics emerge due to its inherent nature, i.e. large service networks, sporadic and slow-moving demand. The similarities/variations in customers and the mounting requisites of stringent service deadlines impart further challenges. High revenues rates in service operations motivate companies to invest and optimize the service logistics function. We review the current forecasting, planning and execution methods for service logistics function at IBM, which is customer focused. At every stage, the service response rate is among binding performance criterions. To support these customer specific operations, IBM actively maintains the installed-base information and utilizes it during forecasting, planning and execution stages. The current case highlights the role of installed-base information for service logistics function at IBM. It also discusses the economic value associated with installed-base information quality for various product / customer groups.

007-0379: The Supply Chain Sustainability Index: Measuring the Economic, Environmental, and Social Performance of Supply Chains

Thomas Sloan, University of Massachusetts Lowell, United States

Researchers and practitioners generally agree that cooperation among members of a supply chain brings economic benefits to all — “a rising tide lifts all boats,” as the saying goes. But is profit the only relevant measure? Growing concerns about the social and environmental performance of companies has given rise to a range of new tools and practices such as Life Cycle Analysis and Triple Bottom Line accounting. And while several researchers have proposed methodologies for evaluating the environmental performance of potential suppliers, there has been little effort towards an appraisal of the overall sustainability of a particular supply chain configuration. Using the Environmental Sustainability Index developed by Yale Center for Environmental Law and Policy as a model, we identify some of the key variables that relate to supply chain sustainability. The development of a Supply Chain Sustainability Index (SCSI) is the first step toward exploring the benefits of cooperation.

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Friday, May 4, 3:30-5:00 **Room:** Fountain

Track: Ops Strat, 4

Chair: Joel D goldhar

Session: Customer Centered Operations

007-0581: Transaction Cost Effect in Video Rental Industry

HY Sonya Hsu, University of Louisiana at Lafayette, United States

Glenn Maples, University of Louisiana at Lafayette, United States

A modern, consumer-focused supply chain needs to fulfill stochastic demand with an array of quality products in a timely fashion at the least possible cost. The growing usage of the Internet has substantially affected the relationships among consumers, retailers, distributors, and producers. Previous research presented compelling arguments for Internet effect on transactional costs in Music CD industry. The present study looks at the next evolution of consumer-focused supply chains: the effects of the virtualization of goods on competing supply chains. This study uses the video rental industry to examine the relationships among technologically determined delivery models (i.e., downloads, storefront, and brick and click) and their effect on transaction costs, supply chain management techniques, and consumer behaviors. This study offers an assessment technique of Internet businesses.

007-0694: The Impact of the Customer Order Decoupling Point in Operations Strategy

Jan Olhager, Linköping University, Sweden

Mattias Hallgren, Linköping University, Sweden

Companies are struggling to improve not only their manufacturing operations but also their value chain operations, recognising the increasing importance of finding the best processes and value chains for their products. The concept of the customer order decoupling point (CODP) is successively becoming a topic of strategic interest. The CODP defines the stage in the value chain, where a particular product is linked to a specific customer order. This paper uses results from empirical studies to analyze the impact of the CODP in operations strategy. We find that the CODP is an important consideration in forming an operations strategy and that the operations upstream the CODP need to be designed differently relative to the operations downstream. We report on the differences in terms of drivers, operating characteristics and performance outcomes.

007-0065: Customer Stratification: Understanding Customer Profitability

Barry Lawrence, Texas A&M University, United States

Arunachalam Narayanan, Texas A&M University, United States

Pradip Krishnadevarajan, Texas A&M University, United States

Brijesh Rao, Texas A&M University, United States

Classification of customers into groups based on profitability and volume is an essential step in developing a customer-centric operations strategy. Our technique stratifies customers into different groups such as Core, Opportunistic, Unprofitable and Service Drain. Core customers are profitable customers who transact in high volume on a regular basis. Opportunistic customers are also profitable customers who buy infrequently when their regular supplier stocks out. Unprofitable customers generate low sales volume for a short period of time and require either low prices or high service levels. Service drain customers are high volume customers who consistently require higher levels of service while demanding low prices. We also recommend strategies to handle each of those customer segments in terms of pricing, negotiation and resource allocation. We will demonstrate this technique and its application using data from an industrial distributor.

007-0333: The Move to Servitization (From a Product Service System Point of View)

Jenny Ang, Singapore Institute of Manufacturing Technology, Singapore

Kian Mok Goh, Singapore Institute of Manufacturing Technology, Singapore

Tim Baines, Cranfield University, United Kingdom

Product Service Systems (PSSs) emphasize the substitution of products with services. The term "Servitisation" was introduced by Sandra Vendermerwe in the 80s to represent the addition of services to increase a company's competitive edge. Key to PSS, and Servitisation more generally, is the "informed product". The informed product enables health monitoring of the product in use and can be key to a workable PSS. This paper reviews the evolution of servitisation and the associated business benefit. It also then reviews the concept of informed product reconfiguration techniques and remote services that enables PSS to be delivered.

007-0377: The Convergence of Factory and Service Operations

Joel Goldhar, Illinois Institute of Technology, United States

Mei Xue, Boston College, United States

Daniel Berg, Rensselaer Polytechnic Institute, United States

Operations Management traditionally makes a distinction between manufacturing and service products and operations in terms of product shelf life and the ability to use inventory to 'decouple' parts of the system from each other and from the customer. However the past 3 decades have been marked by strenuous efforts to make factory operations leaner, faster, more responsive and able to manage variety to the level of customization; with investments in JIT inventory/make to order/rapid response/FMS/CIM/robotics, etc. capability. Similarly traditional services have worked to 'industrialize' and gain economies of scale and the operational predictability of factory operations. So factories want to look more like services and vice versa and for the same reasons. We discuss this phenomenon and offer ideas for integrating factory and service operations designs and strategies to achieve maximum operational effectiveness and sustainable competitive advantage from operations.

52	Friday, May 4, 3:30-5:00 Room: French	Track: Sustain Ops, 1	Chair: Luk Van Wassenhove
	Session: A Sustainable Perspective on Sustainable Operations		

007-0267: A Sustainable Perspective on Sustainable Operations

Luk Van Wassenhove, INSEAD, France

Jo van Nunen, Erasmus University Rotterdam, Netherlands

In this presentation, we build upon more than 15 years of experience working on different facets of sustainability in operations and supply chains. We discuss some of our earlier work with industry in Europe. We then move into a more recent and encompassing perspective on sustainability which creatively explores synergies between different facets like safety, security, environmental and social impact in global operations and the enabling role of modern ICT.

53	Friday, May 4, 3:30-5:00 Room: Garden Session: Workshop: Teaching Executive MBA	Track: Education, 4	Chair: Nicole DeHoratius
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007-0411: Workshop Session: Teaching Executive MBA

Nicole DeHoratius, University of Chicago, United States

We discuss executive education offerings at ASU, Babson, Cornell, and the University of Chicago. These offerings include executive short programs as well as degreed programs. In addition to highlighting the OM curriculum within these programs, we address a number of other topics pertinent to teaching executives. Topics include cultural challenges when delivering programs abroad, motivating students to care about OM, offering an integrated curriculum, managing diversity in the skill level of participants, incorporating real world examples, and the design of custom programs. Panel members include Tom Choi, Nicole DeHoratius, Paul Mulligan, and Rohit Verma.

54	Friday, May 4, 3:30-5:00 Room: Green Room Session: Role of Information Technology in Disaster Management	Track: Disast Mgt, 1	Chair: Amiya Chakravarty
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007-0090: Critical Success Factors of an Effective Business Continuity / Disaster Recovery Program in a Post 9/11 World

Michael Barbera, Ogilvy Renault, Canada

Kevin Laframboise, Concordia University, Canada

Anne-Marie Croteau, Concordia University, Canada

Corporations are increasingly reliant upon information technology. Many have experienced devastation when an IT disaster strikes. As businesses increasingly rely on data new threats are emerging that affect all corporations, making preparedness a necessity. Business continuity and disaster recovery are strategies implemented to increase the likelihood of effectively recovering business functions from disaster. This research project aims to fulfill two key objectives: (1) to examine whether the ranking of critical success factors for implementing a disaster program have changed from previous research and (2) to contribute to the academic and practitioner communities by outlining several CSFs not referenced within previous research. Using a multi-method approach, a qualitative analysis of 11 interviews was conducted and contrasted to results carried out through a quantitative analysis of 52 respondents through a survey questionnaire. After analysis of results, four sets of CSFs were proposed and supported.

007-0637: Individualized Disaster Communication - An Approach with a Knowledge-based Stakeholder Information System

Martin Stöblein, University of Dayton, United States

The Internet plays a crucial role in the communication strategy of companies during and immediately following a disaster (natural or otherwise). However, information distribution in such cases is often untimely and does not always satisfy the specialized requirements of stakeholders such as customers, suppliers or shareholders. In this paper we describe the concept of knowledge-based Stakeholder Information Systems (SIS). By providing situation-oriented and individualized information in a highly automated way, SIS can improve disaster preparedness. We describe the features of a prototype SIS developed for the purpose of concept evaluation. The knowledge base consists of information requirements and pre-formulated text elements. Both were derived from an analytical framework and evaluated by experts. Lessons learned from hundreds of cases is incorporated and thus reassure practicability. Prototypical applications show how to inform decision makers (Active SIS) and to guide how best to respond to stakeholders' inquiries (Reactive SIS). Different kinds of expert system techniques were tested for the (semi-)automatic adaptation of SIS with project partners.

007-0688: Possible Effects of International Standards on Logistics in Disaster Management. Case Study: National Crisis Management Center, Thailand

Waessara Weerawat, Mahidol University, Thailand

Being one of the tsunami affected countries in December 2004, Thailand realized that there was a need to establish a national crisis management center(NCMC). The idea of establishing the NCMC is to streamline logistics issues in disaster management. The main ideas were related to the ways to bring in and deploy the right resources legally to the needed affected area and people in time. The challenges base on the facts of more than twenty government and non-government unit functions involved in disaster management. Each government unit function has different rules and regulations to follow. It is challenging to bring various international standards (ITU, ISO) to use in disaster management. The research addresses the key findings of the effects in adopting standards in disaster management, in the area of command control coordination and communication.

007-0791: Online Collaboration for Disaster Relief

Amiya Chakravarty, Northeastern University, United States

With a large number of relief organizations now becoming active in disaster relief, it is apparent that without some collaboration their efforts could become counterproductive. The organizations, moved by tales of harrowing human suffering, are beginning to move huge quantities of supplies to wherever they are able. However well intentioned, this has started to become the problem. There are already indications that right supplies in right quantities are not reaching the right areas while some regions starve, others struggle to manage the excessive, even irrelevant, quantities of supplies they receive. An effective way of matching supply with demand is to provide information transparency throughout the system, so that organizations are able to see what the sister organizations are planning and executing a framework for online collaboration.

55	Friday, May 4, 3:30-5:00 Room: Oak Session: Quality and Information Issues in SCM	Track: Supply Chn, 17	Chair: Hufan Ma
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007-0027: Outsourcing and Pricing Strategies Considering Product Quality Aspects

Hamidreza Faramarzi, Wilfrid Laurier University, Canada

Xuan Zhao, Wilfrid Laurier University, Canada

Ignacio Castillo, Wilfrid Laurier University, Canada

We consider an outsourcing decision-making problem for a two-player supply chain consisting of an OEM and a Contract Manufacturer (CM). The OEM produces and delivers a single product to the end-customers, who are both quality and price sensitive. Two aspects of product quality are taken into account: standardization and customization. The OEM can outsource standardization or customization to the CM. There are different strategies that the OEM and the CM can set the outsourcing price and the optimum level of each quality aspect to maximize their profits. Our models show that these strategies vary from product to product and are dependent on some of the product features such as the importance of customization and standardization qualities to customers and standardization and customization cost factors. Our models are aimed at determining the promising outsourcing and pricing strategies.

007-0322: The Value of Information Sharing in a Supply Chain with Product Substitution

Srinivasan Raghunathan, The University of Texas at Dallas, United States

Chandrasekharan Rajendran, Indian Institute of Technology Madras, India

Muthusamy Ganesh, Indian Institute of Technology Madras, India

The literature of information sharing has investigated only the case in which the supply chain manufactures and distributes a single product to customers. This paper consider the case in which a supply chain distributes multiple products that are substitutable in the sense that a consumer is willing to buy an alternate product when the customer's preferred product is out of stock. We show that such substitutability generally reduces the value of information sharing. Moreover, when information about the demands of only a subset of products is shared, the value of information sharing under substitution is higher than that under no substitution under certain conditions. The key implication of our findings is that if substitution effects are ignored, then there is a risk of overestimating the value of information sharing. The overestimate can be very significant when there is large number of substitutable products.

007-0157: Role of Quality Uncertainty in Remanufacturing Decisions

Huafan Ma, University of Wisconsin-Milwaukee, United States

Samar Mukhopadhyay, University of Wisconsin - Milwaukee, United States

As one important input for the remanufacturing process, the used products acquired by firms may vary significantly in their conditions. In this study, we investigate the impact of the uncertainty resulting from various conditions of returns on firms' remanufacturing policy. We show that firms can deal with this problem strategically by handling returns of diverse quality levels differently. In some cases, they can remanufacture all acquired used products upon their receipt. In other cases, it will be more profitable for firms to make use of secondary market for selling returned products with relatively low quality, as is, rather than remanufacturing them. We find the optimal remanufacturing policies under these different conditions. Additionally, we study the effect of important related factors on remanufacturing and obtain managerial insights on these issues.

007-0013: Dynamic Options Pricing and Investment Analysis in a Pre-sale Housing Market

Zhan Pang, Chinese University of Hong Kong, Hong Kong

Youyi Feng, the Chinese University of Hong Kong, Hong Kong

We consider a house developer who designs an options contract in a presales (sales-before-completion) housing market. A real options approach is applied in designing pre-sale contract in the pre-sale market so as to share the risk between the house developer and customers and the seller prices the options premiums dynamically. We show that the pricing strategy of the pre-sale contract can be optimized by a threshold policy. Through the comparative static analysis, we can design and optimize the pre-sale contract. We also discuss the put option and compound option contracts extensively. Finally, we incorporate the developer's construction and financing cost into the model and propose a optimal financing strategy for the house developer.

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Friday, May 4, 3:30-5:00 **Room:** Panorama
Session: Cargo Shipment Management

Track: Trans Log, 4

Chair: Robert A Russell

007-0416: Optimal Baggage Limit Policy: Airline Passenger and Cargo Allocation

Wai Hung Wong, Chinese University of Hong Kong, Hong Kong

Anming Zhang, University of British Columbia, Canada

Yer Van Hui, City University of Hong Kong, Hong Kong

Lawrence C. Leung, Chinese University of Hong Kong, Hong Kong

This paper addresses the optimal baggage limit policy in the airline industry. Currently, much of the cargos are transported in the residual aircraft belly space after all the passengers' baggage are enplaned, which may restrict the air carriers' profit from freight. It is important, therefore, that carriers plan both the passenger and cargo production together when setting their passenger baggage limits and subsequent passenger-cargo allocations for a specific flight. We formulate this problem similar to a price-dependent multi-item newsvendor model with capacity constraints. Effects of baggage weight, volume, pricing and costing on the passenger and cargo numbers are studied. Based on the model and current carriers' practice, we develop several illustrative cases and find that the current baggage limits are sub-optimal. To maximize profit, both the narrow and large aircrafts may need to reduce their baggage limits by as much as 57% and 53%, respectively, from the current policy.

007-0367: Evaluating and Pricing Lanes for Truckload Motor Freight

Robert Russell, University of Tulsa, United States

Tim Madden, LinkAmerica Corporation, United States

One key strategic issue facing truckload motor freight carriers is the selection and pricing of lanes over which transportation services are provided. The revenue management decision environment is characterized as dynamic and uncertain. We develop analytical methods to aid in the selection and pricing of lanes. Heuristic and optimization-based simulation methods are developed and results based on actual carrier data are presented.

007-0557: The Role of Cross Functional Teams in Supply Chain and Logistics*Jack Crumbly, Jackson State University, United States**Jeremy Meacham, Jackson State University, United States*

Supply chain management is an important component within organizations. The process of transferring goods from manufacturer to consumer involves suppliers of parts, third party logistics providers and other organizations. In this role, organizations communicate with each other in a team environment. Each interaction impacts all organizations involved. The use of interorganization cross functional teams in supply chain would provide a method of sharing knowledge and improving the supply chain process. Based on social cognitive theories and information processing theories, the research will look into important determinants of the cross functional team framework within the supply chain environment. The study will focus on the role of third party logistics organizations with other organization using empirical research methods and analyze the results.

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Friday, May 4, 3:30-5:00 **Room:** Patio
Session: Mass Customization: Simulation Studies

Track: Mass Cust, 4**Chair:** Fabrizio Salvador**007-0351: Measuring the Degree of Mass Customization: A Product Architecture Modularization Perspective***Juliana Mikkola, Copenhagen Business School, Denmark*

This paper examines how mass customization (MC) can be measured in terms of product architecture modularization. MC is interpreted as a process to produce customized goods at low cost, which has enabled many companies to penetrate new markets and capture customers whose personal needs were not met by standard products and services. MC is enabled through modular product architectures, from which a wide variety of products can be configured and assembled. Product architecture modularization is concerned with system decomposition, selection of components and how they are linked with each other without compromising system integrity. In order to understand the implications of product architecture modularization for MC, the 'modularization function' (Mikkola & Gassmann 2003; Mikkola 2007) is explored by applying and simulating it to a hypothetical system. Based on this exercise and sources from the literature, a new model is introduced. Furthermore, theoretical and engineering management implications are discussed.

007-0241: Effectiveness of the Product Configuration Task : Theory Formalization and Test*Fabrizio Salvador, Instituto de Empresa, Spain**Cipriano Forza, Università di Padova, Italy**Björn Claes, Instituto de Empresa Business School, Spain*

Quick and reliable response to customers' needs has been argued to be a key competitive advantage when manufacturing customized products. Anecdotal evidence and case-based research point to the importance of the effective management of information on feasible product configurations in order to achieve good time performance. However, no empirical, large-sample test of this contention has been done as yet. Our paper begins to close this research gap by testing a theory-derived model of how information on product modeling and configuration relates to the speed with which customers can be served. We find that availability of information supporting the product configuration task indeed allows companies to serve their clients faster and more accurately. We also find this benefit to be moderated by the availability of appropriately codified knowledge on past product configurations.

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Friday, May 4, 3:30-5:00 **Room:** Pavilion
Session: ERP Systems

Track: Opns-IT, 2**Chair:** Arun Madapusi**007-0465: Data & Information Quality Issues in ERP Systems***Arun Madapusi, University of North Texas, United States**Ching-Chung Kuo, University of North Texas, United States*

Information has become a key driver for economic growth today. Previous studies have shown that incomplete or inconsistent data often leads to low quality information, which reduces the efficiency of transaction processing and thereby results in unsatisfactory business performance. To ensure the availability of high quality information, companies are implementing enterprise resource planning (ERP) systems. The main benefit of these software packages lies in the real-time integration of data from different functional areas in an organization to provide managers with timely, accurate information for sound decision-making. In this paper, we develop a theoretical model that draws on relevant literature to analyze the relationships between data input into and information output from an ERP system. We identify the critical successful factors at each stage of the ERP implementation process to help firms obtain useful information for improving their competitive position.

007-0492: Linking Changing Business Requirements to the Evolution of Portfolio of Application Systems in an Organization*Sanjay Kumar, XLRI Jamshedpur, India*

ERP packages provide a range of functionality within a common architecture and subsume many of the transaction processing applications that a company would have in its applications portfolio such as accounting, inventory management. Vendors have tended to sell them as complete solutions. However, companies use a portfolio of applications which has evolved over a period of time, and now includes ERP systems. This raises some pertinent questions. How do ERP systems fit into this portfolio of applications? What role do they play in meeting the overall requirements of the organization? Where do they fail to meet the required functionality? The study looks at industry environment, business strategy, IT strategy and related initiatives, the required IT functionality and the applications chosen to meet this IT functionality. It studies the evolution of the portfolio of applications, as an organizational response to changing business conditions.

007-0449: ERP Implementation at OMC - A Case Study*Sanjeev Chopra, Orissa Mining Corporation, India**Arun Madapusi, University of North Texas, United States**Richard White, University of North Texas, United States*

Krishna Sundar Diatha, *Indian Institute of Management Bangalore, India*

The challenges of globalization and shortened product life cycles has forced firms to turn to enterprise resource planning (ERP) systems to meet their information management needs. In this case study, we examine how Orissa Mining Corporation (OMC), a public sector mining firm in India, is implementing a phased ERP system as part of its e-governance initiative. Data were gathered through interviews and in-house documentary material and supplemented by a validated survey questionnaire administered to OMC's ERP system users. The results indicate that OMC has successfully managed its ERP implementation and obtained significant performance gains. The findings suggest that the firm should now focus on leveraging its ERP system to successfully transition into an e-governance firm. The findings from this case analysis could help other mining firms as well as other public sector firms bridge the digital divide and equip themselves to successfully handle global competitive pressures.

007-0751: Resource Allocation in Software Maintenance

Jayashankar Swaminathan, *University of North Carolina at Chapel Hill, United States*

Sridhar Balasubramanian, *University of North Carolina at Chapel Hill, United States*

Sriram Narayanan, *University of North Carolina, United States*

In this paper we study allocation of engineering resources in software maintenance. First, using actual data we show that as software defects stay in the system longer, the probability of successfully resolving them reduces. Next, we use this insight to estimate required engineering resources to manage debugging efforts. We explore the cut off policy based on threshold time without finding a successful resolution. Our analysis shows that such policies minimally impact rates of successful resolution and reduce waiting times for incoming bugs in the system. Through a computational study, we explore how such policies may improve overall productivity and enable efficient utilization of engineering resources.

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Friday, May 4, 3:30-5:00 **Room:** Royal
Session: Managing Service Quality

Track: Qual Mgmt, 4

Chair: Maria Gouvêa

007-0750: Service Quality Trends for Failing Online Auction Businesses

Byron Finch, *Miami University at Ohio, United States*

Xiaowen Huang, *Miami University, United States*

The popularity of online auctions like eBay has grown substantially. Like any industry, however, some businesses succeed and some fail. This study examines the feedback of high-volume eBay businesses that have failed to identify trends in various aspects of service quality during the decline of the business.

007-0189: Expectations and Perceptions of Individual Bank Clients with High Earnings in the Municipality of São Paulo - Brazil

Maria Gouvêa, *University of São Paulo, Brazil*

Ana Masano, *University of São Paulo, Brazil*

This study presents an evaluation of expectations and perceptions of individual bank clients with high earnings in the municipality of São Paulo. A quantitative survey with 206 interviewees draw on attributes of bank services as well as models and scales provided by the relevant literature. The scales of quality, satisfaction, image and loyalty were analyzed in terms of reliability and validity. Considering the clients stratified in two ranges of extremes of loyalty degree (the least and the most loyal range), logistic regression was applied. The results show that there are some aspects of bank services that distinguish clients with different degrees of loyalty. Additionally, it was found that where clients' expectations were high, their perceptions regarding the quality of the services provided were not homogeneous. These results can provide relevant directions to banks that intend to improve the quality of their services.

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Friday, May 4, 3:30-5:00 **Room:** State
Session: Miscellaneous Topics in Supply Chain Management

Track: Games, 4

Chair: Sreekumar Bhaskaran

007-0624: To Yield or Not to Yield: Strategic Choices in Supplier Development

Manu Goyal, *University of Maryland, United States*

Cheryl Druehl, *University of Maryland, United States*

Siva Viswanathan, *University of Maryland, United States*

Supply chain management requires a firm to invest in its suppliers. The frequency of such supplier development initiatives has increased with the rapid growth of outsourcing. We analyze the optimal strategies for manufacturers that have a choice between reducing yield-uncertainty or reducing marginal costs by investing in their supplier. We model duopolistic competition between manufacturers that share a common supplier to examine the impact of competition on the equilibrium outcomes and examine the implications of the leakage of investments that result from the use of a common supplier.

007-0202: Technology Licensing and Market Entry Under Specific Investments

Sinan Erzurumlu, *University of Texas at Austin, United States*

Sreekumar Bhaskaran, *Southern Methodist University, United States*

Consider a decentralized supply chain in which an original equipment manufacturer (OEM) procures a key component of its product from an upstream supplier. The quality of the OEM's product depends on the quality of this component and the investments from the OEM. We examine the case in which the supplier develops a new technology which enables him to offer a component of higher quality. However, the improved quality of the component would enhance the product quality if the OEM undertakes investments to enhance the compatibility of the component with the product. We analyze the issue of when and how a supplier would license his technology to another supplier with which he also competes for the demand of the OEM. Our analysis focuses on the level of technology transfer and the competition. We explore the investment decisions by the OEM and the supplier and the optimal strategies for the supplier.

007-0734: Optimal Group Decisions: The Case of Portfolio Review Committees

Sanjiv Erat, University of California at San Diego, United States

Academic literature is replete with examples of analytical models that assume that portfolio decisions, in specific go/no-go decisions that occur during various stages of a product development process, are made by a single decision-maker. However, both the best practice recommendations from more applied research as well as the actual practice in the industry suggest a dominant role for groups when making strategic portfolio decisions. This presentation explores some key differences that are introduced by modeling the portfolio process as a group decision process. The presentation explores the efficacy of portfolio committees by considering the effects of external and internal environment on the value of group decisions.

007-0163: Dynamic Production and Pricing Model for Competing Firms: An Alternating-Move Approach

Soheil Sibdari, University of Massachusetts Dartmouth, United States

David Pyke, Dartmouth College, United States

Game theory has been used in supply chain and revenue management literature to tackle incentive-related problems with multiple agents. To best of our knowledge, all related papers use simultaneous-move game, in which all players take the action at the same time, in order to model the interaction between different agents in the market. Stationary policies are used in which the outcome of a single-stage game is applied for the entire time horizon. One assumption in these papers is that the model's parameters, such as production cost, are deterministic and remain constant over the time horizon. In reality, these parameters are not deterministic and the stationary policy cannot be used throughout the entire time horizon. In such environment, the firms do not adjust their moves to be at the same times nor they ignore the actions taken by their opponents in previous periods. Relaxing these assumptions is the motivation of this study. We consider a two-player alternating-move dynamic game over an infinite time horizon to model the competition between two firms in a duopoly.

61	Friday, May 4, 3:30-5:00 Room: Terrace Session: Managing Healthcare Delivery Networks	Track: Health Care, 4	Chair: Vicki Smith-Daniels
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007-0659: Improving Funding Allocation in a Community Care Access Centre

Kenneth Klassen, Brock University, Canada

Gail Riihimaki, Brock University, Canada

Community Care Access Centres (in Ontario, Canada) must allocate funding to a large number of health care services every year. If this allocation is inaccurate, some services may be reduced at some point during the year, while others may not require their entire budget. This results in a lower level of health care since the clients of services in higher demand will not receive care even though there are funds available. This research uses a number of quantitative methods in an attempt to more accurately forecast demand for a number of services. By testing time series and regression models and combining them with some qualitative factors, forecasting models are developed that outperform prior management decisions for these services. This suggests that the budget allocation process would benefit from the use of these methods.

007-0496: Interruption and Forgetting in Radiology Services Production

Bhaskar Narayanaswamy, University of Cincinnati, United States

Craig Froehle, University of Cincinnati, United States

Mark Halsted, Cincinnati Children's Hospital Medical Center, United States

An increasingly common barrier to productivity in medical environments is interruptions. Interruptions cause stoppage of the current task and often induce forgetting on the part of the worker, which can cause rework. This research employs empirical data gathered from a hospital radiology department and develops a simulation model in order to better understand the impact of interruptions, forgetting, and rework. To help mitigate the deleterious effect of interruption-induced rework, we introduce and test a sequestering policy, where one of the servers is protected from interruptions. We find that sequestering can improve overall productivity and cost performance of the system, but the decision to implement a sequestering policy must consider the costs associated with delaying both interruptions and production work as well as the forgetting rate of the system's human workers. We also found that if forgetting is not explicitly considered, the model substantially underestimates the benefits of a sequestering policy.

007-0630: Health Care Supply Chains: Practices, Theory, and Future Research Directions

Vicki Smith-Daniels, Arizona State University, United States

Over 30% of the costs of an average hospital discharge are attributable to supplies and the average hospital's supply costs grew from \$36 million dollars in 2003 to over \$50.5 million in 2006. Estimates for potential savings in the health care supply chain exceed 16 billion dollars annually. Fragmentation among the principal organizations that constitute the health care supply chain (suppliers, distributors, group purchasing organizations, information system vendors and providers) is consistently identified as a major feature of supply chain dysfunction in the US and in other nations. This presentation describes factors that facilitate or restrain supply chain excellence in the health sector, evaluates current research in healthcare supply chain management, identifies manufacturing practices that have been successfully transferred to the health care industry, proposes theoretical lens for future research, and identifies high priority research topics.

62	Friday, May 4, 3:30-5:00 Room: Vista Session: JIT Production and SCM	Track: JIT & Lean, 1	Chair: Hisashi Kurata
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007-0651: SC Approach to Understanding JIT/Lean Organizations

Lumbidi Kupanhy, Euromed Marseille Ecole de Management, France

JIT/lean system has been an attraction since the 1980s. It is simple, efficient, and does not require any sophisticated equipment. The system works in highly automated, computerized or robotized production environments as well as in production organizations that cannot afford expensive equipment. Although many companies have implemented the system, only Toyota and some Japanese companies like Honda continue to sustain their growth and success thanks to JIT/lean methods. Observation shows that many companies have implemented JIT from the point of view of production system only. We contend that JIT companies' sustained successes are due to their integrated supply chain approach to JIT. The paper tries to show that TPS/JIT means more than a production system: it is a logistics and supply chain management system.

007-0490: JUST-in-Time Inventory Systems Adoption: Effects on First Tier Suppliers

John Kros, East Carolina University, United States

Beginning in the early 1980's, a number of US firms followed the efforts of Shigeo Shingo and Taichi Ohno and adopted just-in-time (JIT) manufacturing in an attempt to reshape their manufacturing environments. JIT requires that a company have a few reliable suppliers and is believed to enhance productivity and build a leaner manufacturing system which minimizes inventories (Helo, 2004) and which reduces risk and helps minimize the cost of manufacturing (Curry and Kennedy, 1999). The present work will analyze results throughout the supply chain in terms of inventory-management, for companies who do business with OEMs that utilize JIT systems, specifically suppliers working under the auspices of Japanese auto manufacturing systems such as the Toyota Production System. The results of this study should enable managers that have or are considering implementing or participating in a JIT inventory management system to become more effective.

007-0048: Achieving On-Time Delivery Through a Leagile Strategy

Bernado Villarreal, Universidad de Monterrey, Mexico

Agility is a business-wide capability that is required to compete successfully in a dynamic market. The aim of an agile company or supply chain should be to carry inventory in as generic form as possible. This is postponement, a vital element in any agile strategy. The concept of lean supply chain has its origins in the idea of lean manufacturing. Leanness means developing a value stream to eliminate all waste including time. This paper is concerned with the implementation of strategies for improving on-time delivery levels for a Mexican company that manufactures electric motors for export. The main strategy includes the identification and implementation of projects with the purpose of reducing lead time. The application of the concepts of decoupling point and postponement is fundamental in deriving the full strategy. The project is ongoing and partial results will be presented.

007-0053: Trade Promotion Choice in a Supply Chain

Hisashi Kurata, Yokohama National University, Japan

Xiaohang Yue, University of Wisconsin-Milwaukee, United States

Trade promotion has a significant impact on retail business. Manufacturers traditionally are concerned with the inefficiency of trade promotion due to retailers' low pass-through of the trade deal to customers. The scan-back (SB) trade deal, which monitors a retailer's sales via an IT system, benefits the manufacturer, but may or may not benefit the retailer. We provide insight into when a retailer in a two-stage supply chain has incentive to accept the SB trade deal.

63	Saturday, May 5, 8:30-10:00 Room: Brasserie Session: The Past, Present, and Future of Quality Management: A Panel Discussion	Track: Qual Mgmt, 1	Chair: Barbara Flynn
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007-0590: The Past, Present, and Future of Quality Management: A Panel Discussion

Barbara Flynn, Indiana University, United States

S. Thomas Foster, Jr., Brigham Young University, United States

Hale Kaynak, University of Texas, Pan American, United States

Roger Schroeder, University of Minnesota, United States

Chris Voss, London Business School, United Kingdom

It seems that the focus in both academia and practice is shifting from implementation of quality management to implementation of Six Sigma, a shift that indicates a widespread belief that the time for quality management has come and gone. This panel will discuss where the research and practice in quality management have been and where they currently are. It will also reflect on the future of quality management both in terms of research and practice. The panel will consider such questions as: how can managers integrate Six Sigma into a quality management system to make their quality management efforts more effective? What kind of research, in terms of both scope and method, in quality management should academicians engage in to facilitate the effective implementation of quality management in practice?

64	Saturday, May 5, 8:30-10:00 Room: Continental Session: Analytical Tools for SCM	Track: Supply Chn, 5	Chair: Rahul Kale
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007-0675: A Multiobjective Approach To Simultaneous Strategic And Tactical Planning

Karuna Jain, Indian Institute of Technology Bombay, India

Lokesh Nagar, Indian Institute of Technology Bombay, India

One challenge in highly competitive industries such as electronics and fashionable products is the rapid introduction of new products. New product introduction is imperative for the growth of revenue, and to sustain in mature markets for such industries. In this paper an integrated multiobjective supply chain-planning model is proposed to simultaneously determine capacity and the production plan, considering uncertain customer demand. The goals of the model are to cover the peculiar characteristics of new products like risk associated with negative profit, maintenance of desired service level under uncertain demands and maintaining the organization's profit goals. The research shows that for new product, especially short life cycle products, it is significant to cover the design and planning decision in an integrated framework.

007-0144: Supplier Selection with Component Commonality

R Samuel Sale, Louisiana Tech University, United States

Mardi Sale, Sam Houston State University, United States

Hill (2000) presents a tool called product profiling which is used to help managers make process choice decisions that are consistent with the characteristics of the markets in which their product compete. While other authors have modified and used this tool to support a variety of decisions other than process choice, it has not been shown to be appropriate for use in supplier selection. Supplier selection is a more complex process that cannot be captured in a simple profile. This paper will highlight some of the inherent difficulty of ranking suppliers and support the use of the Analytic Hierarchy Process (Saaty 1994) as a mechanism for dealing with this highly complex scoring problem.

007-0348: Do We Need Organisation Theory in Supply Chain Management?

Kate Blackmon, University of Oxford, United Kingdom

Dirk Pieter Van Donk, University of Groningen, Netherlands

Much-needed rigorous theory building in operations management can be achieved by using insights from or integrating theoretical contributions from related management fields. So far, organizational theory (OT) has been used and applied in different fields within operations management as in a forthcoming special issue of the Journal of Operations Management focusing on integrating OT and supply chain management (SCM). Despite the number and breadth of contributions made (e.g., in the use of OTs and variety of SC phenomena), no one seems to ask "Do we need organisation theory in supply chain management?". Starting from the special issue's contributions, we explore what OT might contribute to SCM based on a critical analysis of the relevant literature. We identify three strategies for linking OT with SCM that scholars can leverage to categorize both past contributions and future research questions.

007-0206: Transaction Cost Economics, Network Theory and Supply Chain Management

Rahul Kale, University of North Florida, United States

Antony Paulraj, University of North Florida, United States

Dag Naslund, University of North Florida, United States

Owing to its complexity, supply chain management (SCM) challenges the explanatory power of most traditional management theories and no single theory can fully explain this complex phenomenon. In this manuscript, we synthesize the contributions of transaction cost economics (TCE) and network theory to the theory of SCM. First, we present the various constructs/proxies used within TCE along with the key dimensions of asset specificity, opportunism, and uncertainty. Additionally, we present the key characteristics of network theory as it is applicable to SCM. In our analysis, we compare and contrast the strengths of each theory in personifying SCM. We further discuss the limitations of applying TCE and network theory to supply chain research and suggest opportunities for further research.

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Saturday, May 5, 8:30-10:00 Room: Executive

Track: Opt Models, 5

Chair: Michael J Fry

Session: Contracts and Resource Management in Operations

007-0723: Dynamic Cash Management of Warranty Reserves in a Multi-Region Setting

Cigdem Gurgur, Colorado School of Mines, United States

It is common for many companies to create a reserve fund to cover future liabilities arising from product warranties. Most researchers assume that the warranty reserve fund is set based on the expected total warranty expenses. However, companies rarely keep reserves to cover their liabilities for the whole life of their products, since maintaining excess reserves would cause opportunity cost. We propose an optimal policy rule to guide dynamic cash management of warranty reserves along two lines: (1) The amount of cash additions or subtractions at the beginning of each period; (2) The amount to contribute to the reserve after each sale. Numerical examples show that this policy indeed captures the current practices. We also show that companies tend to deplete their reserves to boost their earnings when the future is discounted at a higher rate.

007-0718: Resource Allocation Solution Approaches in an Available-to-Promise Stochastic Programming Model

Chien-Yu Chen, George Mason University, United States

In face of demand uncertainty, an available-to-promise system adopts a partition strategy to pre-allocate a critical resource into multiple sales channels and time periods. A two-stage stochastic programming model was developed to support real-time order promising decisions so that expected total profit is maximized. We used the effective L-shape decomposition method to solve the stochastic program containing a large number of demand scenarios. Single-cut, multi-cut, and hybrid approaches were investigated in order to improve the efficiency of the decomposition method. We also explored the use of optimal basis analytically for sub-problems without actually solving individual linear programming models. This presentation reports the performance of these solution approaches in terms of number of iterations, number of cuts, computer memory utilization, and computing time.

007-0056: Workload Balancing Through Recurrent Subcontracting

Michael Fry, University of Cincinnati, United States

Bogdan Bichescu, University of Tennessee, United States

George Polak, Wright State University, United States

We model a situation where a firm wishes to balance workload requirements arising from nonstationary demand by creating a portfolio of recurrent insourcing and outsourcing contracts. We use Fourier transforms to decompose an input workload profile into a portfolio of insourcing and outsourcing contracts using sinusoidal and Walsh basis functions to better achieve some desired constant workload level. However, this initial selection of contracts may result in impractical options. Therefore, we also develop mathematical programs using principles from goal programming formulations to refine the portfolio of contracts to more accurately reflect a realistic environment by placing constraints on the available contracts and explicitly considering operational costs.

007-0055: Sensitivity Analysis of the Swap Problem in the Petroleum Industry

Raed Husain, Kuwait University, Kuwait

To capture the complexity of swaps taken place between competitors supplying substitutable products that are closer to each others' customers, a mathematical model was developed and applied to a real case from the petrochemicals industry, in which its results illustrated the superiority of the model's solution over current industry practices. In this paper, the robustness of our mathematical model is tested under variety of operational parameters and their interactions effect. The results of this sensitivity analysis model provide greater understanding of the swap phenomenon in the petroleum industry and the decisions which are to be made under changing conditions.

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Saturday, May 5, 8:30-10:00 **Room:** Far East

Track: Mkt-Opns, 5

Chair: Tamer Boyaci

Session: Pricing Models with Strategic Operations and Marketing Considerations

007-0306: Optimal Pricing and New Edition Release Strategies in the Textbook Industry

Saibal Ray, McGill University, Canada

Haresh Gurnani, University of Miami, United States

Shuya Yin, University of California, Irvine, United States

In this paper, we analyze a typical textbook supply chain: the bookstore buys the book from the publisher at the beginning of the first period, and sells it to price-sensitive students. At the end of the first period the store buys back the used books and makes it available in the second period. The publisher can also decide to publish a new edition (at a cost) and sell it to the bookstore in the second period. On the other hand, the publisher may choose not to release a new edition; the store will then buy "new" copies of the old edition in the second period. We establish the profit-maximizing decisions for the supply chain partners assuming the publisher to be the Stackelberg leader. Our analysis sheds light on the role that buybacks play and the underlying reason behind the increased frequency of new editions and soaring prices in this industry.

007-0470: Competitive Price Matching Guarantees in a Decentralized Channel: Role of In-store Availability and Its Verification

Saibal Ray, McGill University, Canada

Arcan Nalca, McGill University, Canada

Tamer Boyaci, McGill University, Canada

We investigate the effects of in-store availability on price matching guarantees (PMGs). Under the simplest form of PMG implementation, a firm matches the lower price of the competitor for an identical product, whenever a customer presents a credible proof (PM). In reality, firms reserve the right to check the availability of the product at the competitor location and may decline to match the lower price if the product is not available there (PMA). A horizontal price competition model is developed where two retailers offer PM or PMA policies. The equilibrium prices and profits under the two policies are derived and compared. Then the horizontal framework is extended to incorporate a manufacturer which supplies the product to the two competing retailers. The analysis reveals that for both PMG policies the issue of product availability and its verification significantly impact the values and behavior of the equilibrium decisions, as well as profits.

007-0629: Advance Selling from a Retailer to Consumers

Xuying Zhao, University of Texas at Dallas, United States

Kathryn Stecke, University of Texas at Dallas, United States

Ashutosh Prasad, University of Texas at Dallas, United States

A retailer having a short selling season and unknown demand volume from consumers faces a newsvendor problem. The retailer can sell products in a discounted price before the selling season. Consumers who buy early make payments early but receive the products later after the selling season starts. Consumers are uncertain about product valuation before the selling season starts. If they buy early, they may realize a negative surplus later. We analyze the tradeoffs faced by consumers and retailers to study when a retailer should sell in advance and how deep should the price discount be. We also examine the impact of demand characteristics (consumer valuation mean, consumer valuation variability, consumer risk preferences, consumer structure), and profit margin during the selling season on a retailer's advance selling decisions.

007-0423: Information Acquisition for Capacity Planning via Pricing and Advance Selling: When to Stop and Act?

Tamer Boyaci, McGill University, Canada

Ozalp Ozer, Stanford University, United States

We investigate a capacity planning strategy that collects commitments to purchase before a one-time capacity decision, and uses this advance sales information to decide on the capacity. Customer demand is stochastic and price sensitive. Once the capacity is set, the provider satisfies customer demand from the installed capacity. We study scenarios in which advance sales and regular sales season prices are set exogenously as well as optimally. For both scenarios, we establish the optimality of a control band policy that describes when to stop acquiring advance sales information and how much capacity to build. Through a numerical study we generate insights into how operating conditions (e.g., capacity building cost) and market characteristics (e.g., demand variability) affect the value of information acquired through advance selling as well the value of knowing when to stop advance selling, and identify conditions under which this capacity planning strategy is most valuable for the provider.

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Saturday, May 5, 8:30-10:00 **Room:** Florentine

Track: Sustain Ops, 6

Chair: Andrew King

Session: Designing for Remanufacturability

007-0613: Designing for Remanufacturing/Continuous Upgrade: Understanding and Overcoming the Technical Design Challenges

Andrew King, University of Bristol, United Kingdom

Steve Barker, University of Bristol, United Kingdom

Remanufacturing is a process that returns used products back to an as new condition for resale into useful service. The reason for this strategy is based on the fact that it preserves both the embodied energy of virgin production (thus reducing the environmental impact) and the intrinsic value adding process of the producer (thus increasing the manufacturer's profitability). However, whilst in certain conditions it may be socially, economically and environmentally advantageous, can it be practically achieved? In the remainder of the paper a more in-depth consideration of the main technical barriers is given. A number of examples are used to illustrate the way products can be designed to better suit remanufacture. However, the main focus of the paper explains how a design platform approach can more strategically address many of these technical issues.

68	Saturday, May 5, 8:30-10:00 Room: Fountain Session: Strategy in Dynamic Environments	Track: Ops Strat, 5	Chair: Emily J. McIlvaine
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007-0430: Relying on the Past and Predicting the Future: Interrelating Perspectives in Operations Strategic Management Systems

Edson Pinheiro de Lima, University of Warwick, United Kingdom
Sergio Gouvea da Costa, Pontifical Catholic University of Parana, Brazil
Jannis Angelis, University of Warwick, United Kingdom

The complexity and dynamics of today's enterprises' environments and operations systems are demanding an integral approach for designing and implementing their operations' strategic management and control systems. This integral approach should be able to deal with the short and long term perspectives and help the enterprises manage their positions, processes and paths for a sustainable development. This paper is based on Operations Management and General Systems theory, intending to discuss and propose a new "architecture" for the strategic management system of the operations function. The findings, of the research project related in this paper, show that the systemic representation of the functionalities and features that a strategic management system for the operations function should be developed to accomplish the related task. The developed framework as theoretical construction is willing to review the cognitive and mental models that the operations managers are using for managing the operations systems.

007-0480: Strategic Resonance in the Strategy Process Within Dynamic Environments.

Steve Brown, Exeter University, United Kingdom

Strategic resonance is a concept first developed by Brown (2000) to provide insights into the dynamic nature of operations strategy in a competitive world that requires operations capabilities including Lean Production, Mass Customisation and Agile Manufacturing. In previous POM conferences, we provided evidence of strategic resonance within specific industries. In Dallas, we will develop further insights and demonstrate the importance of strategic resonance across industries. This builds upon seminal work including Skinner, and Hayes and Wheelwright. We discuss how strategic resonance depends upon having: - a) senior-level operations personnel in place; b) operations managers whose role includes business issues rather than a mere technical role and c) operations strategies that feed into and form part of business strategies within their organisations.

007-0138: Manufacturing Competition Through the Factory in a Box Concept

Mats Jackson, Mälardalen University, Sweden
Mats Winroth, Jönköping University, Sweden

Today's business environment is dominated by change and uncertainty, and global competition is diminishing defined markets. Manufacturing success and survival are becoming more difficult to sustain and it is recognized that low cost and high quality alone are not enough to sustain firm's competitive position in the market place. Market uncertainty and frequent introductions of new products have created a growing need for responsive manufacturing systems. There is a growing demand for well-formulated and implemented manufacturing strategies which provide necessary support for developing and sustaining relevant order-winners and qualifiers, which enable rapid product realization as well as flexibility and reconfigurability within operations. The objective of this paper is to analyze and investigate how to develop and implement a manufacturing strategy supporting the development of flexible and reconfigurable production systems. An ongoing research project in Sweden, 'Factory-in-a-Box', will be presented as one initiative in this area.

007-0754: Exploring the Effect of Organizational Learning and Information Processing Capabilities on Manufacturing Performance

Emily McIlvaine, University of Minnesota, United States
Rachna Shah, University of Minnesota, United States

In today's competitive and dynamic markets it has become clear that a firm's strategy cannot be static but must change with the environment in which it exists. Understanding the development and evolution of a firm's operations strategy has proven difficult and many questions about how operations strategy can contribute to firm competitiveness remain unanswered. Using the lenses of the Resource Based View of the firm and Complementary theory this research will propose that the interplay between firm resources is an important factor in the development of sustainable competitive advantage. The goal of this paper will be to examine the role of two important firm capabilities, organizational learning and information processing, and their affect on the manufacturing performance of the firm.

69	Saturday, May 5, 8:30-10:00 Room: French Session: Teaching about Business and the Environment	Track: Sustain Ops, 2	Chair: Beril Toktay
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007-0292: Teaching about Business and the Environment

Beril Toktay, Georgia Institute of Technology, United States

We discuss the content, approach and responses to a course on Business and the Environment taught at Georgia Tech College of Management.

007-0759: Teaching Sustainable Operations Management at the Presidio School of Management: A Progress Report

Dwight Collins, Presidio School of Management, United States

The author teaches sustainable operations management (OM) at the Presidio School of Management in San Francisco. He will discuss the challenges in crafting a syllabus that encompasses both traditional OM basics and elements of sustainable OM such as industrial ecology, remanufacturing, and life cycle assessment. He will review how including the sustainability dimension influences the content material taught in the traditional OM sectors such as supply chain design and forecasting.

007-0601: Managing for Sustainable Development

Robert Klassen, University of Western Ontario, Canada

An overview will be presented of different pedagogical options that I have used to introduce and teach aspects of sustainable development. In general, sustainable development can be integrated into several sessions of a core course or expanded into a stand-alone course. For the former, my approach has been to expand traditional topics to touch on environmental dimensions. For the latter, my emphasis has been to structure a course around building more sustainable business models. This presentation will look at both course design and execution, including relevant topics, cases, simulations and videos.

007-0307: A Framework for Teaching Environmental Supply Chain Management

Santosh Mahapatra, Clarkson University, United States

Environmental supply chain management is of significance due to increased emphasis on global supply chain, rapid shortening of product life cycle and economic merit of managing business in an environmentally responsible manner. However, routine managerial perspectives and practices often ignore the importance of environment because of the emphasis on traditional short-term quick payoff practices and lack of training in environmentally responsible practices. Consequently, one of the responsibilities of the supply chain academic community is to educate future managers about the importance and viability of integrating environmental perspective into supply chain management both at the strategic and tactical levels. This presentation attempts to present a framework to integrate environmental perspectives in the supply chain management curriculum and to share the experiences of adopting the framework at undergraduate and MBA level teaching.

70	Saturday, May 5, 8:30-10:00 Room: Garden Session: Workshop: A Course in Revenue Management	Track: Education, 5	Chair: Chris Anderson
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007-0270: A Course in Revenue Management

Chris Anderson, Cornell University, United States

Revenue Management has been taught at the Cornell Hotel School for numerous years given the necessity of its application in the industry. In this interactive workshop we will cover the basics of RM and how they are organized into a full semester long lecture and Excel based course. Additionally we will discuss a few cases used to teach RM concepts that have been used as part of other OM courses.

71	Saturday, May 5, 8:30-10:00 Room: Green Room Session: Disaster Risk Management and Mitigation	Track: Disast Mgt, 2	Chair: Willard Price
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007-0685: Risk Mitigation Using an Alternate Supplier and Risk Inventory for a Global Supply Chain

U.V Manoj, University of Texas at Dallas, United States

Milind Dawande, University of Texas at Dallas, United States

Divakar Rajamani, University of Texas at Dallas, United States

Chelliah Sriskandarajah, University of Texas at Dallas, United States

In this research, we develop a risk mitigation model for a Dallas-based manufacturer who imports semi-finished items from an overseas supplier. Supply disruptions at the port or at sea result in a hefty loss for the manufacturer. We study two risk mitigation models for a single product. In the first model, the manufacturer sources materials from a single supplier and maintains risk-inventory. In the second one, the manufacturer maintains risk-inventory and sources from an alternate supplier in addition to the existing one. We demonstrate that our risk mitigation models are sensitive to the product cost parameters and study their behavior with respect to these parameters. We also demonstrate how a payment contract, in which the manufacturer can delay payment to the supplier for a definite period of time, affects the selection of a sourcing policy.

007-0387: Evolving POM Capabilities for Disaster Management:

Martin Starr, Rollins College, United States

Three major disaster categories are: (1) intentional malevolence; (2) human errors and technological failures; (3) regional acts of nature (e.g., hurricanes and earthquakes). Regional disasters often trigger additional catastrophes such as supply chain interruptions, power outages, and building/dam destruction. Pandemics result from combinational causes. Among the worst repetitious disasters are 40,000 USA and 66,000 European annual auto fatalities. We examine how POM models can structure the three types of situations before they occur, during emergency periods, and after their occurrence. Our main focus is on before scenarios. Avoiding catastrophes removes severe penalties incurred during and after their occurrence. This can justify large investments required for detection and prevention of disasters. POM provides insights using QC, predictive maintenance methods, adaptive forecasting techniques, etc. POM is responsible for security and safety for all nine categories (cells) of the disaster management matrix. Development of new models is warranted.

007-0706: Shifting Responsibility and Risk of Flood Protection

Willard Price, University of the Pacific, United States

Flood protection was traditionally the responsibility of all levels of government, who financed, planned, designed and constructed levees and other structures to prevent flooding and economic loss to assets in proximity to water courses. Owners of domestic, commercial and industrial property increasingly paid fees for flood projects and carried flood insurance to compensate for damages and losses. Recovery costs of dewatering, rebuilding infrastructure and reimbursing economic losses were commonly paid by Federal and State governments. Now, remembering Katrina victims, California has passed initiatives to fund flood protection. Yet current policy debates suggest the risk and responsibility for flood strategies will deliberately shift to property owners and local governments. Based on Sacramento/San Joaquin Valley flood improvement experiences, this research examines runoff volumes, statistical protection, levee design standards and investment/risk sharing among governments, homeowners and commercial interests.

72	Saturday, May 5, 8:30-10:00 Room: Oak Session: E-commerce and Software in SCM	Track: Supply Chn, 18	Chair: Robert Jacobs
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007-0437: Internet-based Tools for Operations Management: Results from an Italian Survey

Francesca Michelino, University of Salerno, Italy

Federica Bianco, University of Padova, Italy

Mauro Caputo, University of Salerno, Italy

ICT-based innovation has a primary role in operations management, enabling improvements in physical, informative and financial flows management. Apart from efficiency and efficacy improvements, the use of internet-based technologies may induce structural changes in business-to-business relationships: new supply chain configurations can emerge and business processes may undergo a re-design. The paper aims at analysing the diffusion of internet-based tools for operations management in Italian B2B transactions. In particular, the paper will analyse the use of both e-auctions and automatic data sharing systems with special regards to order cycle, logistics and integrated supply chain planning. The effects on business processes will be analysed in terms of changes in activities, players and roles. The paper is based on a survey developed involving 1458 Italian companies with more than 50 million euros turnover from product and service industries. The response rate was 31.8%, with 463 firms answering.

007-0014: A Real Options Analysis on the Capacity Contracting Problem in the Presence of B2B Exchange

Youyi Feng, Chinese University of Hong Kong, Hong Kong

Zhan Pang, Chinese University of Hong Kong, Hong Kong

Motivated with the fast development of B2B exchanges, we consider a problem of contracting capacity portfolios between a capacity provider (e.g. freight carrier) and a capacity marketer (intermediary or 3PL) in a contract market. The dynamic pricing strategy of players are studied. We also study the contracting behaviors of the players. Finally, we study the acquisition decisions of the players with benchmark of the integrating system.

007-0173: An Analytical Extension to the Internet Beer Game

Mark Cotteleer, Marquette University, United States

Terence Ow, Marquette University, United States

Charles Wood, University of Notre Dame, United States

F. Robert Jacobs, Indiana University, United States

The Bullwhip Effect is a fundamental supply-chain phenomenon. It is critical that management education programs use approaches that equip students to deal with its challenges. The "Beer Game" has traditionally served an important role in fulfilling this need. Recent years have seen several electronic versions of the Beer Game emerge. Most prominent is The Internet Beer Game (IBG), developed by Robert Jacobs at Indiana University. In addition to illustrating the Bullwhip Effect, IBG has the advantage of providing free, server-based access for multi-player and multi-team exercises. It has been played more than 3,000 times at 170 universities since 2001. This paper introduces an extension to IBG that enables instructors to access and format (e.g., charts, graphs) game data for easy presentation during analysis and game debrief. The extension thus contributes to ongoing pedagogical efforts to enhance understanding of this important supply-chain concept.

007-0022: Supply Network Planning & APO

F. Robert Jacobs, Indiana University, United States

This session will be an overview of the features of SAP's APO software. The APO product from SAP is intended to support advanced supply chain planning and scheduling. The application includes special planning algorithms and optimization techniques to support these decisions. APO consists of five major modules: Demand Planning (DP), Supply Network Planning (SNP) including Deployment Functionality, Production Planning & Detailed Scheduling (PP/DS), Available to Promise (ATP), and Transport Planning & Vehicle Scheduling (TP/VS). During the session, Prof. Jacobs will translate the terminology used by SAP into terminology used by academics familiar with research related to the area. Features of the modules will be discussed and topics for potential future research identified.

73	Saturday, May 5, 8:30-10:00 Room: Panorama Session: Prevention and Mitigation of Supply Chain Disruptions	Track: SC Disrupt, 1	Chair: Adegoke Oke
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007-0524: An Investigation of Risk Mitigation Strategies in Supply Chains

Adegoke Oke, Arizona State University, United States

Mohan Gopalakrishnan, Arizona State University, United States

Supply chains are vulnerable to different types of risks including supply risks, demand risks and risks that affect the cost of doing business. In this paper we employ transaction cost theory, resource dependency theory, resource based theory and agency theory to identify risk mitigation strategies in supply chains. A conceptual analysis supported by empirical results based on multiple case studies lead to seven propositions. Supplier based management strategies including supply base rationalization, supplier certification and development are proactive strategies that may increase the ability to reduce the impact of risks or the probability of risk occurrence (risk reduceability). Flexible capacity strategies, emergency response systems and supply chain design are reactive strategies that are likely to increase the ability to cope with the occurrence of risk (risk copability).

007-0466: Interactive Complexity, Tight Coupling and Disruption-Free Performance

Kathryn Marley, Ohio University, United States
Peter Ward, The Ohio State University, United States
James Hill, The Ohio State University, United States

The prevalence and cost implications of supply chain disruptions is the motivation for a considerable amount of academic and practitioner literature. In this paper, we consider disruptions as accidents and use organizational accident theory to address how supply chain disruptions can be prevented by understanding the role of lean management, interactive complexity, and tight coupling within a system (Perrow, 1984, 1999a). To accomplish this, we estimate the levels of interactive complexity and tight coupling of various processes in a steel processing plant and relate these to the likelihood of supply chain disruptions. The results indicate that there is a significant process complexity effect, thus suggesting that process simplification can be an effective countermeasure to preventing supply chain disruptions. We also find significantly fewer disruptions under conditions of low process complexity and tight coupling support the benefits of adopting lean management practices to improve supply chain performance.

007-0236: Measurement of Benefits of an Organizations' Investment Toward the Prevention of Supply Chain Disruptions

Jack Crumbly, Jackson State University, United States

Supply chain disruptions are a phenomenon that can damage relationships between suppliers and their customers. Organizations such as Wal-Mart have developed facilities that monitor natural and human influenced events to communicate with suppliers. This strategy is assumed to be a competitive edge for the retailer. However, this competitive advantage may or may not be rewarded by customers and investors. Negative brand perceptions may cause consumers to look at alternative buying options. This study investigates the impact of investment of supply chain systems adapting to supply chain disruptions. The researchers will focus on the short and long term impact of supply chain disruption adaptation on suppliers, retailers and investors.

007-0589: Vaccination of Supply Chains for Managing Disruptions

RS Srinivasan, i2 Technologies, United States

This article discusses a method for managing supply chain disruptions, which draws inspiration from biology, where a human being can be vaccinated to protect against infection by a specific microbe and builds on a recently proposed methodology for supply chain immunity. Using business gene libraries consisting of the factors influencing a supply chain, different types of risks (antigens) are constructed and the corresponding solutions are found by simulations. The solution (or antibody) is also constructed from similar gene libraries representing elementary corrective actions, for example, SCOR. The antibodies that best counteract the antigen are chosen as options for disruption recovery. Such a method would enable companies to assess the impact of these disruptive risks on different nodes in the supply chain and plan for recovery.

74	Saturday, May 5, 8:30-10:00 Room: Parisian Session: Empirical Research in OM	Track: Emp Res, 5	Chair: Justin Ren
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007-0528: The Current State and Impact of Quality Improvement Activities in U.S. Hospitals

Joseph Restuccia, Boston University, United States
Alan Cohen, Boston University Health Policy Institute, United States
Michael Schwartz, Boston University, United States
Justin Ren, Boston University, United States
Xin Wang, Brandeis University, United States
Erol Pekoz, Boston University, United States

We surveyed 474 hospital chief quality officers and 5,398 front line physicians and nurses to determine the nature, breadth, and perceived value of the quality improvement (QI) activities undertaken by U.S. hospitals. Hospital performance data from the Centers for Medicare and Medicaid Services have been merged with the survey data to analyze the relationship between QI efforts and quality of care in sampled hospitals. Three major research questions are being addressed: What are the major QI activities associated with higher measures of quality of care? What structural and process characteristics of hospitals are strongly associated with quality of care? How do hospitals that differ in terms of quality of care measures differ in terms of various cultural, strategic, and other structural and process characteristics?

007-0200: Capacity Estimation and Optimal Staffing for an Email Contact Center

Sameer Hasija, University of Rochester, United States
Sanjog Misra, University of Rochester, United States
Edieal Pinker, University of Rochester, United States
Robert Shumsky, Dartmouth College, United States

In this paper we present a staffing rule for an email contact center, as well as a method to estimate agent capacity parameters using agent productivity data, given that the historical data is truncated at an upper limit. The staffing rule has been implemented by an actual vendor that provides email-based customer support for a major e-retailer. The implementation results demonstrate that the method provides accurate staffing recommendations for a real-world contact center.

007-0201: On the Drivers of Quality in US hospitals: An Empirical Investigation*Carol Theokary, Boston University, United States**Justin Ren, Boston University, United States*

To date, research examining the relation between hospitals' characteristics and service quality has found mixed or inconclusive results. In this paper, we explore the impact of non-profit status, teaching status and high patient volumes on hospitals' operations quality. Our empirical investigation makes use of a large dataset that measures the operations quality of about 4000 hospitals for the treatment of heart attack, heart failure and pneumonia. Our findings indicate that (1) overwhelmed by their special teaching missions, teaching hospitals do not outperform their non-teaching counterparts in treating routine medical conditions; (2) the association of profit-making with the supply of medical services has resulted in a lower quality of care; (3) higher patient volumes significantly contribute to enhancing quality in heart diseases but not in pneumonia.

007-0749: Conducting Behavioral Experiments via Multi-Media Web-Surveys: Discrete Choice Analysis*Rohit Verma, Cornell University, United States*

Discrete choice analysis has its roots in economics but is being widely used to study a variety of research topics in operations management, marketing, product development and other related fields. The purpose of this workshop is to introduce the participants with the theory and different applications of discrete choice analysis. Examples from manufacturing, healthcare and service sector industries will be presented.

75	Saturday, May 5, 8:30-10:00 Room: Patio Session: Mass Customization: Modularity and Customer Focus	Track: Mass Cust, 5	Chair: Xuying Zhao
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007-0793: Delayed Differentiation: Cost and Benefits*Manish Mathur, Indiana University, United States**Puneet Mathur, Indian Institute of Management Bangalore, India*

Modular design enables manufacturer to delay the point of differentiation. It provides product variety, shorter product lead time and reduces finished goods inventory. However, it requires significant changes in design, manufacturing process and supply chain. Firms must consider the trade off involved before venturing. We evaluate delayed differentiation by quantifying the benefits and costs involved in offering modular product. We compare the base case of serial supply chain with single plant supplying FG to warehouses which in turn supply to retailers and the proposed scenario where plant supplies differentiating modules, which are assembled at warehouse before supplying to retailers. Demand is stochastically distributed (poisson). Supply lead-time from plant to warehouse is exponentially distributed. Warehouse follows base stock policy with continuous monitoring. Supply lead-time from warehouse to retailers is introduced when warehouse assembles the modules.

007-0594: Dynamic Pipeline Management – Exploiting a Moving Decoupling Point for Customer-Specific Variety*Bart MacCarthy, University of Nottingham, United Kingdom**Philip Brabazon, University of Nottingham, United Kingdom*

Producers striving for Mass Customization must reconsider traditional operational models and approaches in order to deliver high levels of customer-specific variety. Traditional production planning is premised on stability to ensure that material and manufacturing resources can be coordinated to meet anticipated requirements efficiently and on time. Here we consider an approach of particular relevance to the automotive sector that exploits the potential variety in the planning pipeline to meet customer requirements more precisely. An open planning pipeline that allows dynamic allocation of products to customers and changes to product specifications increases flexibility in responding to customer demand. Simulation results are presented demonstrating the characteristics of such systems in an automotive context. The approach results in a moving decoupling point and is very relevant to high variety situations where customer specifications need to be matched to some degree. The relevance of the approach to different sectors is debated.

007-0168: Procuring Customized Products: Integrating Contracting with Co-Design*Songlin Chen, Hong Kong University of Science & Technology, Hong Kong**Mitchell Tseng, Hong Kong University of Science & Technology, Hong Kong*

Customization is essentially a pull system and customers' demand for customized products is the ultimate force that drives a customization business. Existing research has been primarily focused on improving customizers' efficiency in eliciting and fulfilling customers' needs. This paper is concerned with customers' procurement decisions when faced with multiple competing customizers. Procuring customized products differs from procuring standard products in that product specifications become variable and other contract terms like price and delivery tend to vary with product specifications. Conceptually, it's a contracting problem with an embedded collaborative design problem, with information asymmetrically distributed between customers and customizers in both the commercial domain and the technical domain. A decision framework for procuring customized products is constructed, and different procurement scenarios and procurement mechanisms are discussed correspondingly.

007-0407: Software Customization: How Much and When?*Ashish Agarwal, Carnegie Mellon University, United States**Pei-yu Chen, Carnegie Mellon University, United States**Tridas Mukhopadhyay, Carnegie Mellon University, United States*

Software vendors can meet customization requirements using a combination of product design choices and customization services. We develop a model of software product design decisions considering two dimensions of customization and the development costs involved. We define these dimensions as productization or the ability to use the product out-of-the-box and scope or the number of features and functions in the product. We find that a monopoly provider will under-develop in productization and scope when the development costs are high and will choose to fill the gap by providing personalized services. As costs decrease, the vendor will increase the productization at the cost product scope while still preferring to provide service. In case of a duopoly, service strategy always leads to lower levels of product customization and lower profits. However, the vendors may still choose to provide services due to the prisoner's dilemma.

007-0158: Operational Complexities Associated with Product Configurator Deployments: An Exploratory Study

Kaushik Sengupta, Hofstra University, United States

Vishwanath Hegde, California State University Eastbay, United States

Product configurator systems have been increasingly integrated into the order generation process in order to facilitate mass customization. However, the impact of configurator deployments on other parts of the company has not received much attention. In this research, we examine the operation complexity associated with configurator deployments. First we develop a research framework by integrating the literature from mass customization, information systems and configurator implementation, and identify the gaps in literature. Then, we identify five categories of operational issues through an exploratory case-study research involving two companies. The findings highlight important operational issues managers should be aware of in configurator deployments.

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Saturday, May 5, 8:30-10:00 **Room:** Royal
Session: Quality Management and Firm Performance

Track: Qual Mgmt, 5

Chair: Petros Christofi

007-0383: The Effect of Quality Management Practices on Operational and Business Results in the Petroleum Industry

Mahour Mellat-Parast, University of South Dakota, United States

Stephanie Adams, University of Nebraska-Lincoln, United States

Eric Jones, University of Nebraska-Lincoln, United States

The purpose of this paper is to empirically investigate the effect of quality management practices on operational and business performance. A reliable and valid survey instrument was used for data gathering from managers in the petroleum industry. A stepwise regression analysis was conducted to determine the effect of quality management practices on two outcomes: operational and business results. The results indicate that top management support, employee training, and employee involvement are significant variables explaining variability of operational performance. A stepwise regression on business results indicated the significance of operational results on business results. The study shows that that top management support is the major driver for quality management implementation which is significantly correlated with most of other quality management constructs. Recommendation for managers for implementing quality management in the oil and gas industries has been provided.

007-0032: An Investigation into the Application of the Military Sea-basing Concept for the Provision Immediate Relief in a Rapid onset disaster

Peter Tatham, Cranfield University, United Kingdom

Faced with a rapid onset natural disaster, much of the initial support provided by major UN Agencies and NGOs utilises expensive airfreight as the primary means of transporting relief aid to the effected country. Using the 2005 Pakistan earthquake as a case study, this paper reports initial research into an alternative approach called "sea-basing". This concept, which is already widely used by military forces, envisages a "floating warehouse" based close to a primary risk area. A suitably sized ship is held at very short notice to transit to the relevant country with a cargo containing sufficient food and non-food items (tents, tarpaulins, blankets etc) to meet the immediate needs of a significant number of beneficiaries. The paper will expose the relevant costs and benefits of the sea basing approach and compare these with the costs of providing airfreight in support of the 2005 Pakistan earthquake.

007-0511: Revisiting the Lost Link Between Quality and Growth

Alexandre Pignanelli, Fundação Getulio Vargas, Brazil

Joao Csillag, Fundacao Getulio Vargas, Brazil

The empirical research on the impact of quality in financial performance, in the majority of cases, use profitability as the operational definition of performance – ROA, ROE, ROI, ROS and net profit as percent of sales are the most common indicators. The quality literature produced since the founders of the quality movement until the most recent academic works points to a positive impact of quality in the growth of the firm. This work revisits this link, analyzing the growth rates of a sample of firms with high effectiveness in the implementation of quality management principles and techniques during a 10 year period. Parametric and non-parametric inferential statistical methods show that the growth rates of these companies are not higher than the average levels of the same industry sectors, motivating discussions on theoretical and practical hypotheses to explain this lack of association.

007-0665: Dow Jones Sustainability Index and Total Quality Management

Petros Christofi, Duquesne University, United States

Seleshi Sisaye, Duquesne University, United States

Andreas Christofi, Monmouth University, United States

The Dow Jones Sustainability World Index (DJSI World) consists of more than 300 companies representing the top 10% of the leading sustainability companies in 60 industry groups across 34 countries. The assessment body, Sustainable Asset Management Group, evaluates a candidate firm's performance in the economic, environmental, and social issues. The authors attempt to show that TQM attributes (economic, social, and environmental) constitute the underline principles of corporate sustainability index such as those reported by DJSI World.

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Saturday, May 5, 8:30-10:00 **Room:** State
Session: Games and Operations

Track: Games, 5

Chair: Xiang Fang

007-0726: A Model for Partial Products Complementarity and Strategic Production Decisions Under Demand Uncertainty

Xiang Fang, Case Western Reserve University, United States

Yunzeng Wang, University of Texas at Dallas, United States

We consider a general industrial setting where multiple manufacturers each produce a different product and sell it to the markets. These products are partially complementary in the sense that there is a common demand stream that requests all these products as complementary sets and there are streams of individual demands each requesting only one of the products. Facing demand uncertainties, the manufacturers each choose a production quantity for its product to maximize its own expected profit. We formulate the problem as a non-cooperative game to study the strategic interactions of such firms and their implications to supply chain performance. We show that such a game may have numerous equilibria. Among all the possible equilibria, however, we prove that there always exists a unique one that maximizes each and every manufacturer's profit, and we derive an explicit solution for this Pareto-optimal equilibrium, from which managerial insights are drawn.

007-0025: The Existence of the Core in a Three-Echelon Supply Chain

Takamichi Hosoda, Cardiff University, United Kingdom

Assuming a stochastic external market demand, this paper studies the existence of the core in a serially linked three-echelon supply chain where payoffs depend on the entire coalition structure. Each player's cost is represented by infinite horizon standard deviation of net stock levels. To represent the activity of a player in a supply chain, the generalized order-up-to policy proposed by Hosoda and Disney (2006) is exploited. It is shown that even though grand coalition can produce a large cost reduction to the overall supply chain (26%), the existence of the non-empty core depends on the characteristics of the external market demand and replenishment lead-times. A stable implementable coalition structure is also presented along with its benefits.

007-0649: Efficient Contract Design in Multi-Principal Multi-Agent Supply Chains

Thomas Weber, Stanford University, United States

Hongxia Xiong, Stanford University, United States

We consider a general multi-principal multi-agent contracting game in a complete-information supply-chain setting and determine coordinating equilibrium transfer schedules in closed form. The resulting contracts manage to align incentives for decentralized decision-making and achieve first-best channel solutions. We allow for multidimensional actions and arbitrary payoff externalities between all members of the supply chain. For the coordinating contracts to exist it suffices that all payoff functions are continuous on the compact action sets in a general sense that accommodates discrete action sets. Our approach unifies and generalizes a significant portion of the extant supply-chain literature. It can be applied to a very large class of many-to-many supply-chain settings.

007-0413: Supply Chain Backorder Management Under Vendor Managed Inventory

Yan Dong, University of Minnesota, United States

Yuliang Yao, Lehigh University, United States

Kefeng Xu, University of Texas at San Antonio, United States

A vendor-managed inventory (VMI) agreement is often proposed as a coordination mechanism to improve performance in a manufacturer-distributor supply chain. However, manufacturer and distributor still square off sometimes with divergent interests. One dilemma faced by the distributor is the potentially excessive stock carried at his cost as the manufacturer tries to avoid stock outs in the distributor location. On the other hand, in case of inevitable stockouts at the distributor location, the manufacturer can not be assured of the distributor's best efforts in converting these stockouts into backorders, especially given the availability of competing products. This research demonstrates that an incentive contract involving the distributor's inventory decision in VMI could coordinate the supply chain in optimally converting stockouts into backorders for the best interests of the manufacturer. Comparisons with other common supply contracts are also provided to illustrate the strengths and weaknesses of this particular VMI contract.

78	Saturday, May 5, 8:30-10:00 Room: Terrace	Track: Health Care, 5	Chair: Anita Tucker
	Session: Frontline Systems Improvement in Healthcare Organizations		

007-0472: Systems Ambiguity and Compliance to Evidence-based Guidelines in Intensive Care Units

Ayse Gurses, University of Minnesota, United States

Yan Xiao, University of Maryland, United States

Kristin Seidl, University of Maryland Medical Center, United States

We conducted a qualitative study to understand the role of systems ambiguity in complying with evidence-based guidelines. Semi-structured interviews were conducted with eighteen care providers of two surgical intensive care units. A grounded theory approach was used in the thematic analyses of the interviews. We found that ambiguity hindering consistent compliance with the guidelines was related to tasks, responsibilities, methods, expectation, and deviations. Clarifying expectations from care providers through education, visual cues to indicate the status of patients with respect to a particular guideline, use of information tools that provide an overview of information critical for guideline compliance, standardized orders, clarifying roles of care providers, and use of decision support tools were among the strategies used to reduce systems ambiguity in the participating units. The concept of systems ambiguity can be used to understand the causes of non-compliance with guidelines and other systems failures in health care settings.

007-0475: Quality Improvement Through Diagnostic Waiting List Management

David Bamford, Manchester Business School, United Kingdom

Amy Lodge, Pennine Acute Hospitals NHS Trust, United Kingdom

We examine a hospital Division of Diagnostics & Clinical Support (150 medical, 1975 non-medical staff) and how systems were changed to facilitate quality and performance improvement. Active, focused involvement from all staff was required: clerical, medical, managerial. Changes were made to patient referral management and IT systems. Crucially a Performance & Improvement Manager transferred key skills in list 'management'. The results were recognised as beneficial to all parties, especially the patients! Staff recognised the need for change; the process transformation was actually welcomed. Patient waiting times reduced from 26 to 13 weeks. Fast-track / 'query cancer' service for outpatients now within ten days; majority of inpatients receive imaging within 72 hours. Ultimately, patients are diagnosed faster and treatment commences earlier. Departmental managers are able to effectively manage capacity to meet demand because, for the first time, they understand the waiting 'profile'.

007-0012: Lean Healthcare: Learning Via Action Research*Antonio Booyesen, University of Cape Town, South Africa**Norman Faull, University of Cape town, South Africa*

"The purpose of (action) research and discourse is not just to describe, understand and explain the world, but also to change it" (Coghlan & Brannick 2001). This paper reports an action research approach to testing lean concepts in healthcare settings. Research in three service situations is reviewed: hospice home care, a centralized pathology laboratory, and an A&E (accident and emergency) unit in a public secondary level referral hospital. The modest lessons from the hospice and laboratory are shown to yield greater impact in the A&E unit. Described by its head as "a high stress high intensity unit that is constantly overwhelmed by numbers and severity of illness of patients," the A&E unit field work was conducted by a medical doctor and MBA student, apparently the decisive difference with earlier studies. The very basic Toyota 'rules-in-use' and value stream mapping helped achieve big reductions in patient queueing times the A&E unit.

79	Saturday, May 5, 8:30-10:00 Room: Vista Session: Japanese Manufacturing in Transition	Track: JIT & Lean, 2	Chair: Tomoaki Shimada
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007-0243: Highly Reliable CAE Model, The Key to Strategic Development of New JIT*Kakuro Amasaka, Aoyama Gakuin University, Japan*

In recent years, the manufacturing industry is engaging in a 'Global Production Strategy' – for 'Simultaneous Achievement of QCD'. A close look at the development designing and production process stage reveals an excessive repetition of 'Experiment, Prototyping, and Evaluation' that prevents the 'Scale-Up Effect' generated in the bridging stage between prototyping, experiment, evaluation, and mass production. For this reason, what is urgently needed is innovation to promote advance from the conventional evaluation-based development that uses prototyping and experiment process (a method based on the confirmation of real goods for improvement) which had long supported the highly reliable design to CAE prediction-based design process, to the establishment of a new development design technique, the 'New Japan Development Design Model'. In an effort to realize this, the author proposed the high quality assurance model for super short period development design, the 'Total Intelligence CAE Management Model', and demonstrated its effectiveness.

007-0405: How Can Japanese Manufactures Recover Their Competitiveness?*Keiju Matsushima, Musashi University, Japan*

In the 1990s, so-called 'Ten Lost Years', Japanese manufacturing companies faced the collapse of the 'bubble' economy caused by extreme asset deflation, and lost their competitiveness remarkably. Meanwhile, manufacturing industries in Asian countries, especially China, India have rapidly grown, resulting in deep concerns about the hollowing-out of respective industries in Japan. In these days, many Japanese manufactures, particularly electric makers and automobile makers, have already done much to improve their performance extremely. It depends not only on the economic environment, but also on new manufacturing strategies. In this article, we suggest the way to recover their competitiveness from the aspect of Enterprise integration, of manufacturing system and IT management.

007-0340: Visionary Planning at Front-End: A Missing Link for Competitive Manufacturing*Michiya Morita, Gakushuin University, Japan**Shigemi Ochiai, Jonquil Consulting Inc., Japan*

This study tries to show visionary planning at the front-end of the company's planning process becomes the heel of Achilles based on the High Performance Manufacturing data of Japanese manufacturing companies. The company's sustainability of performance depends on how well the long-run management cycle, P-D-C-A cycle, of the company works over time. The long-run management cycle here means the cycle from strategic planning, implementation and performance. Our analysis indicates strategic planning including visionary planning of the company's visions and total goals and the strategic planning for their attainment tends to fail easily even though past performances were satisfactory, as pointed out by recent literature emphasizing the importance of visionary planning. (Hamel and Prahalad, 1994; Collins, 2001) The failure of it leads to uncompetitive manufacturing process. The study emphasizes the importance of visionary planning involving manufacturing at front-end.

007-0172: Product Recalls and Corporate Social Responsibility*Akiko Onishi, International University of Japan, Japan**Tomoaki Shimada, Kobe University, Japan*

Many manufacturers have been improving their quality control with lean production. Although manufacturers spend sufficient money and human resources in managing quality, product recalls sometimes occur. If defective products cause injury or death, the recall issue is very serious. Panasonic, one of the largest home appliance manufacturers, suffered from its kerosene fan heater recalls after a few users' death or serious injury in Japan. Panasonic appropriated about US\$ 200 million for activities of the recalls in fiscal 2005. However, as a result of Panasonic's sincere action of recalls through repeated TV advertisements, the company did not lose customers. To analyze Panasonic's recall action from a manufacturer's standpoints, we conducted a questionnaire survey of the product recalls with an electrical equipment manufacturer. We found that a technical division has different viewpoints about the recalls from a sales division within the same company.

80	Saturday, May 5, 10:30-noon Room: Brasserie Session: Vertical Integration Decisions for Innovation and Design	Track: Prod Innov, 6	Chair: Jin-Kyu Park
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007-0565: Manufacturing-Development Interface: Outsourcing vs. Vertical Integration*Korhan Gurkan, Carnegie Mellon University, United States*

Make vs. buy choices, which determine which value chain activities a firm would keep in-house and which would be outsourced, are fundamental aspects of managing the firm's operations. The implications of alternative supply chain structures have been studied extensively in the context of supplier, intermediary and retailer relationships. In this paper, we consider a different dimension of value chain structure: we study how outsourcing product development impacts the level of innovation and profits in a value chain. We compare value chains where development and manufacturing are vertically integrated, and disintegrated value chains where development is outsourced and upstream firms specialize in development while downstream ones focus on manufacturing. We show that the effects of outsourcing product development crucially depend on the tail shape of the distribution of development project outcomes.

007-0016: External Technology Sourcing Strategies and Innovative Performance: Operations in the Pharmaceutical Industry

Sotiris Rompas, Warwick Business School, United Kingdom

Jannis Angelis, University of Warwick, United Kingdom

This study investigates the relationship of external technology sourcing strategies and the innovative performance of incumbent pharmaceutical firms. Biotechnology has significantly disrupted the innovation process of pharmaceutical firms, which cannot rely on internal knowledge to produce innovative products but must also acquire resources through external technology sourcing strategies. We extend the concepts of technology complementarity and innovative operations by identifying operational capabilities that directly or indirectly affect complementarity variations amongst firms. We suggest that innovative performance is highly correlated with the rate of complementarity between internal and external sourcing. The study employs a large cross-sectional panel dataset of the biggest pharmaceutical firms during 1991-2005. We find that technological proximity and timing of external technology sourcing are key contextual factors that affect complementarity and innovative performance. We suggest that firms with higher operational capabilities perform better due to the existence of high complementarity between external acquired and internally developed assets.

007-0530: Investigating the Influence of a Broker on NPD Project Outcomes in Horizontal Networks

Moronke Idiagbon-Oke, Grand Canyon University, United States

Adegoke Oke, Arizona State University, United States

We use political power theory to examine the impact of broker's power on NPD outcomes in innovation-driven horizontal networks. Based on a survey of innovation driven networks we find that both mediated and non-mediated power bases of brokers are significantly related to project development time and design performance. However, these relationships are mediated by strength of ties between members in horizontal networks.

007-0378: The Effect of Alignment of Product Architecture and Organization Structure on Product Performance

Jin-Kyu Park, Florida International University, United States

Sebastian Fixson, Massachusetts Institute of Technology, United States

The goal of this research is to empirically test two propositions by investigating the U.S. road and mountain bicycle markets from 1980 to 1992. The first proposition is that in dealing with technology requiring a modular product architecture, specialized component firms may show better product performance than vertically integrated firms. The second proposition is that in dealing with technology requiring an integral product architecture, vertically integrated firms may show better product performance than specialized component firms. This study reveals that only the second proposition is strongly supported. These results implies that firm boundary should not be static in the presence of technological changes, rather as a technology evolves to a new state that is embedded in an integral product, so do the efficient boundaries of the firm.

81	Saturday, May 5, 10:30-noon Session: Communication and Knowledge Transfer	Room: Continental	Track: Supply Chn, 6	Chair: Santiago Kraiselburd
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007-0678: Communication and Performance of Buyer-Supplier Relationships, the Influence of Demand and Technology Uncertainty

Marian Oosterhuis, University of Groningen, Netherlands

Taco Van der Vaart, University of Groningen, Netherlands

Eric Molleman, University of Groningen, Netherlands

In this study we suggest that the way people in buyer-supplier relationships communicate is related to the amount of uncertainty that is observed in buyer-supplier relationships. We differentiate between technology uncertainty and demand uncertainty and test their moderating influence on the relationship between communication and performance of buyer-supplier relationships. Hypotheses were tested with data from a sample of 405 persons, from buyer-supplier relationships of 84 different production companies in The Netherlands. Multiple respondents of both buying and supplying companies filled out the questionnaires. The results indicate that when technology and demand uncertainty are both high, frequent communication between buyers and suppliers is necessary to reach a satisfying performance. When either technology or demand uncertainty are low, frequent communication is not necessarily needed to reach a high performance. Apparently companies are then able to seek other solutions to deal with uncertainty.

007-0785: Knowledge Transfer in Supply Chain Partnership: Characteristics and Research Propositions

Abby Ghobadian, Henley Management College, United Kingdom

David Gallear, Brunel Business School, United Kingdom

Qile He, Middlesex University, United Kingdom

Peter Race, Henley Management College, United Kingdom

Nigel Spinks, Henley Management College, United Kingdom

Supply Chain Partnership as conduit of interfirm knowledge transfer is attracting increasing attention from practitioners and academics. Previous research appear to give limited clarifications on characteristics of supply chain partnership. Thus characteristics of knowledge transfer in supply chain partnership are less clarified. The literature suggests there are many types of alliances, such as franchise, R&D alliance, joint-venture. We commented that supply chain partnership is a specific type of alliance because of its vertical functional cooperative interface, loosely defined contractual agreement, more indirect performance target, and potential network-based partnership extension. All these factors make supply chain knowledge transfer to be different from that in other interfirm relationships. In this paper characteristics of knowledge transfer in supply chain partnership were discussed. A number of propositions were developed regarding relationship factors that are more likely to affect conduction of interfirm knowledge transfer in supply chain partnership based on existing theories.

007-0154: Newsboy Contracts in OR/OM Academia and in Practice: A Historical Perspective.

Santiago Kraiselburd, Zaragoza Logistics Center, Spain

This paper addresses the following questions: When was the newsboy or “news vendor model first developed? Was it motivated by the study of newsboys? Who articulated the (mostly) established idea that the model’s conclusions could be generalized? The paper analyses actual present newsboy contract in the US, explaining the chain of events that lead to its present form from its origin in the 19th century, discussing the following set of questions. When and how have newsboy contracts evolved in the US through the years? Did circumstances change in a way that impacted the types of contracts used in practice? Why is it that today, of all possible contracts, the wholesale price, full returns contract prevails?

82	Saturday, May 5, 10:30-noon Room: Executive	Track: Opt Models, 6	Chair: Amy Z. Zeng
	Session: Supply Decisions and Analysis under Uncertainty		

007-0197: Alternatives to Mathematical Optimization in Inventory Analysis

Jack Hayya, Penn State University, United States
Terry Harrison, Pennsylvania State University, United States
Uttarayan Bagchi, University of Texas, United States
Dean Chatfield, Virginia Tech, United States

We seek approaches to stochastic inventory analysis other than mathematical optimization. We know that inventory cost is a function of lead-time variability, along with other factors. We wish to exploit such a relationship to determine the optimal cost and then search for the optimal policy parameters. We also consider the problem of order crossover which renders mathematical optimization intractable since the modified lead times (after crossover) represent a time series that is futile to characterize analytically. Lastly there is the question of the general model where both demand rate (cost vector A) and lead time (cost vector B) are stochastic. Here, we use the cosine law to arrive at the optimal cost, noting that that the angle subtended by A and B is the correlation of A and B.

007-0300: The Effect of Rebates and MSRP on Manufacturer Profitability in a Supply Chain

Shilei Yang, Washington State University, United States
Charles Munson, Washington State University, United States
Bintong Chen, Washington State University, United States

Although rebates have become ubiquitous consumer promotional techniques in today’s business world, they have not received much attention in academia. We use a consumer’s utility approach to analyze the “slippage” phenomenon along with a reference price effect. We consider a two-stage supply chain whereby the manufacturer offers rebates directly to the consumers and also provides a suggested retail price to the consumers as a reference price. The consumers’ slippage behaviors are characterized by two parameters: the redemption confidence and the actual redeeming rate. We show that rebate promotions are not always beneficial to the manufacturer. The manufacturer’s optimal strategy is determined by the size of the slippage space and the consumers’ respective loss aversion rates.

007-0450: Developing Collaborative Backup Supply Contracts to Cope with Upstream Supply Chain Disruptions

Amy Zeng, Worcester Polytechnic Institute, United States

Supply disruptions account for over 70% of supply chain failures, and recent surveys reveal that companies experienced supply chain disruptions have suffered significant drops in operating income and sales growth. However, those firms that have a backup supply have maintained resilient and continuous operations during unexpected disruptions. Although using a backup supply has been a common practice in many service industries, it is less adopted in manufacturing supply chains and under addressed in academia, due in part to the intrinsic nature of a backup service, a possible large investment, and no decision tool available for assessment. In this research, we develop and examine two types of collaborative backup supply contracts for strategic, outsourced items under uncertain demand and disruptions. We report our results on the optimality and sensitivity of the decision parameters and the critical factors affecting the choice of the contract alternatives.

83	Saturday, May 5, 10:30-noon Room: Far East	Track: Mkt-Opns, 6	Chair: Shanling Li
	Session: Empirical Methods and Applications at the Marketing-operations Interface		

007-0443: Requisite Integration in the Cross-functional Context – An Empirical Investigation

Virpi Turkulainen, Helsinki University of Technology, Finland

While cross-functional integration has received great attention in recent OM literature, the majority of prior research has assumed universal positive effects of integration taking integration for granted even though the results of empirical research have been mixed. Prior research has ignored when and where integration is more important. Our starting point is that integration is an investment and we propose that introducing the concept of requisite integration (Lawrence & Lorsch 1967) to the study of cross-functional integration in OM would increase the understanding of the topic. Instead of assuming that higher integration is always beneficial, we examine the relationship between requisite integration, integration mechanisms, achieved integration and manufacturing performance. We study factors affecting requisite integration. We study these issues in a sample of 229 manufacturing plants in eight countries and three industries.

007-0120: Specifying Successful Products: Identifying Hedonic and Emotional Benefits Through Projective Survey

Jorge Correa, Fumec University, Brazil

Gustavo Souki, Fumec University, Brazil

Cid Gonçalves-Filho, Fumec University, Brazil

An increasing number of products and services are chosen by consumers, based on their extrinsic characteristics. Quality Function Deployment, Quality Surveys, Consumer Surveys, Focus Groups and Interviews are research techniques used to develop and evaluate products and services. These are excellent approaches, but as they use direct questioning, they could not generate an adequate view of hedonic and emotional benefits. This research used a survey to understand the consumer behavior of woman buying cosmetics. With 368 respondents, the research compares the results of the questionnaire and a direct questioning questionnaire. Using a quantitative approach, the researchers accomplished an exploratory factor analysis. Different factors emerged from both questionnaires (direct and projective), with more hedonic and emotional weights at the projective approach. This important finding, could suggest that use of projective survey allows quantification of importance of hedonic items to design products or services.

007-0043: Can Price Perceptions Influence Customer Satisfaction?

Panagiotis Kyriazopoulos, Technological Education Institute of Piraeus, Greece

Irene Samanta-Rounti, Technological Education Institute of Piraeus, Greece

According to Zeithaml et al. (1996), many organizations observe clear link between customer satisfaction, quality service and price perceptions associated with switching service providers. The reason is that customers have different preferences and cost heterogeneities.

This study examines the influence of price perceptions to customers' retention and how they are affected by service quality, satisfaction and switching barriers. A sample of 804 users from mobile sector. Data analysis includes factor analysis, within a 95% confidence level. Cluster analysis was used to group variables and identify differences between samples. The findings identified distinct groups of customers with positive intentions expressing preference, stay loyal longer, pay less attention to competition, and are fewer prices sensitive to the firm. Another group, faces difficulties to change service provider. This is a costly action. There is fixed cost associated with a change.

007-0362: Capabilities and Survivability of Software Companies (1995 - 2005): An Empirical Study

Shanling Li, McGill University, Canada

Jennifer Shang, University of Pittsburgh, United States

Sandra Slaughter, Carnegie Mellon University, United States

Software industry has played a critical role in the global economy. The "dot-com bubble" in 1995-2000 and its subsequent burst provide an excellent opportunity to understand how software companies compete and survive in the internet age. This research first examines the capabilities of the software industry from the marketing, operating and innovation perspectives in the period of 1995-2005. It then links the relationship between the capabilities of the 500 firms and their survivability. Stochastic efficiency frontier and survival functions are applied. The computational results and managerial implications will be discussed.

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Saturday, May 5, 10:30-noon **Room:** Florentine
Session: Green Supply Chains Tutorial

Track: Sustain Ops, 7

Chair: Rob Klassen

007-0656: Greener Supply Chains: Design to Logistics

Robert Klassen, University of Western Ontario, Canada

Building stronger course pedagogy for our students can range from a strategic level, emphasizing such aspects as product design and supply chain structure, to a more tactical level, with a focus on supplier review, logistical timing and quality. The implications of such a broad spectrum will be explored and suggestions for possible course integration will be offered.

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Saturday, May 5, 10:30-noon **Room:** Fountain
Session: Strategy for Inter-firm Networks

Track: Ops Strat, 6

Chair: Cecil C Bozarth

007-0463: Vertical Integration Strategy in Manufacturing Industry: An Exploratory Study

Aldo Bastos Jr., Fundacao Getulio Vargas / Klabin, Brazil

Marcelo Pedroso, University of Sao Paulo, Brazil

Joao Csillag, Fundacao Getulio Vargas, Brazil

The strategy of vertical integration may be associated with a large range of advantages and benefits regarding the performance objectives of enterprises. Some disadvantages may be also associated to this strategy. This article presents an exploratory study about vertical integration for manufacturing enterprises. The construct competitive advantage was evaluated in terms of Slack and Lewis' (2001) performance objectives. The results identified that vertical integration provided competitive advantages related to both supply dependability and raw material costs. This article did not find evidence of advantages or disadvantages related to quality and speed. The study found that vertical integration caused a loss of flexibility.

007-0414: A Real Option Perspective On Supply Chain Management Strategy in Collaborative Alliances Framework

Thierry Rakotobe-Joel, Ramapo College of New Jersey, United States

Resulting supply chains from collaborative alliances and joint ventures often face a multi-faceted challenge that may jeopardize the entire process. This paper looks at the implementation of a real option strategy to counter such risk. A simulation study was conducted in order to look at various implementation alternatives, with special focus on supply chain design, strategy, and the required multi-staged decisions. Related performance metrics are proposed in order to formalize the results.

007-0182: Inter-firm Network: A Methodological Approach for Operations Strategy

Jose Gobbo, Sao Paulo State University, Brazil

This paper presents the results of a field research study to verify the validity of the operations strategy theory, which has been developed under a business unit paradigm and an inter-firm networks perspective. For this study, it was necessary to make some adaptations on the existing methodological approaches and theoretical ground for operations strategy to cope with the specificities presented by inter-firm networks. Under this context, the paper presents one methodological approach to extend the scope of two decision areas of operations strategy (vertical integration and facilities) while considering an inter-firm networks perspective. The study proposes an integration of these different perspectives in an empirical study to analyze the re-configuration in an inter-firms network.

007-0532: The Impact of Supply Chain Complexity on Manufacturing Plant Performance

Cecil Bozarth, North Carolina State University, United States

Donald Warsing, North Carolina State University, United States

Barbara Flynn, Indiana University, United States

E. James Flynn, Indiana University, United States

We propose a model of supply chain complexity and test it empirically using plant-level data from 179 plants across six countries. We test the impact of supply chain complexity on plant performance, and we examine the potential moderating effects of four sets of managerial practices suggested in the organizational science and operations strategy literatures. Of the three dimensions of supply chain only upstream complexity shows a significant, negative relationship to plant performance. Upstream complexity has a strong impact on schedule attainment, providing empirical evidence that geographically dispersed supply bases can significantly hamper the ability of plants to effectively and consistently meet production schedules. No significant moderating effects were found, although the practice of lateral relations demonstrated a positive impact on performance. A cluster analysis reveals an interesting mix of management practices in the face of various sources of complexity.

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Saturday, May 5, 10:30-noon **Room:** French

Track: Sustain Ops, 3

Chair: Dan Guide

Session: How to Work with Industry but Publish in Academia

007-0539: How to Work with Industry but Publish in Academia

Luk Van Wassenhove, INSEAD, France

V. Daniel Guide, Jr, The Pennsylvania State University, United States

We discuss our experiences in working with industry on relevant problems and how to leverage these experiences into academic research and teaching cases.

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Saturday, May 5, 10:30-noon **Room:** Garden

Track: Education, 6

Chair: Srinagesh Gavirneni

Session: Workshop: Semester in Strategic Operations: Cornell Example

007-0239: Semester in Strategic Operations - Immersion Learning Prepares Cornell MBA's for the Real World

Jan Suwinski, Cornell University, United States

Srinagesh Gavirneni, Cornell University, United States

Semester in Strategic Operations (formerly Semester in Manufacturing) is a 15.5-credit immersion program targeted to the first year MBA students in the Johnson School at Cornell University. Taught by a team of professors with business and academic experience, SSO effectively combines classroom learning with plant visits and guest speakers. We will discuss the evolution of this immersion course, curriculum design, the learning objectives, and the results achieved from this popular program. A formal presentation will be followed by a panel discussion, and a question and answer session.

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Saturday, May 5, 10:30-noon **Room:** Green Room

Track: Int/Global, 1

Chair: Michael Naor

Session: Cultural and Organizational Problems in Global Operations

007-0427: Organizing for Knowledge Transfer in Outsourcing Situations

Dan Paulin, Chalmers University of Technology, Sweden

Kaj Suneson, Chalmers University of Technology, Sweden

The purpose of this article is to analyze how different organizational and operational solutions affect knowledge transfer between product development units in Sweden/western Europe and production units in India/China. Case studies at several Swedish multinational companies are used as empirical base. The analysis includes, for example, the characteristics of the knowledge transferred, the source, the recipient and the context in which the knowledge transfers takes place (such as organizational structures and coordination mechanisms). The primary results show that the combination of the characteristics of the transferred knowledge and the organizational structure affects the outcome of the knowledge transfer process. The managerial implications regarding the decision making process are also discussed.

007-0228: Developing a Training Strategy for a Chinese Manufacturing Company

Hong Woo, Middlesex University Business School, United Kingdom

Joyce Ling, Middlesex University, United Kingdom

China's aspiration for modernization and rapid industrialization requires an investment in its human capital. As more lowly skilled jobs are being replaced by jobs that require problem solving, interpersonal and cognitive skills, there is a need for people to be able to work effectively in a rapidly changing and increasingly complex environment. In addition, as China moves towards a market economy, the issue of workforce skills is paramount. However, there seems to be a shortage of skilled labour in China. Hence, Chinese organizations should nurture their human capital through adequate training and development. This paper investigates the need and development for training in a Chinese company, and the development and challenges faced by Chinese companies adopting training programmes.

007-0277: Psychic Distance in Global Operations Management

Naomi Brookes, *Aston Business School, United Kingdom*
James Smith, *Brintons, United Kingdom*

The impact of national culture on the management of global operations is a growing field of research. The influence of national culture can be discerned in a wide variety of operations management decision processes (e.g.ERP implementation, quality systems, outsourcing decisions). Dealing appropriately with national cultural differences is of increasing importance to global operations management networks. A construct that has been used with some success to capture the difference between national cultures is that of 'psychic distance'. This paper discusses the ways in which psychic distance can be operationalised in an operations management context, and using a series of 'micro-cases', compares the utility of psychic distance over other cultural measures in delineating the effect of national culture on operations management.

007-0085: The Mismatch Between Organizational and National Culture: Does Culture Fit Effect Performance?

Michael Naor, *George Mason University, United States*
Roger Schroeder, *University of Minnesota, United States*
Kevin Linderman, *University of Minnesota, United States*

The goal of this study is to examine the convergence/divergence debate in the international management literature, by investigating the multi-level relationship between organizational and national culture, and their impact on manufacturing performance. Data analysis of 189 plants from six countries shows that organizational culture inside plants differs across countries and it is weakly associated with the national culture (according to GLOBE framework) where the plants are located. Furthermore, polynomial regression analysis indicates that organizational culture has more effect than national culture or the fit between them, on manufacturing performance.

8	Saturday, May 5, 10:30-noon Session: Various SCM Issues	Track: Supply Chn, 19	Chair: Jianli Hu
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007-0341: A Pricing Model and Simulation of Eastern Route of South-to-North Water Transfers Supply Chain

Huimin Wang, *Hohai University, China*
Li Zhang, *Hohai University, China*
Wei Yang, *Hohai University, China*
Jinping Tong, *Hohai University, China*

Pricing is the key issue of operation and management of eastern route of south-to-north water transfers in China. Based on supply chain of eastern route, we gave an expanded description of the joint pricing model based on Operational Approach, designed the dynamic pricing restrictions about upper price limit by simulation. It demonstrates that supply chain nodes favor more profits in the joint pricing model than Stackelberg pricing model. Win-win of the whole chain can be realized by designing profits sharing.

007-0160: Analysis of Bounds for Sole versus Dual Sourcing Inventory Models

Charles Munson, *Washington State University, United States*
Mihaela Vajiac, *Chapman University, United States*
Jianli Hu, *Chapman University, United States*

The fact that many companies today are developing strategic relationships with their suppliers makes the issue of selecting proper number of suppliers increasingly important. In this study, we present easily calculated bounds for the dual sourcing problem and show that these bounds are mostly tight under a large numerical experiment design, which implies that the error of using the bounds will be rather small in most purchasing scenarios. In addition, we compare the cost of single sourcing with the bounds of dual sourcing. The results reveal that in most cases the answer to whether one or two suppliers should be used is given clearly by the comparison.

007-0342: The Effect of VMI on the Bullwhip Effect in the South-to-North Water Transfer Supply Chain

Yanhong Hou, *Hohai University, China*
Li Zhang, *Hohai University, China*
Huimin Wang, *Hohai University, China*
Lei Qiu, *Hohai University, China*

Vendor managed inventory (VMI), has been widely used in various industries. The South-to-North Water Transfer Project(SNWT) is public infrastructure dispatching the unwanted water from southern to northern district. In this paper we analyzed the feasibility of application of VMI to the SNWT supply chain, which means water retailers give control of inventory to vendor. Finally, the paper simulates the effect of VMI on the Bullwhip Effect in the SNWT supply chain. The results prove that the application of VMI in the SNWT supply chain has a dramatic contribution to the decrease of Bullwhip Effect.

007-0455: Decision Making at the Production Marketing Interface Using APO

Sanjay Kumar, *XLRI Jamshedpur, India*

In current environment of increased customer responsiveness, and the availability of real time data through ERP systems, the paper studies impact of ERP add-ons (APO) on decision making at the interface of sales and production. Use of Advanced Planner and Optimizer allows for higher availability of analytics and processed information in decision making at the production marketing interface. Tradeoffs required by various players comprise a complex decision making process, and the impact of APO on the process is studied.

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Saturday, May 5, 10:30-noon **Room:** Panorama
Session: Models for Managing Supply Chain Disruptions

Track: SC Disrupt, 2

Chair: Paul Kleindorfer

007-0033: Managing Supply Chain Disruptions: Descriptive Analysis and Analytical Modeling

Germaine Saad, Widener University, United States

This paper discusses basic trade-offs and missing links necessary to monitor disruptions faced in supply chain operations. Based on this analysis, classification of different types, and categories of disruptions and pertinent insights, an analytical model is developed. The AHP framework is used to incorporate in the model both relevant quantitative and qualitative factors simultaneously, and to take advantage of the flexibility and robustness features of this framework. The model design will be presented along with implementation guidelines.

007-0244: A Transportation Network Efficiency Measure that Captures Flows, Behavior, and Costs with Applications to Network

Anna Nagurney, University of Massachusetts at Amherst, United States

Qiang Qiang, University of Massachusetts at Amherst, United States

We propose a transportation network efficiency measure that can be used to assess the performance of a transportation network and which differs from other proposed measures, including complex network measures, in that it captures flows, costs, and travel behavior information along with the topology. The new transportation network efficiency measure allows one to determine the criticality of various nodes (as well as links) as we demonstrate through a network component importance definition, which is well-defined even if the network becomes disconnected. Several illustrative transportation network examples are provided in which the efficiencies and importance of network components are explicitly computed. Their rankings are tabulated. This framework can be utilized to assess the vulnerability of network components in terms of their criticality to network efficiency/performance and to, ultimately, enhance security.

007-0671: Evaluating and Optimizing the Performance of Complex Multi-stage Supply Chains Under Disruptions

Sanjay Kumar, University of Texas at Dallas, United States

Kathryn Stecke, University of Texas at Dallas, United States

Tom Schmitt, University of Washington, United States

Fred Glover, University of Colorado at Boulder, United States

Many companies are vulnerable to uncertainties in demand and possibilities of disruptions. While the need to understand these effects to probe for weaknesses, predict outcomes, and test policies is undeniable, the scale and complexities involved pose significant problems. In collaboration with Sandia National Labs, we develop and validate a supply chain model to study manufacturing and transportation within high-tech electronic supply chains in the Pacific Northwest. This includes case studies of electronics firms, analysis of databases, interviews with selected companies, a review of inventory, and supply-chain literature. We developed a large-scale optimization-embedded simulation model. We study various disruption types and inventory management policies. Various search methods such as Tabu search, genetic algorithms, and Fibonacci search are used to determine order-up-to quantities at various stages of the supply chain. We develop and test various scenarios related to various costs, expediting, and the length of disruptions.

007-0386: Responding to Shipment Delays: The Roles of Operational Flexibility & Lead-time Visibility

Aditya Jain, Indian School of Business, India

We consider a periodic review stochastic inventory system in which shipments are subject to random delays. For this inventory system, we analyze various response strategies devised to mitigate the risk of demand-supply mismatch resulting from shipment delays. These strategies differ in operational flexibility and lead-time visibility required for their implementation. With each of the response strategies, we derive the optimal policy for making decisions and illustrate the effects of operational flexibility and lead-time visibility on the structure of optimal policies. We provide cost comparison of these strategies, using an extensive set of numerically solved examples. We show that the operational flexibility mitigates the adverse effect of long lead-times, the lead-time visibility provides protection from the risk of lead-time uncertainty. Further, we show that operational flexibility and lead-time visibility enhance each other's values, or in other words are complementary in nature.

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Saturday, May 5, 10:30-noon **Room:** Parisian
Session: Empirical Benefits of Information Use

Track: Emp Res, 6

Chair: Jeff Stratman

007-0403: Towards a Selection Model for Technology Integration for Healthcare Organizations

Asoke Dey, University of Minnesota, United States

Kingshuk Sinha, University of Minnesota, United States

Sriram Thirumalai, University of Utah, United States

Though application of information technologies in healthcare supply chains has direct positive impacts on patient safety and business-process reengineering, inappropriate choice of technologies and lack of integration across these technologies have left much to be desired. This study develops a conceptual understanding of how firms select the appropriate bundle of technologies and how it affects the performance of these firms. The econometric analysis in the study is based on data collected from 1005 healthcare organizations in the US. The findings of the study indicate that while greater investment in technologies leads to superior capabilities and in-turn better performance, not all firms will benefit. Specifically, we find that hospitals self-select themselves into different levels of technology integration and benefit from doing so. Implications of the study findings, limitations, and directions for future research are identified.

007-0388: Revenue Management Performance Drivers: An Exploratory Investigation*Carrie Crystal, Georgia Institute of Technology, United States**Mark Ferguson, Georgia Institute of Technology, United States**Jeff Stratman, University of Utah, United States*

We present an exploratory investigation of revenue management performance drivers. The literature shows that market segmentation, pricing, forecasting, capacity allocation, IT use, organizational focus, aligned incentives, organizational structure, and education and training contribute to effective RM. We group these elements into two concepts: RM technical capability and RM social support capability and propose that these capabilities positively impact RM performance. We present results from a survey applied to the hotel industry. In line with expectations, we find evidence that forecasting and organizational focus positively impact RM performance. On the other hand, the results show evidence that the current perceived "best practice" hotel hierarchy structure negatively impacts RM performance. We provide a few explanations for this non-intuitive result and proposals for future research.

007-0462: Linking Quality Management to Mass Customization: A Knowledge-based View*Xiaowen Huang, Miami University, United States**Mehmet Kristal, York University, Canada**Roger Schroeder, University of Minnesota, United States*

This study investigates the role of quality management in the development of mass customization capability. Building upon the knowledge-based view, we argue that quality-management practices enable the creation of knowledge associated with both products and processes within a plant. In turn this enhanced knowledge base contributes to product modularization and the effective implementation of process, which lead to mass customization capability. Our analysis based on 189 manufacturing plants in three industries and six countries, provided empirical support for the indirect effects of quality-management practices on mass customization capability, mediated by effective process implementation and product modularization.

007-0130: Choices in Operational Information Focus: Implications for Strategic Efficiency and Paths to Profitability*Elliot Bendoly, Emory University, United States**Eve Rosenzweig, Emory University, United States**Jeff Stratman, University of Utah, United States*

The widespread adoption of enterprise systems reflects the view that information systems can provide firms with a competitive advantage. Yet the average financial impact of enterprise system adoption is essentially neutral. Information processing theory suggests the explanation that the overwhelming amount of business information provided by these systems may actually hinder decision making if not carefully managed. In this study, we examine the efficient use of three types of enterprise information sources in the realization of common strategic goals. We employ data envelopment analysis on a sample of 63 manufacturers to calculate a measure of efficient information use. This efficiency metric correlates significantly with COMPUSTAT profitability data, providing evidence that efficient information use affects bottom-line performance. Additional analyses suggest that a manufacturer's choice of operational information focus varies with its level of efficiency and the position of its primary products in the product lifecycle.

92Saturday, May 5, 10:30-noon **Room:** Patio**Track:** OAG, 1**Chair:** Harm-Jan Steenhuis**Session:** Working with Industry: Experiences from the Field**007-0502: Modeling a Pilot Manufacturing Process - Experiences, Observations, and Results***Asoo Vakharia, University of Florida, United States*

Industry collaborations are one of the more insightful pursuits for a faculty member. In this paper, the research focus is on analyzing the pilot manufacturing process for a major contact lens manufacturer. This collaboration was initiated when several key executives from the company attended an executive MBA program at the University of Florida and through coursework were exposed to some of the key issues in managing operations. On completion of the program, these executives felt that some of the problems associated with managing the pilot manufacturing process within their company could perhaps be addressed using generic operations models and methodologies. After being invited to a site visit and touring the manufacturing facility, discussions with the managers and process personnel resulted in the identification of key project deliverables. This presentation will focus on issues related to: (a) managerial/researcher interactions – challenges and opportunities; (b) identification of project deliverables – what can/cannot be accomplished and how conflicts can be resolved; and (c) lessons learnt which could be of use to guide future industry/faculty collaborations.

007-0250: Role of Supply Chain Coordination in OM: Select Experiences from India*Arshinder Arshinder, Indian Institute of Technology Delhi, India**Arun Kanda, Indian Institute of Technology Delhi, India**S G Deshmukh, Indian Institute of Technology Delhi, India*

Supply Chain (SC) concerns the integration (combining into harmony) of processes between various different but dependent SC entities to manage seamless flow of resources and information. SC Coordination helps in managing dependencies, which seems to be often conflicting among various entities, especially in developing countries. It can be challenging for teaching community to tackle the problem at the activity and interface level with existing analytical models, which are highly fragmented, myopic and disjointed. The utility of these models seem to be limited from practitioners point of view. In this paper, a pedagogical framework using heuristics and simulation is proposed with managerial implications and insights, which can act as a learning device-cum- decision support to the practitioners, thereby, bridging gap between model and reality. The framework may also link coordination mechanisms and performance.

007-0554: Working with Industry: A Conceptual Model with Examples*Harm-Jan Steenhuis, Eastern Washington University, United States*

Denis Gray, North Carolina State University, United States

It has been argued that Operations Management scholars have lost touch with practitioners. The Operations Advantage Group is one initiative to improve the academia-industry relationship. In this paper, a conceptual model is presented that illustrates different methods in which universities and industry can interact. These interactions can take place as part of teaching, research and/or service activities. They can also vary in their organizational formality. For instance, research interaction between firms and universities can occur via research contracts (low formality) or industrial consortia (high formality). Pros and cons of the different types of interactions are discussed from a university as well as from a company viewpoint. Furthermore, examples of the different types of interactions are provided.

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Saturday, May 5, 10:30-noon **Room:** Royal
Session: Gaming in Supply Chains

Track: Games, 1

Chair: Shuya Yin

007-0063: Group Buying Mechanisms for Business-to-Business Exchanges

Cuihong Li, University of Connecticut, United States

Rachel Zhang, Hong Kong University of Science and Technology, China

Rachel Chen, University of California at Davis, United States

In a group-buying mechanism, a seller offers quantity discounts and buyers pay a price based on their aggregated purchasing quantity. As a dynamic pricing mechanism, group buying allows buyers to aggregate their purchasing power and obtain lower prices than they otherwise would be able to get individually. Unlike in the traditional quantity discount, the price in group buying decreases with the total purchasing quantity, which implies the existence of positive externality among buyers. We consider two group buying mechanisms in business-to-business exchanges when buyers vary in their valuations. We study the buyer's bidding behavior, and compare the buyers' surplus, the seller's revenue, and social welfare under these two mechanisms.

007-0066: Contracting for Supply Flexibility Under Asymmetric Information

Tianjun Feng, University of California, Irvine, United States

Fuqiang Zhang, University of California, Irvine, United States

This paper studies a buyer's procurement problem when there are either one or multiple potential suppliers with private cost information. The market demand is uncertain and the supplier needs to make capacity decisions before demand is realized. We derive the optimal procurement mechanism for the buyer and also identify simple mechanisms that perform well.

007-0371: Impact of Slotting Fees on Product Variety and Consumer Surplus

Ling Wang, University of Miami, United States

Ravi Anupindi, University of Michigan, United States

Roman Kapuscinski, University of Michigan, United States

Several rationales for the existence of slotting fees cited in the analytical literature do not find support in the empirical literature. Furthermore, the analytical literature tends to evaluate the benefits of slotting fees to manufacturers and retailers; rarely have these considered its impact on consumers and social welfare. We propose to address these gaps. We consider a two-stage supply chain with two competing suppliers and one retailer. The retailer may carry products from both suppliers but incurs a transaction cost with each supplier. The retailer charges a slotting fee and suppliers compete to provide their products. Our analysis suggests that, contrary to often quoted claims, slotting fees do not always lead to less variety or higher price. When variety is indeed decreased, it is usually compensated by lower prices. We further find that consumer surplus often increases with the use of slotting fees.

007-0062: Coalition Formation Among Component Suppliers in Decentralized Assembly Systems

Shuya Yin, University of California, Irvine, United States

This paper studies coalition formation among component suppliers in various decentralized assembly systems. Demand for the final product can be deterministic or stochastic. When it is stochastic, demand can be (selling) price-independent or price-dependent. We analyze the coalition structure(s) emerging in equilibrium, and we also examine the impact of demand uncertainty and the assembler's control over the selling price on the stable coalition structure(s).

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Saturday, May 5, 10:30-noon **Room:** State
Session: Tutorial: Operational Economics

Track: Games, 6

Chair: Marty Lariviere

007-0296: Tutorial: Operational Economics

Martin Lariviere, Northwestern University, United States

This is a tutorial on Operational Economics.

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Saturday, May 5, 10:30-noon **Room:** Terrace
Session: Scheduling and Coordination in Healthcare Delivery Systems

Track: Health Care, 6

Chair: Daniel Wright

007-0498: Blocking in Service Operations: New Heuristics and a Healthcare Application

Hubert Pun, Indiana University, United States

Kurt Bretthauer, Indiana University, United States

Hans Heese, Indiana University, United States

We consider the problem of optimal capacity allocation in a hospital setting, where patients need to sequentially pass through two stations, for example acute care and post-acute care. If the post-acute care station is saturated, a patient whose service at the acute care unit is complete is blocked and cannot leave the acute care unit. We suggest new heuristics to efficiently evaluate the effects of such blocking on system performance and we demonstrate that these heuristics are superior to those suggested in the literature. We apply our heuristics to derive insights and actionable capacity strategies for a specific hospital context, where such blocking occurs between the acute care and post-acute care units.

007-0586: Supplier Selection in Health Care

Joseph Van Orden, University of Utah, United States

Rohit Verma, Cornell University, United States

Supplier selection is a widely studied area of research in operations management, supplier chain management and other academic disciplines. However, most research studies have been conducted in the context of manufacturing and distribution of products. In this study, we examine how suppliers for a range of medical imaging equipments are selected by health care organizations. Empirical data for this study was collected from over 400 executives, doctors, and technologies from various hospitals in the United States.

007-0658: Outpatient Appointments: Scheduling with the Plateaued-Dome Pattern

Kenneth Klassen, Brock University, Canada

Reena Yoogalingam, Brock University, Canada

Outpatient health care service providers face pressure to improve the quality of their service through efficient scheduling of appointments. In this paper a simulation-optimization approach is used to determine optimal rules for a stochastic appointment scheduling problem. The dome scheduling rule proposed in some prior literature is robust, but practitioners could benefit from considering a flatter, plateaued-dome. The plateaued-dome scheduling pattern is shown to be robust over many different performance measures and scenarios. In addition, it is shown that: the pattern holds up with the presence of no-shows, the performance measure chosen has a large impact on which appointment schedule is deemed best, and end-of-day decisions (e.g., when the doctor wants to go home) have a large impact on which appointment schedule is most appropriate. Other findings are also provided, including methods to reduce algorithm search times in the outpatient scheduling environment.

007-0240: Value of Information for Patient-Flow Coordination

Vikram Tiwari, Indiana University Bloomington, United States

Kurt Bretthauer, Indiana University, United States

M Venkataramanan, Indiana University Bloomington, United States

This study addresses the value of information for improving the performance of a healthcare delivery network. Sharing information should lead to more effective coordination of capacities; however, such improvements may be contingent upon the variability of demand and service rates, and also on the capability of the network to respond to the information stimulus. An acute care hospital is simulated using data obtained from a healthcare system located in a major city on the West Coast, and the value of sharing information, both static and in real-time, against varying levels of resource flexibilities and demand and service rates is tested. The conditions that offer the greatest potential to exploit information availability are determined.

96	Saturday, May 5, 10:30-noon Room: Vista Session: Technology and Business Infrastructure for JIT production	Track: JIT & Lean, 3	Chair: Munenori Kajiwara
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007-0324: Hitachi's UHF RFID Project for Operations Management Professionals

Michael Kawagishi, Hitachi America, Ltd, United States

In recent years, many production operations management professionals and supply chain professionals have implemented and examined the performance of RFID. They all have reached one conclusion, '3H' = High defect rate, High reading error, and High cost. To overcome these problems and to support POM professionals, Hitachi has developed a new UHF RFID tag named 'Hibiki'. Hibiki RFID tag enables POM professionals to monitor and track Quantity, Condition, and Location information at above desired accuracy level. In this presentation, we will discuss various techniques and benefits for POM professionals.

007-0325: Sensor Networks and Sensible Organizations for Operations Management

Koji Ara, Massachusetts Institute of Technology, United States

Akiko Sato, Hitachi America, Ltd., United States

Sensor networks is an emerging technology that opens up numerous new opportunities in many different industries ranging from predictive maintenance and remote monitoring to precision instrumentation. In this presentation, the basic concept of sensor networks will be introduced and their technical challenges will be discussed. As an expansion of sensor network SCM application, a unique social network experiment called Sensible Organization will be introduced and show how this technology can solve the problems of industrial operations management.

007-0326: Next Generation Business Intelligence for Operations Management Professionals

Nader Fathi, SigmaQuest, United States

Recent studies found that warranty and field returns erode 30-35% of a company's potential profits. SigmaQuest provides an on-demand suite of solutions that help companies build better products using business intelligence techniques for product design, manufacturing, supplier quality, repair and returns. Benefits are reduced warranty costs, improved product quality, fewer no-trouble-founds, and increased revenue and profits.

007-0328: Visualizing What We Can Visualize, and Control What We Can Control

Munenori Kajiwara, Hitachi East Japan Solutions, Japan

Masaru Tezuka, Hitachi East Japan Solutions, Japan

Kazunori Miyabayashi, Hitachi East Japan Solutions, Japan

During forecasting and planning, errors and gaps are often overlooked, even though quantitative analysis and deeper awareness of errors and gaps may improve POM process. Quantitative uncertainty management is not fully utilized, even though many academic studies suggested that degree and/or attributes of uncertainty should support purchasing policy change. Business rule should be established based on degree and/or attributes of uncertainty. Scope of decision maker, metrics, and responsibilities are not aligned(matched); therefore, decisions and important feedback to support decisions will not fully be committed with confidence and not executed accordingly. Real world Production Operations Management Professionals do not receive the support they need; Support for methodologies and training/education for connecting dots and analysis must be in place. We have found that minimum level of data visualization and business processes to support the findings are helpful component to POM professionals.

79	Saturday, May 5, 1:30-3:00 Room: Brasserie Session: Sustainability and Innovation	Track: Prod Innov, 7	Chair: Geoffrey Parker
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007-0259: Innovation for Sustainability: New Product Development for a Greenpeace Licensed Air Conditioning Substitute

Jose Barbieri, FGV Business School, Brazil

Rogério Calia, FGV Business School, Brazil

The paper presents a case study of the new product development that created in Brazil the Ecobrisa-EB20, a product licensed by Greenpeace, due its positive environmental sustainability compared to the air conditioning equipments it substitutes, by saving up to 95% electric energy consume. The case study is based on interviews with key professionals involved in this product development project, in order to understand the innovation management determinants that resulted in this high environmental performance product. The paper reviews academic research on environmental technological innovation. Secondly, the paper describes the environmental issues of air conditioning in relation to energy consume efficiency, climate change and biodiversity in Brazil. Finally, the paper presents the case study of the innovative company Viva Equipamentos on the development of the Ecobrisa-EB20 product and on how the Greenpeace license impacted the innovation process.

007-0536: Packaging Innovation Project Towards Marketing, Logistics and Ethics Integration: Evidences from Case Studies

Maria Vernuccio, Universita di Roma la Sapienza, Italy

Alessandra Cozzolino, Universita di Roma La Sapienza, Italy

Laura Michelini, Lumsa University of Rome, Italy

Recently, product packaging has become strategic in the new competitive marketplace. Packaging is not only a "dress" but a critical component of the output that has to be managed as project. According to the literature, product packaging has different functions. In particular, three dimensions can influence packaging innovation: marketing, logistics and ethics. A new packaging design can be marketing-driven, logistics-driven and/or ethics-driven. The first dimension (marketing) refers to consumer perceptions. The second (logistics) is focused on product preservation in movement. The third (ethics) points out the social matter of packaging. The purpose of this paper is to identify the critical factors in packaging innovation and to analyse how to develop a successful packaging project to satisfy the three dimensions simultaneously in a multi-dimensional approach. Finally, we provide an analysis of some Italian packaging innovation best practices (eg. Tetra-pak, COOP).

007-0783: Plates with Agroindustrial Residues: The Life Cycle Assessment as an Instrument in the Evaluation of the Recycling Benefits

Rosane Battistelle, UNESP - campus de Bauru, Brazil

Maria Fernanda Santos, Unesp - Campus de Bauru, Brazil

Jair Manfrinato, Sao Paulo State University, Brazil

The constant growth in cellulose industry has caught the attention of researchers due to the large amount of residues produced during the process, and also due to the potential that such reject represents for the construction sector, when reusing in the manufacture of new materials. The aim of this paper is to study the life cycle of material produced from the industrial residue, since its manufacture, use and disposal, for help with one instrument regarding recycling decisions. The quantification for the input was obtained from the measurement of water, energy and car fuel consumption indices. The output data were obtained from pollutant emissions. As conclusion, the stabilizing agent that is the biggest pollutant and the cost of the plates could be reduced to 50% provided that the residue is obtained at a maximum of 100 Km from the manufacturing city.

007-0607: Managing Risk in Alternative Energy Product Development

Geoffrey Parker, Tulane University, United States

Edward Anderson, University of Texas at Austin, United States

Burcu Tan, University of Texas at Austin, United States

Developing alternative energy products is inherently risky because of volatility in oil prices. This volatility stems from cycles in oil exploration and information asymmetry because energy firms with access to the most fruitful sites for discovery of new reserves may not report them accurately due to technological or geopolitical factors. This leads us to discuss the impact of these price risks on alternative energy product development and how these risks might be mitigated.

88	Saturday, May 5, 1:30-3:00 Room: Continental Session: Fuzzy Logic, Equilibrium Modeling, Chaos Theory in SCM	Track: Supply Chn, 7	Chair: John MacDonald
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007-0249: An Integrative Framework for Coordination in Supply Chain

S G Deshmukh, Indian Institute of Technology Delhi, India

Arshinder Arshinder, Indian Institute of Technology Delhi, India

Arun Kanda, Indian Institute of Technology Delhi, India

Supply chain coordination relates to effective management of different disparate but dependent members/processes. Dependencies between various members and coordination mechanisms to manage these dependencies are captured by proposing coordinated-procurement model in this framework. The applicability of coordination theory has motivated a holistic approach called as Situation-Actor-Process-Learning-Action-Performance for exploring the status of coordination. The effectiveness of various coordination mechanisms is modeled through multi-criteria approaches based on graph theory and fuzzy logic. The extent of coordination is evaluated by qualitative study (based on the inputs given by practitioners) and simulation. Simulation helps in assessing the value of coordination in terms of improvement in various performance measures related to coordination. The novelty of the integrative framework lies in combining a rich mixture of both qualitative and quantitative tools to address important issues in coordination and applying the same to a real-life case.

007-0460: Modeling Coordination in a Dynamic Supply Chain : A Fuzzy Logic Based Hybrid Negotiation Mechanism

Vipul Jain, INRIA-Lorraine, France

Lyes Benyoucef, INRIA-Lorraine, France

To model coordination in a dynamic supply chain, this paper proposes a new fuzzy logic based hybrid negotiation mechanism. In most real world negotiation situations, agents have a common interest to cooperate, but have conflicting interests over exactly how to cooperate. These situations involve constrictions and preferences that may be vaguely and partly defined. This study takes advantage of fuzzy logic and develop a hybrid negotiation based mechanism, which combines both cooperative and competitive negotiations. The different strategies adopted by agents may produce conflicts. While agents coordinate with each other in the operations, they negotiate their strategies to reduce conflicts. The proposed mechanism allows negotiation agents more flexibility and robustness in an automated negotiation system. The efficacy of the proposed approach is demonstrated through an illustrative example.

007-0232: Multiperiod Competitive Supply Chain Networks with Inventorying and A Transportation Network Equilibrium Reformulation

Zugang Liu, University of Massachusetts at Amherst, United States

Anna Nagurney, University of Massachusetts at Amherst, United States

We present a multitiered dynamic supply chain network equilibrium modeling framework in which the decision-makers have sufficient information about the future and seek to determine their optimal plans that maximize their profits over the multiperiod planning horizon. We construct the variational inequality governing the equilibrium of the multiperiod competitive supply chain network. The model allows us to investigate the interplay of decision-makers in the supply chain in a dynamic setting, and to compute the resultant equilibrium pattern of product outputs, transactions, inventories, and product prices. We then establish the supernetwork equivalence of the multiperiod supply chain model with a properly configured transportation network. This framework offers great modeling exibility so that transportation delay and/or perishable products can be easily handled. Numerical examples are provided to illustrate how such multiperiod supply chain problems can be reformulated and solved as transportation network equilibrium problems in practice.

007-0534: Practical Implications of Chaos in Supply Chains

Ian Frommer, US Coast Guard Academy, United States

Itir Karaesmen, University of Maryland, United States

John MacDonald, University of Maryland, United States

Supply chains are complex systems, potentially filled with nonlinearity, feedback effects, delays, and discontinuous behavior. These features can also be found in chaotic systems. Hence, analyzing supply chains from the perspective of chaotic dynamics can shed light on the behavior of the supply chain. In this paper we give an overview of chaotic dynamical systems, discuss connections between chaos and supply chains, and extend previous work on chaos in the beer game by focusing on practical implications of chaos. We describe how insights gained from this type of analysis can help managers determine appropriate prediction horizons as well as study the impact of changes in supply chain parameters on system behavior.

007-0278: Supply Chain Management and its Impact on Operation Function

Amarpreet Kohli, University of Southern Maine, United States

There has been a major paradigm shift in traditional operation management ideology, which has defined supply chain management as just one of the important operation decisions. In fact, the value of supply chain management in the contemporary business world has augmented to such an extent that it has become one of the most popular concepts today. Thus, Supply Chain Management can be viewed as one of the key business functions having a strategic, tactical, and operational impact on other traditional functions of the firm including Operations.

99	Saturday, May 5, 1:30-3:00 Room: Executive Track: Opt Models, 7 Chair: David I Heimann
	Session: Applications of Optimization Models in Supply Chains

007-0506: Location, Process, and Routing Optimization Framework and DSD Consolidation Case Study

Juan Valencia, Clarkston Consulting / University of Dallas, United States

Daniel Lago, Clarkston Consulting, United States

Carol Kozlowski, Clarkston Consulting, United States

Nowadays, many companies are facing challenges that could change the dynamics of their core business, implying a realignment of distribution networks, manufacturing sites, and warehousing capabilities in order to serve their clients. The traditional approach is to divide the problems into separate isolated models, include assumptions to resemble the real challenge, and use different software and tools for each sequence and iteration. The final solution results in the aggregate total of the optimal solution from each separate model. Although developments have been done providing robust algorithms that aim to solve the problem collectively, the use has not achieved widespread adoption. This paper addresses the strategic and operational impact of utilizing optimization tools to solve routing, location, and process optimization problems. It provides a case study based on a leading convenience-store supplier and wholesale-food distributor facing DSD consolidation, impacting distribution network, and describes the approach to solve the problem.

007-0194: A Closed-Form Positive-Inventory Approximation Model*David Heimann, University of Massachusetts Boston, United States**Frenck Waage, University of Massachusetts Boston, United States*

In real supply chains, the assumption about the supplier's reliability is not always satisfied. The supplier's unreliability introduces a dilemma to the purchaser. If the reorder point r is set low, the purchaser may run out of product before re-supply, incurring outage costs. On the other hand, if r is set high, larger inventories would be carried incurring an increase in inventory carrying costs. The present paper extends earlier results developing approximate closed form formulas for the cost-minimizing order point so that the assumption that $r = 0$ is no longer required. We discuss the value of a closed-form solution, and obtain the optimal reorder quantity q for given values of r , optimal r for given values of q , and the globally optimal cost minimizing pair (q^*, r^*) . We establish that these optima have costs that are close upper bounds to the costs for the exact formulation.

100Saturday, May 5, 1:30-3:00 **Room:** Far East**Track:** Mkt-Opns, 7**Chair:** Daewon Sun**Session:** Decision-making Problems at the Operations Marketing Interface**007-0495: Simultaneous Evaluation of Product Line Decisions and Investment in Production Technology/Capacity Decisions***Sarang Jagdale, IIM Bangalore, India**Ishwar Murthy, IIM Bangalore, India**L Murty, IIM Bangalore, India*

Research has shown the need for a balance between revenue and cost dimensions while determining the optimal product mix. Yet there is scant research that integrates product line decisions (extensions and trimming) and manufacturing technology (dedicated or flexible resources) and capacity decisions. This study developed a model that simultaneously considers these decisions as a 0-1MILP. A solution method is developed using constraint tightening and valid inequalities that resulted in reasonably good solutions with reduced computational effort for test problems. A primal-dual procedure is developed using interlinking variables, complicating constraints, and dual objective function gradient change that yielded optimal solutions in 67.5% test problems. An additional 20% test problems had their solution within 5% of the optimal solution. For problem parameters like cannibalization levels and cost structures, some interesting observations are made that link the product line decisions with manufacturing technology and capacity decisions.

007-0122: Product Pricing, Market Information, and Salesforce Incentives*Ying Zhang, University of Wisconsin - Milwaukee, United States**Samar Mukhopadhyay, University of Wisconsin - Milwaukee, United States*

Many firms sell their products outshore. They gain market knowledge through their salespeople. Local salespeople have market information which is critical for a foreign firm to make product price. A major question is how a firm can provide incentives to the local salespeople so that they are willing to disclose what they know about the market and putting more efforts at the same time. We will provide a solution to this question and give some managerial explanation.

007-0028: The Impact of Context Effect on Product Design*Bin Shao, University of Illinois, United States**Dilip Chhajed, University of Illinois, Urbana-Champaign, United States*

We present a new model of customer's buying behavior that explains the customer choice under the observed marketing phenomenon, "context effect", which suggests that the customer deviates from the standard rational choice model. Our model allows us to explore the effect of context effect on product design problem. We develop guidelines to help the managers in designing products and they also can be used for upselling - moving the customers to a higher level product.

007-0578: Performance of Single-Unit Buyout Auctions*Daewon Sun, University of Notre Dame, United States**Jack Hayya, Penn State University, United States**Zhaolin Li, City University of Hong Kong, Hong Kong*

Motivated by the proliferation of online selling, we study a seller's decision problem: The seller has one unit of product and needs to choose a selling format among three different selling formats (posted price, auction, and auction with buyout price) and to decide upon the corresponding decision variables. We first characterize and identify the customers' decision rule for auction with buyout price, and then present the seller's optimal choices by comparing the performance of the three choices. Through a comprehensive numerical study, we investigate the performance of the three selling formats by changing the experimental factors. Interestingly, we find that buyout auctions strictly dominate pure auctions; however, posted price can outperform buyout auctions. We discuss some conditions that make buyout auctions more preferable.

101Saturday, May 5, 1:30-3:00 **Room:** Florentine**Track:** Sustain Ops, 8**Chair:** Aejaz Khan**Session:** Managing Returns**007-0600: Optimal Control of a Returns Evaluation Facility***Aejaz Khan, University of Houston, United States**Basheer Khumawala, University of Houston, United States*

We determine policies for operating a returns evaluation facility to maximize value recovery from product returns subject to exponential value decay. We consider a single product and model the problem as one of admission control to an M/M/1 Queue. The admission decision is based on the state of the system, given by the current queue length in the facility and the recoverable value v , determined by observing the time since sale. For a given v , we show that the optimal policy can be represented by a set of threshold values. A simple extension allows us to derive a similar result for the case of multiple products with similar value decay. Finally, we consider the special case of two products with different revenue contributions and different decay rates. In this case, we derive the joint admission and sequencing policy to maximize value recovery.

007-0393: Returns Network Design for Maximizing Value Recovery

Aejaz Khan, University of Houston, United States

Basheer Khumawala, University of Houston, United States

Traditionally, management of product returns has been a cost minimization problem with an emphasis on managing end-of-use or end-of-life returns. However, commercial product returns, those returned within 90 days of sale, have increased in recent years and are estimated to be worth \$100 billion annually. A significant proportion of this value is lost due to delays in processing and transportation. We propose three models for maximizing value recovery from product returns. We model each case as a mixed integer nonlinear program, with the evaluation and remanufacturing facilities modeled as M/M/1 and M/G/1 queues respectively. We propose a heuristic based on Lagrangian Relaxation and present results of test problems.

007-0633: Managing an Assemble-to-Order System with Returns

Gregory DeCroix, University of Wisconsin-Madison, United States

Jing-Sheng Song, Duke University, United States

Paul Zipkin, Duke University, United States

We consider a multi-product assemble-to-order system, where inventory is kept only at the component level, and the finished products are assembled in response to customer demands. In addition to stochastic demand for finished products, the system experiences stochastic returns of subsets of components, which can be used to satisfy subsequent demands. The system is managed over an infinite horizon using a component-level base-stock policy. We identify several ways that returns complicate the behavior of the system, and we demonstrate how to handle these additional complexities when calculating or approximating key order-based performance metrics, including the immediate fill rate, the fill rate within a time window, and average backorders. We also present a method for computing a near-optimal base-stock policy. We use these results to address managerial questions on both operational (e.g., the value of product-based return information) and product-design (e.g., the value of using common components across products) levels.

007-0004: Optimal Pricing, Ordering, and Return Policies for Consumer Goods

Michael Ketzenberg, Colorado State University, United States

Rob Zuidwijk, Erasmus University Rotterdam, Netherlands

We address a firm that sells a product to consumers who are sensitive to both price and return policy. The decisions of interest are the selling price, return policy, and quantity of new product to purchase. We conceptually model a single selling season that is split into two periods where the boundary between periods is delineated by the opportunity to recover product returns and resell them.

007-0349: Sustainability and Rework: A Framework and Comparison of Food Processing and Chemical Industries

Monique French, University of Colorado at Colorado Springs, United States

Dirk Pieter Van Donk, University of Groningen, Netherlands

Process industries are as diverse as discrete industries. As a consequence, different process industries need different planning and control instruments, quality control and inventory policies. With respect to rework, closed-loop supply chains, waste management, reuse and other issues related to sustainability, it seems that process industries are hardly addressed and if so, differences between process industries are not taken into account. The current paper aims at filling both gaps by exploring sustainability in different types of process industries. It starts with exploring relevant characteristics of products, processes and plants of process industries in general and deriving sustainability consequences. This framework is applied to both food processing and chemical industries to make a comparison and to arrive at an agenda for managerial and research issues. We use empirical data from recent survey and case-study research.

102	<p>Saturday, May 5, 1:30-3:00 Room: Fountain Session: Theory Building</p>	Track: Ops Strat, 7	Chair: Daisy Wang
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007-0526: Process Governance: Moving OM Beyond Planning and Control

Nigel Spinks, Henley Management College, United Kingdom

The textbook conceptualisation of the management function in operations is typically limited to the activities of planning and control. This is despite the fact that management in related fields, such as supply chain, has been subject to in-depth investigation. This paper addresses this limitation through an examination of process governance which it defines as the co-ordination of interdependent activities in pursuit of a specific goal. Whilst acknowledging the influence of other theoretical approaches, such as transaction cost economics, relationship marketing, and corporate governance, the paper explores the relevance of concepts drawn from political science, especially the idea of multi-level governance. The latter offers potential insight into the management of processes that may be inter-organisational, inter-functional, and intra-functional and of which different stakeholders may have different expectations. The paper proposes a framework for analysis and an agenda for further research.

007-0142: When the Sand Cone Model Meets SMEs

Daisy Wang, Southern Illinois University Carbondale, United States

Suresh Tadisina, Southern Illinois University Carbondale, United States

The Sand Cone Model in operations strategy claims that firms following the unique sequence of the Sand Cone Model outperform those with other strategies. However, previous focus was on large firms. With the flexibility and financial constraints that Small Medium Enterprises (SMEs) have, do SMEs have to follow this model to be competitive? Therefore, this paper attempts to explore the possibility that SMEs and large firms are suitable for different types of strategies and SMEs are able to construct different strategic priorities without following the sequence suggested by the Sand Cone Model. We hope, through this paper, more efforts will be put in SMEs as they play important roles in global economies.

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Saturday, May 5, 1:30-3:00 **Room:** French

Track: Hum Log, 1

Chair: Aruna Apte

Session: Strategies and Operational Issues in Humanitarian Aid/Strategies and Operational Issues in Humanitarian Aid

007-0354: Optimal Force Sizing and Prepositioning for Natural Disasters

Aruna Apte, Naval Postgraduate School, United States

Javier Salmeron, Naval Postgraduate School, United States

Ee Shen Tean, Singaporean Army, United States

Recent natural disasters in Asia and the U.S have brought to our attention the difficulty to cope with the overall needs for humanitarian logistics. The complexity is intensified by shortcomings in current pre-disaster planning and logistics. The objective of this research is to provide insights into these impending issues by developing a mathematical optimization model. We formulate a two-stage stochastic optimization model that guides relief units and assets under monetary and physical limitations, and maximizes expected survivors. As first-stage decisions we consider the expansion of the resources that will facilitate the logistics to the affected areas. The second-stage models the problem as a network where the objective is to maximize expected rescued survivors and delivery of required commodities. The model has been assessed on notional scenarios, and is expected to be tested on realistic cases by personnel at Fort McNair involved in relief planning.

007-0359: Reducing the “Gap of Pain”: A Strategic Approach to Optimizing Federal Resource Availability in Response to Major Incidents

Curtis Heidtke, Major, United States Air Force, United States

Aruna Apte, Naval Postgraduate School, United States

In domestic disasters, a temporal gap frequently develops between the exhaustion of state and local resources and the arrival of federal resources. To date, strategies for reducing this so-called “gap of pain” have not been based upon scientific methodology. We review alternatives for ensuring continuous availability of critical commodities. For a given scenario, the optimum approach is likely to be some combination. Mathematical modeling using optimization techniques holds great promise for producing efficient and effective strategic solutions. One such primitive model is evaluated using data obtained from the Hurricane Isabelle response in the Washington, D.C. metropolitan area. The results reinforce the validity of using this method to generate viable strategic alternatives for consideration by senior decision-makers. With additional development and testing, the model may be productively applied to a range of natural and man-made incidents, in disparate locations.

007-0356: Fresh Produce Supply Chain Network: Design and Vulnerability

Aruna Apte, Naval Postgraduate School, United States

Geraldo Ferrer, Naval Postgraduate School, United States

The news that nearly 200 Americans in 26 states had fallen sick by eating packaged spinach contaminated with E. coli exposed the lack of knowledge of the fresh produce supply chain. Part of this industry operates in a dangerously precarious system, vulnerable to accidental — and deliberate — contamination. Understanding this supply chain network and its vulnerabilities is critical in preventing these events and managing the damage that they create. In this research we map the fresh produce supply chain network, looking for similarities with other established supply chain networks. We verify the criticality of these networks to understand if their design help or hinder the development of vulnerability. Finally, we use the network topology and its characteristics to understand the conditions under which contamination can be successfully eradicated.

007-0767: Logistics Challenges for Tissue Engineering Products and Services

Katrina Nordström, Helsinki University of Technology, Finland

Patrick Lee, Dolan School of Business, United States

Ari Vepsäläinen, Helsinki School of Economics, Finland

Tissue engineering (TE) offers new treatments of chronic, life threatening, degenerative illnesses and other conditions. However, for TE to fulfill such high expectations, or just to provide therapies for general use, efficient distribution systems and supply chain management are needed to accommodate the conflicting requirements of TE for logistics: acute patients, customization of care and matching of tissues for individual patients call for responsive service whereas proactive tissue sourcing, long follow-up periods, short self life, and microbial and other risks due to privacy and ethics enforce flexible services with tissue banks, detailed tracing, authorization and regulation. We discuss some operational solutions and strategic opportunities for the distribution of TE products and services that may lead to viable business models.

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Saturday, May 5, 1:30-3:00 **Room:** Garden

Track: Education, 7

Chair: Dana Johnson

Session: Workshop: Curriculum Model for Service Systems Engineering

007-0096: Curriculum Model for Service Systems Engineering

Dana Johnson, Michigan Tech, United States

Leonard Bohmann, Michigan Tech, United States

Kris Mattila, Michigan Tech, United States

John Sutherland, Michigan Tech, United States

Sheryl Sorby, Michigan Tech, United States

Nilufer Onder, Michigan Tech, United States

Demand for undergraduates emphasizing service industry engineering, sciences, and management greatly exceeds the supply. Current trends in the service sector account for more than 80% of the GDP and more than 85% of the workforce. Michigan Tech is launching a new undergraduate degree offering in 2007. Service Systems Engineering (SSE) will be coupled with the Bachelor of Science in Engineering program. The curriculum development efforts are being funded by a \$500,000 NSF grant. Interdisciplinary emphasis of engineering, sciences, and business allow for the development of curriculum to match the needs of industry. The team has worked closely with service industry representatives through a Delphi study and follow-on curriculum development.

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Saturday, May 5, 1:30-3:00 **Room:** Green Room
Session: Empirical Studies in International Operations

Track: Int/Global, 2

Chair: René (M.) B De Koster

007-0448: Productivity at Operations, Business and National Levels

Attila Chikán, Corvinus University of Budapest, Hungary

Krisztina Demeter, Corvinus University of Budapest, Hungary

There are several international surveys collecting and analyzing operations data (eg. International Manufacturing Survey, IMSS; Global Manufacturing Research Group survey; High Performance Manufacturing survey). Results of these surveys show that differences between companies in the use of operational strategies and practices are usually larger by countries than by industries. In order to further explanation of these country differences we use the IMSS data to analyze the impact of operations strategies and practices on productivity both at business and national level, comparing results from 12 countries all with at least 30 observations. Productivity is set in focus since it is a performance measure which can be analyzed at all these levels and it is a major influencing factor of competitiveness both for companies and nations.

007-0026: Critical Success Factors for Hong Kong Owned Manufacturing SMEs

Hong Woo, Middlesex University Business School, United Kingdom

Small and medium sized enterprises (SMEs) are the backbone of many countries, responsible for creating jobs and, collectively, making significant contributions to their economies. This is particularly true for fast-changing and developing economies such as Hong Kong where there are over 250,000 SMEs, with over 120,000 engaged in manufacturing, although, production often takes place outside in mainland China. Hong Kong is the world's largest production manager and trader in industries such as clocks and watches, imitation jewellery, toys and games, travel goods and handbags. This paper reports the survey findings of a study investigating the critical success factors of SME manufacturers in Hong Kong. Results of 307 responses indicate six factors considered critical to the successful management of manufacturing SMEs in Hong Kong. These factors are customer orientation; efficient management; product quality; company strategy; capital accessibility and supportive business environment.

007-0515: Sense and Nonsense of Container Terminal Benchmarking

Rene De Koster, RSM Erasmus University, Netherlands

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. This paper compares some recent benchmarking studies with own results based on data obtained from APM terminals and shows results differ strongly. Causes include unavailability and inaccuracy of data used, and inhomogeneity of terminal types. Only if better quality and additional data can be obtained, DEA may lead to insight in container terminal performance.

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Saturday, May 5, 1:30-3:00 **Room:** Panorama
Session: Managing Replenishment Delays in Global Supply Chain

Track: SC Disrupt, 3

Chair: Aditya Jain

007-0229: Dual Sourcing Policies in Presence of Commodity Markets

Ankur Goel, University of Texas at Austin, United States

Genaro Gutierrez, University of Texas at Austin, United States

Manufacturers often rely on different types of long term contracts with established suppliers to procure goods often involving delivery lead times. Commodity markets as well as online markets provide additional procurement flexibility; manufacturers can procure through their conventional channels or interact directly with the market either through spot or forward transactions. Spot market procurement allows mitigating supply uncertainty in the regular mode. In this research we explore the value of incorporating information about spot and futures market prices in procurement decision making. We also model transaction costs associated with procurement from spot and forward markets. Due to shorter response times, transaction costs associated with spot market procurement (including freight) are typically higher. We develop optimal and approximate procurement policies for this problem. Our results suggest that it is possible to significantly reduce inventory costs by incorporating spot and futures price information in the procurement decision making process. Our results imply that, apart from risk reduction, the potential savings in transaction costs associated with forward procurement entice manufacturers to procure a higher fraction of goods from forward markets, using spot procurement only to fine tune stocking levels and recover from emergencies.

007-0135: Capacity Disruption in Flow-Matching Supply Networks

Martin Wortman, Texas A&M University, United States

Alex Savachkin, University of South Florida, United States

While introduction of lean business practices can greatly enhance the operating efficiency of production enterprises, these practices can leave supply networks brittle with dramatically increased exposure to disruptions in both production and supply capacities. In this talk, we explore capacity disruption risk in large supply networks. We give particular emphasis to structural properties production supply networks needed to characterize disruption risk.

007-0305: On Optimal Expediting Policies for Supply Systems with Uncertain Lead-times

Panos Kouvelis, Washington University in St. Louis, United States

Sammi Tang, Washington University in St. Louis, United States

We study how the existence of an expediting or de-expediting service can help improve inventory management in supply systems with stochastic lead-times. A retailer places a regular order from a supplier. After the order is released, it is possible to (de-)expedite part or all of the original order when it passes through some intermediate point so that the (de-)expedited products will be delivered in a certain time. We characterize the optimal expediting and de-expediting policy and study the impact of the expediting option on relevant performance measures.

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Saturday, May 5, 1:30-3:00 **Room:** Parisian

Track: Emp Res, 7

Chair: Sriram Thirumalai

Session: Managing Successes and Failures in Operations

007-0313: Operational Measures as Predictors of Future Financial Performance

Taylor Randall, University of Utah, United States

Christian Terwiesch, Wharton School, United States

James Cannon, University of Utah, United States

This paper examines the role of operational measures in predicting future financial performance. We develop models that link operations to financial performance and demonstrate the incremental benefit of operational data in predicting future performance. The study is based on data from the U.S. airline industry.

007-0400: Product Recalls in the Medical Device Industry: An Econometric Analysis of the Costs of Poor Quality

Sriram Thirumalai, University of Utah, United States

Kingshuk Sinha, University of Minnesota, United States

Medical devices today play a significant role in the delivery of superior health care. However, medical devices are prone to quality failure, which presents a potential health risk to the patients and personnel using these devices. This study empirically assesses the performance implications of medical device recalls (the costs of poor quality to firms) to understand if these implications are severe enough to deter firms from introducing potentially hazardous medical devices into the market. The econometric analyses in the study are based on data from manufacturers in the medical device industry over a four-year period from 2002 to 2005. Contrary to our expectations, the findings indicate that market penalties for device recalls are not significant, i.e., the costs of poor quality are not severe. Implications of the study findings, limitations, and directions for future research are identified.

007-0573: An Empirical Analysis of Product-Process Alignment: Impact on Survival of Entrepreneurial Electronic B2C Operations

Gregory Heim, Boston College, United States

Kingshuk Sinha, University of Minnesota, United States

When poorly designed or managed, operations can become barriers preventing competitive advantage. It is not uncommon for an entrepreneurial firm to under- or over-invest in its process and thus not be appropriately matched to the market demand for its products. Both are instances of product-process misalignment, with potential consequences being that the firm is not able to attain competitive advantage or loses its competitive advantage. Thus, product-process alignment – i.e., operational processes providing optimal capacity to meet market demand for products at a point in time and over time – is fundamental to managing the operations of entrepreneurial firms. In this paper, we investigate how product-process alignment applies to managing business-to-customer (B2C) operations using a large sample of electronic food retailers. The paper contribution is in empirically demonstrating product-process alignment in electronic B2C operations is associated with retailer survival over time, an indicator of the sustainability of competitive advantage.

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Saturday, May 5, 1:30-3:00 **Room:** Patio

Track: OAG, 2

Chair: Martin Spring

Session: Working with Industry: Linking Research and Practice

007-0321: Studying the True Cost of Product Complexity, and What Companies Can Do About It

Mark Jacobs, Broad School of Business, United States

Morgan Swink, Michigan State University, United States

This presentation will provide an overview of several research projects aimed at modeling the impacts of product architectural complexity on cost, quality and delivery outcomes in the supply chain. We will discuss the opportunities and the difficulties we have uncovered through the negotiation, data collection, and analysis processes associated with managing the projects at various firms. Preliminary results of the research will also be presented.

007-0316: Emergent Research Design Strategies in Collaborative Research: A Tale of Two Studies

Martin Spring, Lancaster University, United Kingdom

Mark Stevenson, Lancaster University, United Kingdom

Kostas Selviaridis, Lancaster University Management School, United Kingdom

Collaborative research is rewarding but, compared to the dominant survey-based model of empirical research, very messy. We report on two case based projects, examining how the original research question and research design were adapted to take account of and advantage of the emerging reality. The first study was intended to explore supply-chain flexibility in three sectors, aerospace, rail and truck manufacturing. However, we found that the chains were linked through common subcontractors, and unforeseen network-level and comparative analysis became possible. In the second study on third-party logistics, the prime collaborator didn't want us to work with any of their direct competitors. While this compromised the design somewhat, it also led to a much deeper relationship with the prime collaborator, and a more critical reflection on the rationale for the research design. We discuss the implications of this type of emergent research design for practitioners and academics.

007-0210: Credit Risk Analysis Applying Logistic Regression, Neural Networks and Genetic Algorithms Models*Maria Gouvêa, University of São Paulo, Brazil**Eric Gonçalves, University of São Paulo, Brazil*

Credit models are useful to evaluate the risk of consumer loans. The application of the technique with greater precision of a prediction model will provide financial returns to the institution. In this study a sample set of applicants from a large Brazilian financial institution was focused on in order to develop three models each one based on one of the alternative techniques: Logistic Regression, Neural Networks and Genetic Algorithms. Finally, the quality and performance of these models are evaluated and compared to identify the best one. Results obtained by the logistic regression and neural network models are good and very similar, although the former is slightly better. The genetic algorithm model is also efficient, but somewhat inferior. This study illustrates the procedures to be adopted by a financial institution in order to identify the best credit model to evaluate the risk of consumer loans and thereby get increasing profits.

007-0777: A Dynamic Model for Analyzing Design Implications for Auctions in Sequential Markets*Nagesh Murthy, University of Oregon, United States**Timothy Baker, Washington State University, United States*

We develop a two-period dynamic model to understand the revenue performance of fixed price and auction-based pricing strategies in sequential markets. The decision variables in a period are posted price or reserve price depending on the pricing strategy (fixed price or auction) and the units allocated for sale. The auctions are structured so that the highest losing bid is paid by all if the number willing to pay at least the reserve price exceeds the allocation in a given period. Some key insights of our analysis are (1) a single auction is best held in the first period, (2) market segmentation should emphasize achieving homogeneity in willingness-to-pay, and (3) it is better to make the first period shorter in duration if an auction is used in that period.

007-0116: The Financial Implications of Outsourcing*Sean Handley, Ohio State University, United States**W.C. Benton, Jr., Ohio State University, United States*

Globalization and advances in information technologies have broadened the range of sourcing options available to organizations. Perhaps the most prevalent sourcing trend today is outsourcing. While today's business environment offers managers the opportunity to effect innovative sourcing strategies, the complexity of outsourcing decisions has also become very complex. This complexity is reflected in anecdotal evidence which suggests that many firms make erroneous outsourcing decisions and are subsequently disappointed with results. Drawing on a detailed review of the extant literature, as well as insights from detailed accounts of several outsourcing initiatives, we provide a comprehensive discussion of the major financial considerations that need to be evaluated in order to develop an effective outsourcing decision model. We also draw on these observations to create an illustrative example of the potential gap between the expected and actual costs of outsourcing.

007-0471: The Effect of Manufacturing Strategy on Outsourcing Plans*John Gray, Ohio State University, United States**Brian Tomlin, University of North Carolina at Chapel Hill, United States**Aleda Roth, Clemson University, United States*

We examine the effect of a firm's manufacturing strategy and current capabilities on its plans to outsource manufacturing. While the theoretical and empirical literature on the relationship between product and market characteristics and outsourcing decisions is fairly mature, only recently have resource-based arguments been used to incorporate firm-specific characteristics into the discussion. Led by economics and strategy, the resource-based arguments to date have primarily examined simple proxies for these firm-specific characteristics, such as production experience. Drawing from the operations management literature, we make theoretical arguments about the effect of specific operations capabilities and priorities on plans to outsource manufacturing resources. We test our empirical model using a large perceptual manufacturing strategy database of 867 business units.

007-0776: Group Purchasing Organizations and Supplier Managed Inventory Hospital Sourcing*Mi Kyong Newsom, Ohio State University, United States**W.C. Benton, Jr., Ohio State University, United States*

Group Purchasing Organizations (GPOs) have become a powerful force in the healthcare market negotiating contract on behalf of hospital systems with suppliers. Antitrust concerns are becoming real issues as the GPOs settle lawsuits with medical device manufacturers and Congress considers the amended Social Security Act that allows these "kickbacks". The GPO business model face three major problems: 1) contracting practices reduce innovation and competition; 2) conflict of interest allow for decisions made based on financial ties to supplier and 3) Inability to demonstrate savings for hospitals. An alternative inventory management system is the supplier managed inventory (SMI). Although issues such as information, operational constraints, performance measurements, inventory ownership, and termination criteria need to be addressed, SMI is known to reduce supply chain costs. An empirical analysis of the economic impact of GPO and SMI inventory management systems on total hospital inventory costs is investigated.

007-0560: Supply Chain Practice and Information Sharing Strategies*Honggeng Zhou, University of New Hampshire, United States**W.C. Benton, Jr., Ohio State University, United States*

Effective supply chain practice and information sharing enhances the current supply chain management environment. The purpose of this study is to investigate the integration of information sharing and supply chain practice in supply chain management. Data from 125 North American manufacturing firms were collected. The results show that (1) effective information sharing significantly enhances effective supply chain practice, (2) supply chain dynamism has significant positive influence on effective information sharing as well as effective supply chain practice, although supply chain dynamism has more influence on information sharing than supply chain practice, (3) and effective supply chain practice becomes more important when the level of information sharing increases. The findings show that both effective information sharing and effective supply chain practice are critical in achieving good supply chain performance.

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Saturday, May 5, 1:30-3:00 **Room:** State
Session: Service Strategy

Track: Service Ops, 1

Chair: Ivor P. Morgan

007-0510: Community-based Modeling of Service Networks

Ari Vepsalainen, Helsinki School of Economics, Finland

Jukka Kallio, Helsinki School of Economics, Finland

Katariina Kempainen, RSM Erasmus University, Netherlands Antilles

The conventional metaphor of services has assumed the intangibility of services and emphasized customer interfaces and work processes. While standardization of service offerings and participation of customers may have sufficed for the analysis and positioning of customer services in retail stores and banking offices, there are new community-based services being commercialized that call for institutional models of service networks. Examples of such technology-driven services include interactive marketing communication, logistic delivery networks, open-source development, and therapies based on tissue engineering and organ transplants. We discuss the classification, criteria of efficiency, and strategic positioning of community-based services and illustrate the complementarity of the community-based representation with the conventional process models.

007-0464: Integrating Service Operations Through Simulation

Paul Mulligan, Babson College, United States

Service systems, while sometimes appearing simple at customer contact, are complex sets of interdependent processes. Service managers regularly make decisions that impact their company's bottom line but the relationship between operating decision and financial impact is not always readily evident. We developed a service simulation that allows managers to more directly observe the financial impact of their operating decisions. The simulation tracks operations metrics such as capacity, capacity utilization, industry-based service quality indices, and customer service quality expectations. These factors, as is true in practice, can not be directly manipulated. Simulation managers make resource allocation decisions related to hiring, management development, technology investment and training that drive these operating measures. Relative performance on these operating measures, versus other management teams, determines market and financial performance, measured through quarterly financial (balance sheet, income statement, cash flow) and market (market share, brand awareness, quality perceptions) reports.

007-0766: Customer Services with Multiple Lead-time Choices

Haifeng Wang, Tsinghua University, China

Houmin Yan, Chinese University of Hong Kong, Hong Kong

This paper considers a multiperiod inventory model in which a supplier provides alternative lead-time choices to customers: a short or a long lead time. The supplier operates in a batch-production mode. Orders from slow customers can be taken by suppliers and included in the next production cycle, while orders from fast customers have to be satisfied from on-hand inventory. We denote the action of providing a short lead-time product to a long lead-time customer as the inventory-commitment decision. The initial inventory stocking is the inventory-replenishment decision. We first characterize optimal inventory-commitment policy. We prove that the optimal inventory-replenishment policy is a base-stock type. Further, we compare the performances of the optimal dynamic inventory-commitment policy and the static inventory-rationing policy. We use the customer-choice model to characterize the risk-pooling, demand-induction, and demand-cannibalization effects.

007-0221: Some Strategies of Positive Services

Ivor Morgan, Babson College, United States

Jay Rao, Babson College, United States

Positive services are optional. Unlike negative services which we hope never to use, or routine services that are part of normal living, positive services are those we plan for and look forward to using. They are the luxury experiences of our lives. So competition is a wide open affair and not within a closed category---a bank choice is generally a matter of selection between banks. Constraints of time and money restrict the number of these services that can be enjoyed. This paper investigates some of the strategies being followed by firms in positive service industries. In particular, we investigate some of the contrasting operating approaches underlying these strategies and their cost consequences. Our analysis focuses on growth and sustainability as measures of success.

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Saturday, May 5, 1:30-3:00 **Room:** Terrace
Session: Modeling Healthcare Systems

Track: Health Care, 7

Chair: Mike Magazine

007-0184: Incorporating Congestion in Preventive Healthcare Facility Network Design

Yue Zhang, McGill University, Canada

Vedat Verter, McGill University, Canada

Oded Berman, University of Toronto, Canada

This paper provides a methodology for designing a network of preventive healthcare facilities so as to maximize participation. We use the total (travel, waiting and service) time required for receiving the service as a proxy for accessibility of a healthcare facility, and assume that each client would seek the services of the facility with minimum expected total time. At each facility, which we model as an M/M/1 queue, the expected number of participants from each population zone decreases with the expected total time. The facilities cannot be operated unless their level of activity exceeds a minimum workload requirement. The arising mathematical formulation is highly nonlinear, and hence we provide a heuristic solution framework for this problem. Four heuristics are compared, and the most efficient heuristic is utilized in solving a real life problem that involves the breast cancer screening center network in Montreal.

007-0646: Patient Flow Analysis Using Existing Data

Kuang-Hung Hsu, Chang Gung University, Taiwan, Taiwan, Republic of China
Fan Tseng, University of Alabama in Huntsville, United States

Patient flow analysis is often conducted to assess the performance of a healthcare unit and to find ways to improve its performance. Performance measures such as patient waiting time, total time staying in the system, and facility utilization must be defined. It also requires information about procedures each patient goes through and when each procedure starts and ends. In reality, it is challenging to get such information for analysis. Data are not always collected or may not be in the form that can be used right away. In this paper we discuss issues in getting information from existing database for patient flow analysis. Real data from an emergency department are used in this study.

007-0186: An Analytical Framework for Managing Community-Based Care Delivery Processes for Chronic Diseases

Beste Kucukyazici, McGill University, Canada
Vedat Verter, McGill University, Canada
Nancy Mayo, McGill University, Canada

In this study, we develop a Markov modeling framework to represent the community-based care delivery process of chronic diseases. This approach enables us to represent the patient flow information in a compact form and to analyze the care delivery process in terms of the flow patterns and to assess the impact of the flow patterns on health outcomes. We also investigate the system-wide impact of several plausible scenarios with regards to the delivery of care. The model constitutes an effective tool for clinicians and system planners in developing an understanding of the disease-specific community care process. The model is applied to data of 3,946 stroke patients discharged from acute care hospitals of Quebec in 2001.

007-0401: Predictable and Short Arrival Times for Services Where Time is Critical in the Metropolitan Area of Mexico City.

Carlos Santillán, ciaO (compañía operadora), Mexico
Javier Araujo, ciaO (compañía operadora), Mexico
Héctor Peña, ciaO (compañía operadora), Mexico

Getting around Mexico City is time consuming, requiring from two to four hours daily, depending on unexpected circumstances. This paper presents system for Operations and Logistics (SOL), which shortens the variability in arrival times, benefiting organizations offering emergency services or companies where specific arrival times are critical. The term "System" should be understood as the systemic approach with which one can articulate and align an organization and its resources, its operative and logistics practices, and common technology, to produce expected results. Included is the case of a leading medical emergency service company with process control charts showing how its service has improved by 20%, arriving within 15 minutes or less, to any point in Mexico City, 95% of the cases and improving. Developing the system for the company is a project management case.

113	<p>Saturday, May 5, 1:30-3:00 Room: Vista Session: Empirical Study on JIT and Performance</p>	Track: JIT & Lean, 4	Chair: Yoshiki Matsui
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007-0289: Learning, JIT and Performance: An Exploratory Study

Brent Moritz, University of Minnesota, United States

This paper examines the relationship between the organizational learning context, just-in-time (JIT) practices and manufacturing performance. Specifically, the organizational learning context is evaluated along the lines of internal and external learning. The internal learning context includes elements such as process improvement and cross-training, while the external learning context includes elements such as contact with suppliers and customers as part of new product development and feedback on quality and delivery performance. JIT is selected as a specific practice of interest because it has an important and established association with performance. Using path analysis, the results support the hypothesis that internal learning drives JIT practices, which contribute substantially to improved operational performance along the dimensions of quality, unit cost, on-time delivery and flexibility.

007-0254: The Relationship between JIT Production and Manufacturing Strategy and Their Impact on JIT Performance

Ayman Abdallah, Yokohama National University, Japan
Yoshiki Matsui, Yokohama National University, Japan

This study constructs multi-item scales to measure key components of JIT production and manufacturing strategy and examines the relationship between them, and the impact of both on JIT performance for machinery, electrical & electronics and automobile industries in Japan, USA, and Italy. JIT production scales include JIT schedule, JIT layout, JIT delivery by suppliers, JIT link with customers, pull system, and setup time reduction. Manufacturing strategy scales are measured in terms of achievement and leadership of functional integration, anticipation of new technologies, communication of manufacturing strategy, formal strategic planning, manufacturing-business strategy linkage, and proprietary equipment. The results from regression analysis show that after controlling for the industry and country effects, manufacturing strategy scales have positive and significant impact on JIT production. The results also show that both JIT production and manufacturing strategy scales have positive and significant impact on JIT performance.

007-0136: Effect of Quality Management and JIT Practices on Competitive Performance: An Empirical Analysis

Anh Phan, *Yokohama National University, Japan*

Yoshiki Matsui, *Yokohama National University, Japan*

This paper presents result of an empirical analysis on quality management practices and JIT practices and their impacts on competitive performance in manufacturing plants. This result has been delivered from the survey conducted between 2003 and 2004 in 163 manufacturing plants locating in five countries: Japan, US, Germany, Italia and South Korea in the framework of High Performance Manufacturing Project. Ten measurement scales were constructed to describe quality management practices and JIT practices. The impacts of quality management and JIT practices on competitive performance indexes in term of quality, cost, delivery, and flexibility were tested by regression analysis. The main finding is the synergy of quality management and JIT practices upon competitive performances. Daily Schedule Adherence, JIT Layout, Setup Time Reduction, Cleanliness and Organization, and Process Control were identified as critical determinants for improving competitive position of manufacturing plants.

007-0331: International Comparison on JIT Manufacturing

Yoshiki Matsui, *Yokohama National University, Japan*

Osamu Sato, *Tokyo Keizai University, Japan*

Hideaki Kitanaka, *Takushoku University, Japan*

Based on the survey data collected from manufacturing plants in seven industrialized countries, we establish measurement scales for JIT production as well as other aspects of operations management such as SCM, HRM, TQM, TPM, TOC, product development, technology development, and manufacturing strategy. Then, the requirements for JIT production and the contribution of JIT production to competitive performance are comparatively analyzed to find out the differences among countries in the structural relationships around JIT production.

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Saturday, May 5, 3:30-5:00 **Room:** Brasserie
Session: Project Management

Track: Prod Innov, 8

Chair: Adrian Choo

007-0365: Managing Work Design in Global Product Development Projects: A Configuration Theory Approach

Kingshuk Sinha, *University of Minnesota, United States*

Anant Mishra, *University of Minnesota, United States*

The tremendous growth in information technology hardware and software has opened up a number of alternatives for designing work and organizing projects. As a result, work design often transcends the boundaries of organizations, professions and countries. Organizations respond to the appeal of these new, alternative distributed work designs (i.e., outsourcing, offshoring and offshore outsourcing). The short term benefits of time and cost savings from alternative distributed work designs are apparent to managers and distributed work designs have become management fashion. However, achieving success in projects with distributed work designs has not been universal and cases of failure abound. Using the configuration theory perspective, we propose that the performance implications from a particular choice of work design is dependent on characteristics of the project (technological uncertainty and project complexity) and project management style (formal management or flexibility).

007-0584: An Adaptive Process Model to Support Product Development Project Management

Tyson Browning, *Texas Christian University, United States*

Viktor Lévárđy, *3D Systems Engineering GmbH, Germany*

Most product development process models assume that all project tasks are known ahead of time, but this is unlikely in practice. We model the PD process as a soup of activities that self-organize based on managerial rules and the state of the project. Instead of pre-specifying the activity sequence, the activity with the highest expected value is selected. Thus, the highest-value process emerges. We present this model and explore its application and results.

007-0636: Product Development Managers and Their Impact on Product Development Integration

Ahmad Syamil, *Arkansas State University, United States*

William Doll, *University of Toledo, United States*

Agnieszka Waronska, *Colorado State University – Pueblo, United States*

This research validates a model of heavyweight product development managers and their consequences to both internal integration (concurrent engineering) and external integration with suppliers and customers. The results indicated that American heavyweight product development managers have significant positive relationships with both internal integration and external integration in order to develop marketable products well. In contrast, German managers have significant positive relationships only with internal integration efforts within a company and weak relationship with external integration efforts, such as those with suppliers and customers.

007-0625: Mechanisms of the Stretch Goal Strategy on Knowledge Creation: Sense of Challenge and Goal Achievability in Six Sigma

Adrian Choo, *Rensselaer Polytechnic Institute, United States*

Many companies adopt the stretch goal strategy to be creative and innovative. This study investigates this practice in Six Sigma projects by focusing on two mechanisms—sense of challenge and goal achievability—derived from the stretch goal strategy. Sense of challenge is creativity-based that arises from being intrigued by the problem associated with a stretch goal. Goal achievability is efficacy-based that is driven from a team's perception of its efficacy in attaining a stretch goal. Results show support for linear and nonlinear effects of the two mechanisms on knowledge created in Six Sigma projects. These findings suggest the general notion that stretch goals lead to "out-of-the-box" thinking may not always hold in the team context such as a Six Sigma project.

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Saturday, May 5, 3:30-5:00 **Room:** Continental
Session: Innovation and Response Time in SCM

Track: Supply Chn, 8

Chair: Hans S. Heese

007-0010: A Simulation Model for Calculating the Response Time of a Supply Chain Network

Yizhong Ding, Shanghai Maritime University, China

The response time of a supply chain network is an important criterion for supply chain assessment. However, the existing approaches to calculating the response time can hardly describe the behavior of the integral supply chain network and the stochastic characteristics of the network. A practical simulation model of the response time of a supply chain network is established in this paper. This model is used to calculate the response time, which can describe the integral response behavior as well as the stochastic property of a supply chain network.

007-0094: How Can Fluid Dynamics Help Supply Chain Management?

Pietro Romano, University of Udine, Italy

Pamela Danese, University of Padova, Italy

This paper investigates the relations between three constructs: supply network structure, business process configuration, and time performance. The study focuses on the time sensitive casual wear industry. Initially, Zara's and Benetton's supply networks are cross-compared to understand the rational behind their differences in time performance. Starting from this analysis, the paper provides a model to explain the relations between the three constructs, and applies it to interpret Benetton's and Zara's decisions on supply network and business process configurations, and their impact on time performance. The proposed model unifies under one framework the different perspectives existing in literature on the phenomenon under investigation. This research also has interesting practical implications, as it offers guidance for managers facing programs for supply network design or re-configuration.

007-0392: Formal Contracts In Supply Chain Management: A Case Study

Silvio Pires, Methodist University of Piracicaba, Brazil

Ana Werneck, Methodist University of Piracicaba, Brazil

Although adequate management of relationships is often considered a key factor in supply chain management, the use of formal contracts in this context has been little studied or reported, even in the automotive industry. This article discuss the major findings of a study conducted in a representative supply chain of the auto industry to verify the use of contracts and how they affect the relationships of the companies in question. Based on an intentional sampling approach, a case study was made of an automaker that uses the industrial condominium configuration, two first tier suppliers operating inside the condominium, and a first tier supplier operating outside the condominium (a conventional supplier). Additionally, a basic framework was built to guide and define the key content of the research, which considered two premises and eleven parameters in the companies in question. The results pointed to some key findings, such as whereas the formal contract in the conventional arm's length relation has a "commercial" bias, in the condominium relations it has a "management" bias.

007-0760: Playing Chicken: Store Brand Introductions by Competing Retailers

Ana Groznic, Indiana University, United States

Hans Heese, Indiana University, United States

Private label products are increasing importance in retailing, often causing supply chain conflict, as the retailer's product directly competes with the manufacturer's national brand. Focusing on the dynamics that arise in single-manufacturer single-retailer settings, previous research suggests that a main driver of store brand profitability to the retailer is reduction of the national brand wholesale price. Under retailer competition, the Robinson Patman Act introduces an interesting trade-off: A retailer that introduces a store-brand incurs the associated cost, while sharing most of the benefit with all competitors. We show that the resulting dynamics in some case cause the retailers to play 'chicken', either of them preferring a store-brand introduction by the competitor. Such dynamics do not arise in supply chains with a single retailer, as has been the object of most previous research.

116	Saturday, May 5, 3:30-5:00 Room: Executive Session: Operations Modeling	Track: Opt Models, 8	Chair: Jaydeep Balakrishnan
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007-0419: Minimizing Utility Time in Mixed-Model Assembly Lines.

Ghorbanali Mohammadi, Shahid Bahonar University of Kerman, Iran (Islamic Republic of)

Assembly lines have traditionally been used to assemble products which have the same physical design. This study optimizes operator utilization and improves the throughput rate of the finished work-pieces in a mixed-model assembly line system. By minimizing the total cost of the utility time and idle time in a mixed-model assembly, the utilization of operators and the throughput of finished work-pieces are improved.

007-0672: Modeling and Results of Satellite Ground Support Optimization

Sanjay Kumar, University of Texas at Dallas, United States

Tapan Bagchi, Indian Institute of Technology Bombay, India

This paper present the methods adopted to model low earth orbiting (LEO) spacecraft support and an actual implementation of this approach. The results of a comparison of actual human schedulers' performance and the support schedules developed by using the proposed modeling approach are presented. Indications based on two years of performance tracking of the new approach are that modeling optimization yields up to half an hour/day of extra support for remote sensing satellites, a very significant gain when one considers the high cost of putting a LEO satellite in orbit.

007-0141: Modeling and Analysis of an Integrated Automated Guided Vehicle System Using CPN and RSM

Tauseef Aized, Tokyo Institute of Technology, Japan

Koji Takahashi, Tokyo Institute of Technology, Japan

Ichiro Hagiwara, Tokyo Institute of Technology, Japan

The objective of this study is to analyze an integrated Automated Guided Vehicle System (AGVS) which is embedded in a pull type multi-product, multi-stage, multi-line Flexible Manufacturing System (FMS). This study analyses the guide path configurations of the AGVS. For this purpose, three different guide path configurations have been developed and their impact on the performance of the flexible manufacturing system has been presented. The system is modeled using colored Petri net (CPN) methodology and the study has been extended to seek near-optimal conditions of the three configurations using response surface method (RSM).

007-0275: Incorporating Rolling Horizons and Forecast Uncertainty in Dynamic Layout

Jaydeep Balakrishnan, University of Calgary, Canada

Chun Cheng, The Chinese University of Hong Kong, Hong Kong

Research in the Dynamic Plant Layout Problem (DPLP) assumes that the planning horizon is fixed and that material flows are known with certainty. But in practice, many companies use rolling planning horizons. Further, they have to deal with the effect of uncertainty in material flow forecasts. This paper investigates the performance of algorithms under fixed and rolling horizons, under different shifting costs and flow variability, and under forecast uncertainty. Nearly 1800 problems were run using different algorithms. The results show that algorithms that dominated under fixed horizons may not work as well under rolling horizons. It also appears that increasing the planning horizon under rolling plans does not offer any advantage. Further forecast uncertainty may not significantly affect the performance of algorithms and in some cases may be beneficial.

007-0620: Evaluation of Stratified Latin Hypercube Sampling in Simulating Operations Management Problems

Hongsuk Yang, University of Utah, United States

Linus Schrage, University of Chicago, United States

We look at the benefits of a type of quasi-random sampling that combines Latin square sampling with multidimensional stratified sampling. We compare this approach with other well-known variance reduction methods when applied to a variety of simulation problems in the operations management area, ranging from stochastic PERT networks, petroleum reserve evaluation, multi-product inventory management with demand substitution, international supply chains under exchange rate uncertainty, option pricing, and stochastic programming. We consider three settings: 1) simple evaluation of a policy, 2) optimization under uncertainty, and 3) percentile estimation as occurs in Value at Risk analysis. In the optimization setting we analyze estimation bias. We show that for practical purposes, stratified Latin Hypercube sampling is never worse than other methods, and in many applications it is significantly better.

117	Saturday, May 5, 3:30-5:00 Room: Far East Session: Linking Operations and Marketing Strategies	Track: Mkt-Opns, 8	Chair: Russell Johnson
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007-0128: Linking Corporate, Marketing and Manufacturing Strategy: The Real Implications for Manufacturing Companies.

Patricia Deflorin, University of St. Gallen, Switzerland

Maïke Rathje, University of St. Gallen, Switzerland

Thomas Friedli, University of St. Gallen, Switzerland

The link between corporate and manufacturing as well as marketing strategy is often seen as hierarchical. But existing capabilities restrict the implementation of new strategies, backfiring higher level concepts. Hierarchical and static models neglect this interaction. This paper provides a conceptual framework that links marketing and manufacturing as well as corporate strategy. It combines the market and resource based view. The framework has been derived through customer segmentation based on manufacturing and marketing criteria. The framework not only combines the different perspectives, but can be used as a visualizing tool. Deriving segmentation from a manufacturing are marketing perspectives leads to management implications which include the redefinition of corporate strategy. Based on the result of an action research project, the procedure and results will be highlighted and discussed.

007-0030: The Role of Flexibility in Linking Marketing Strategy to Operations Strategy

Abdulkareem Awwad, Al-Hussein Bin Talal University, Jordan

Flexibility plays a major role in linking operations strategy to marketing strategy. It gives an organization the ability to introduce new products, adjust capacity rapidly, and customise products. It enables organizations to respond effectively to changing circumstances, particularly, when dealing with the turbulent environment that may be characterised by rapid changes such as short and uncertain product life cycles, innovative process technologies, and customized products. More specifically, flexibility addresses operations strategy with quick response to change production volume. For example, expansion flexibility links marketing to operations strategy when dealing with growth strategies such as venturing into new markets. At the same time, flexibility interacts with marketing strategy enables an organization to respond effectively and efficiently to change product mix, customization of product and introducing new products.

007-0650: Using the Theory of Constraints to Strategically Link Marketing and Operations

Russell Johnson, Metropolitan State College of Denver, United States

Viable Vision is an approach to creating a significant competitive advantage using the production (Drum-Buffer-Rope and Buffer Management), distribution (TOC replenishment) and/or project management (Critical Chain) applications of the TOC and leveraging that advantage in the market place. The intended result is to move an organization to the point that, in less than four years, annual net profits are equal to, or greater than, current annual sales. These projects are taking place throughout the world in companies of all types and sizes where a physical product is involved. This paper shares the key concepts of the Viable Vision approach and examples of the efforts. This paper is of high value to those professionals involved in operations management who are frustrated with the continued focus on cost reduction rather than growth.

118	Saturday, May 5, 3:30-5:00 Room: Florentine Session: Remanufacturing Issues	Track: Sustain Ops, 9	Chair: Mark Ferguson
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007-0558: OEM Certification Programs for Remanufactured Products

Beril Toktay, Georgia Institute of Technology, United States

Mark Ferguson, Georgia Institute of Technology, United States

Se-Kyoung Oh, Georgia Institute of Technology, United States

Independent remanufacturers sometimes create reputation problems for the original OEM brand. In response OEMs may develop certification programs in which certified remanufacturers are required to provide a certain level of quality for the remanufactured products. We study the effectiveness of such programs provided by the OEM under different conditions (e.g. consumers can/cannot distinguish between the OEM's and the remanufacturer's product, OEM reputation is linked to remanufacturing quality only, or both remanufacturing quality and quantity).

007-0610: The Role of Leadership in Encouraging Sustainability in Agro-Based Supply Chains

Pranab Majumder, Duke University, United States

Ashok Srinivasan, University of Southern California, United States

We examine the issue of promoting sustainability in long supply chains with agricultural inputs. Examples include apparel (cotton), coffee (coffee beans), furniture (timber), and organic food products (fruits, vegetables, food grains). The initial agricultural input has a high impact on the environment during its production and often significantly impacts the recyclability of the final product at the end of life. Sustainability also includes reliability of supply from marginal farmers. We propose a model of contracting in long supply chains where the leader has the ability to offer contracts to any other member of the chain. Our model shows that by directly offering contracts to the input producer, the supply chain leader can promote sustainability. An additional benefit in many cases may be increase in the efficiency of the chain.

007-0344: Analysis of Disassembly Systems in Remanufacturing Using Kanban Control

Aybek Korugan, Bogazici University, Turkey

Kemal Dingec, Bogazici University, Turkey

Disassembly is the most critical stage of remanufacturing activities. The condition of parts disassembled for reuse/remanufacturing display a high variance. Hence demand for different parts found in a core cannot always be satisfied by a single core. At this point the question is whether to partially or fully disassemble the second core. In this paper, we concentrate on quantifying the potential benefits of this decision in a remanufacturing environment by using a queuing network model with kanban control. In our model, machine service times, demand and return arrival times to the remanufacturing facility are assumed to be independent and exponentially distributed random variables. The model is solved analytically by an approximate method to compare the performances of two different types of disassembly system.

007-0088: Remanufacturing Planning with Different Quality Levels for Product Returns

Gilvan Souza, University of Maryland, United States

Mark Ferguson, Georgia Institute of Technology, United States

V. Daniel Guide, Jr., The Pennsylvania State University, United States

Eylem Koca, University of Maryland, United States

We consider a production planning problem where remanufacturing cost increases as the quality level for product returns decreases, and any unused returns may be salvaged. Decision variables include the amount to remanufacture each period for each return quality level and the amount of inventory to carry over for future periods for returns, and finished remanufactured products. Our model is grounded with data collected at Pitney Bowes. The problem is formulated as a linear program, given demand forecasts over a planning horizon, and it has a network-like structure. Given some conditions on holding costs, we find that the firm always remanufactures the exact demand in each period. We also study the value of a nominal quality grading system in planning production. We show that a grading system decreases cost by 11% over a wide range of parameter values commonly found in the remanufacturing industry.

007-0481: Returns Decisions in Process Industries

Monique French, University of Colorado at Colorado Springs, United States

Rebecca Duray, University of Colorado -- Colorado Springs, United States

Conventional wisdom views all process industries as the same or considers process industry companies to be similar within their industries. However, recent research has shown diversity within process industries. Companies differ in their processes and their products. Research into product returns and reprocessing options used in process industries has found a wide variety of both. This paper examines process industries from the perspective of product returns. We propose that there is commonality in the types of returns companies accept and that it is the commonalities of these groups that impact the reprocessing options. Although one would anticipate that returns sources would be common within an industry, we find that process industry group membership is not dependent on industry.

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Saturday, May 5, 3:30-5:00 **Room:** Fountain
Session: Strategic Innovation

Track: Ops Strat, 8

Chair: Germaine H. Saad

007-0011: The Effect of Fidelity Between R&D and Manufacturing on Speeding Up the Production Ramp-up

Bowon Kim, KAIST, Korea, Republic of (South Korea)

Jongjoo Kim, KAIST, Korea, Republic of (South Korea)

To be competitive in the market, a firm should be able to speed up its ramp-up production after new products and/or new processes developed by R&D were transferred to the manufacturing environment. In this paper, we put forth that fidelity between R&D and manufacturing is critical to accelerating the ramp-up production. We formally define fidelity as congruence between R&D and manufacturing in two dimensions, structural and infra-structural. In addition, active coordination between R&D and manufacturing is supposed to reduce any negative effects on the ramp-up production, which were caused by lack of fidelity between the two functions. As another mediating factor, we consider different R&D contexts, characterized by the level of newness of product and process, which represent such market conditions as uncertainty and competition faced by the firm.

007-0670: Digital Manufacturing Orientation: The Construct, Research Propositions, and Managerial Implications

Dean Bartles, General Dynamics, United States

The literature reflects remarkably little effort to develop a framework for understanding the implementation of a “Digital Manufacturing” culture or orientation, as well as the necessary antecedents for such nor the resulting consequences. The author will attempt to synthesize extant knowledge on the subject and provide a foundation for future research by clarifying the construct’s domain, developing research propositions, and constructing an integrating framework that includes positing potential antecedents and consequences of a “Digital Manufacturing” orientation. The author intends to draw on the occasional writings on the subject over the last 15 years in the literature, work in related disciplines, and multiple field interviews with managers in diverse functions and organizations. Managerial implications of this research will be discussed.

007-0177: Business Process Innovation: A “SMART” Approach

Germaine Saad, Widener University, United States

Samia Siha, Kennesaw State University, United States

This paper presents a new approach for business processes innovation labeled SMART. SMART is a five phase framework which also represents its five main goals and provides specific improvement/outcome. This outcome is measurable, feasible and workable, attainable, relevant, and timely. The outcome achieved is what is mostly needed and fitted to the present and future time horizon of underlying operations environment. How each of the above goals is realized will be presented, along with implementation guidelines.

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Saturday, May 5, 3:30-5:00 **Room:** French

Track: Hum Log, 2

Chair: Luk Van Wassenhove

Session: Panel Discussion: Setting a Research Agenda for Research on Humanitarian Disaster Logistics

007-0467: Panel Discussion: Setting a Research Agenda for Research on Humanitarian Disaster Logistics

Luk Van Wassenhove, INSEAD, France

Jo van Nunen, Erasmus University Rotterdam, Netherlands

The panellists will first present their views on the research issues in humanitarian disaster logistics. This will be followed by a Q&A session with the audience. The objective is to exchange ideas and materials on the subject and to come to an agreement on the priorities for research in this emerging field. The discussion will also touch upon the opportunities for teaching and pedagogical material development.

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Saturday, May 5, 3:30-5:00 **Room:** Garden

Track: Education, 8

Chair: Norman Faull

Session: Interactive Games in Operations Management Education

007-0431: Games: Educating the Professor

Norman Faull, University of Cape Town, South Africa

There is little theory in POM. Most teachers use cases to allow learning from the experience of others, trying to clarify some processes (e.g. scheduling) and tools within a set of principles (e.g. Lean). But it is in the practice of POM that the real learning occurs: doing is knowing. So many of us use games, e.g. the Beer Game, to illustrate processes, tools and principles. This paper presents the evolution of a game over nearly 15 years of teaching. The Chain Gang Game involves making paper chains, through cutting, punching (for a decoration), and 'welding' (actually stapling) combinations of white and coloured paper to produce specified designs. Costs and revenues are involved. Within the last year it has been altered to teach 'takt' and cycle time, line balancing, and other concepts. A major surprise, at least to the author, is how much the teacher learns as a game matures!

007-0134: Pitching Pennies: A Interactive Learning Tool for Quality Management

John Howard, University of South Alabama, United States

Alan Chow, University of South Alabama, United States

Nancy Lambe, University of South Alabama, United States

Total Quality Management uses statistical concepts extensively. While students have learned them to get through one or two semesters of statistics, they struggle to apply them. Shooting a coin at a target, or pitching pennies, is used as a tangible simulation of real world processes. Each coin tossed at a target represents the manufacture of a product, an interaction with a customer, or a customer delivery. We present a simple interactive exercise that helps students, judge quality performance of processes, understand the basis of process capability, visualize both accuracy and precision, understand/determine sources of variation, and internalize the concept of the “cost of poor quality” and Taguchi loss function. This activity uses readily available props and provides involvement and entertainment to keep students’ interest with a hint of competition. The teaching points are clear and relevant to the course of study.

007-0132: Carter Cranks: An Interactive Class Room Production Exercise

Nancy Lambe, University of South Alabama, United States

Alan Chow, University of South Alabama, United States

John Howard, University of South Alabama, United States

Most undergraduate students have never seen a production process, thus have no visualization of lecture material presented. We provide an exercise that gives intense, interactive exposure to challenges in a production environment gives appreciation of the importance of training, layout, line balancing and cellularization, and provides experience of potential havoc. Activity simulates multi-workstation manufacturing. Each station has a number of component parts that assemble into the product. The goal is to complete as many jobs as possible during the allotted time. Students are assigned positions (operator, scheduler, material-handler, production control, inspector, or accountant) and perform tasks per work orders and routing slips associated with each job according to the bills-of-material and prototypes provided. Operational problems are expected and students must face them as they arise. Afterward, students answer questions about their experience and observations. Instructor conducts a discussion that solidifies the clarity of teaching points.

007-0337: Addressing Exchange Rate Uncertainty in Risk-averse Operational Hedging*Rockey Myall, Lehigh University, United States**Aurelie Thiele, Lehigh University, United States*

Operational hedging has emerged as an important strategy to optimize profit in the global supply chain; however, there has been little effort so far to incorporate the manager's risk aversion directly into the decision-making framework. We focus on a US multinational with a US plant and a foreign plant, subject to exchange rate uncertainty. We investigate the impact on the optimal strategy of enforcing limits on the manager's risk exposure. We provide theoretical insights into the structure of the optimal policy for a broad class of return and risk measures. Finally, we compare three models, using the expected profit as a return measure and standard deviation, shortfall and value-at-risk as risk measures, through extensive numerical experiments using both simulated and historical exchange rate data. Our empirical study suggests that, although shortfall has become a popular risk measure in finance, it exhibits lackluster performance in operational hedging.

007-0451: The Value of Ordering Protocols in Global Supply Chains*Katariina Kemppainen, RSM Erasmus University, Netherlands**Ari Vepsalainen, Helsinki School of Economics, Finland*

Increasing specialization and outsourcing of operations make it difficult for manufacturing firms to anticipate the tardiness of individual orders throughout the global supply chain from sales to final delivery. This paper analyzes the design of efficient ordering protocols for coordinating inter-organizational processes to boost on-time delivery performance. The key is to apply systematically the value of on-time delivery (or the cost of tardiness) for each customer order to manage the priorities across the companies. In addition to computational results that show the relative power of the rules in terms of tardiness and holding costs, real-life examples will be discussed.

007-0001: The Impact of Discount Brokerage Fees on Online Stock Trading: A Study of the Stock Market in Thailand*Krishnan Dandapani, Florida International University, United States**Arvi Arunachalam, Florida International University, United States**Sushil Gupta, Florida International University, United States*

This paper examines the impact and impetus of discount trading fees on online stock trading in Thailand. The mid 1990s saw the advent of Internet and the proliferation of stock trading using Internet. While the U.S stock markets have lead the world in terms of de-regulation, discount brokerages and competitive commission fees, in many Asian stock markets this situation has been replicated. The deregulation of trade commissions, entry of new discount online brokerages reshaped the competitive landscape of securities trading in Asia most notably in Japan, Hong Kong and Korea. Online stock trading, though recent, yet is fast growing trend in Thailand. This paper investigates the economic rationale and prospects for individual investors to participate in the stock market due to market micro structure factors such as deregulation of brokerage of commissions, and macro industry factors such as the relatively inexpensive Internet connectivity costs.

007-0570: Hyper-mart Retailing Operations: Issues of Globalization and Localization*Ravi Kumar, University of Southern California, United States**Youn Kim, Inha University, Korea, Republic of (South Korea)*

This research is motivated by Wal-Mart having to withdraw from S. Korea due to its unsuccessful operations. We will focus on analyzing factors influencing customer satisfaction and loyalty in 'big-box' retail operations, especially in the US and Korea. To examine these relationships, we will look at such factors as extent of globalization and localization of both product line and operational features. Also, competitive strategy of Korean discount retail store such as E-mart will also be discussed.

007-0507: An Empirical Approach to Supply Chain Risk Management*Wolfgang Kersten, Hamburg University of Technology, Germany**Philipp Hohrath, Hamburg University of Technology, Germany**Mareike Boeger, Hamburg University of Technology, Germany*

Today companies face challenges with regards to Supply Chain Management. One challenge arises out of trends associated with lean management. Strongly synchronized interfaces and the reduction of inventory cause a greater dependence of supply chain partners on each other. This close co-operation between supply chain partners exacerbates the risk exposure of companies in a supply chain. The Hamburg School of Logistics performed an empirical investigation on risk and risk management activities. Based on that, a framework for supply chain risk management will be developed. Starting from theoretical risk classifications, companies' risk assessment and the description of companies' supply chains, suitable supply chain risk management strategies will be discussed. We show that there are differences in the way companies from different sectors should approach this challenge. Recommendations will be given.

007-0747: Managing Disaster Inventories: An Example from Retail*Douglas Morrice, University of Texas at Austin, United States**Fehmi Tanrisever, University of Texas at Austin, United States**Sara Knowles, The University of Texas at Austin, United States*

Hurricanes Katrina and Rita had a devastating impact on the supply chains of many industries along the gulf coast. The brunt of these natural disasters was particularly acute on some retailers that experienced pre, during, and post supply chain disruptions. In this project, we examined the amount of disaster inventory held by a particular retailer. We used actual hurricane data and the newsvendor model to gain insights into how to improve inventory levels and other operations.

007-0504: Competitiveness and Resilience in an Agri-export Supply Chain in Brazil

Joao Csillag, Fundação Getúlio Vargas, Brazil

Natalia Aguiar, Fundação Getúlio Vargas, Brazil

Claudia Medeiros, Fundação Getúlio Vargas, Brazil

Disaster management, analyzing the benefits and disadvantages of each type of relation settled between the agents, is the focus of this article. This paper highlights factors that contribute for competitiveness through the analysis of vulnerability lacks and resilience that result from the relations settled. The consequences of disruptions in supply chain will be the main part of the study, specially the disruptions that come as a consequence of avian flu. The focus is chicken supply chains in Brazil that provide the United States because of the importance of this market for exportation in Brazil and the intention of improving the economic relations between them. Better comprehension of supply chain's management can offer possibility of effective approach in competitiveness and resilience of the chain facing disasters, contributing for the producers in Brazil to improve management.

124	Saturday, May 5, 3:30-5:00 Room: Parisian Session: Empirical Investigations of Technology-Enabled Supply Chain Operations	Track: Emp Res, 8	Chair: Eve Rosenzweig
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007-0080: Long Tails or Superstars: Evidence from Internet Retailing Returns

Timothy Laseter, University of Virginia, United States

Elliot Rabinovich, Arizona State University, United States

Our paper explores two contradictory theories for growth in Internet Retailing. The “Long Tail” perspective argues that the future comes from “selling less of more” as the Internet offers opportunities to provide better “customer fit” at a lower cost. The Superstar model implies that the very best products will increasingly dominate categories due to the global reach of the Internet and the growth of “winner takes all” markets. Our empirical research examines return data from over 5,000 SKUs of an Internet retailer of durable consumer goods to test these theories.

007-0525: Supplier Relationship Development and the Use of Technologies - A Critical Examination

Anand Nair, University of South Carolina, United States

Ajay Das, City University of New York, United States

In this study we examine the link between the supplier relationship development practices on the use of process, design and information technologies in manufacturing firms. Our results, using empirical cross-sectional data, suggest that the impact of supplier relationship development on buyer's technology experiential capital is of complex and intriguing form. Apprehensions of “hollowing-out” effects appear founded to an extent, underlining the need to carefully nuance relationships with suppliers in order to prevent unintended dilution of experiential capital.

007-0068: A Contingent View of E-collaboration and Performance in Manufacturing

Eve Rosenzweig, Emory University, United States

Over the last several years, manufacturers have utilized Internet-based tools to conduct collaborative activities with business customers. While conventional wisdom suggests that the greater the extent to which manufacturers engage in Internet-enabled commerce with downstream business customers, the better the performance, we espouse an alternative view. Consistent with the relational view of competitive advantage and contingency theory, we develop a model and a series of hypotheses that specify how various product and market characteristics may influence the nature of the expected positive relationship between e-collaboration and performance. To test the model, we collected data from 50 manufacturers using a Web-based survey. Our findings contribute to the operations strategy literature on supply chain relationships in the e-business arena and offer managers a framework for the conditions under which investments in e-collaboration are more appropriate and therefore more beneficial.

007-0421: Influence of Supply Chain Capabilities on Innovation Performance

Vincent Mabert, Indiana University, United States

Sachin Modi, i2 Technologies, United States

This paper investigates whether supply chain capabilities of a firm influence its innovation performance. Supply chain capabilities refer to a firm's ability to build, integrate, and reconfigure its upstream supply chain, internal operations, and downstream supply chain to address rapidly changing market needs. Innovation performance of a firm is conceptualized as the firm's ability to develop new products/processes and enhance existing products/processes. The methodology used is regression analysis of archival financial data and patent citation data. Data over one decade, from 1987–1996 for publicly traded for-profit U.S. organizations within the manufacturing sector of SIC 20–39 inclusive, were used for analysis. Results indicate that supply chain capabilities do indeed influence innovation performance.

125	Saturday, May 5, 3:30-5:00 Room: Patio Session: OAG Industry-Academia Panel Discussion	Track: OAG, 3	Chair: Rafael Menda
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007-0686: Operational Advantage Group's Fourth Annual Panel Discussion

Rafael Menda, McNeil Consumer Healthcare, United States

As in the previous three years, OAG will again bring together a panel of POM academics and practitioners. The discussions will focus on industry-academia collaboration, its pitfalls as well as its rewards. The contributed papers presented earlier in the day as part of the OAG track will have illustrated several recent examples of collaborative research, while reflecting the experiences of the researchers. The panelists will be asked to comment on those presentations and offer recommendations on future direction of OAG in fulfilling its mission more effectively.

126	Saturday, May 5, 3:30-5:00 Room: Pavilion Session: IT and Firm Performance	Track: Opns-IT, 4	Chair: Indranil Bardhan
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007-0642: Strategic Alliances of IT Among Supply Chain Members: A Case Study of a Retail Distribution Center

Christine Alexander, Morehead State University, United States
HY Sonya Hsu, University of Louisiana at Lafayette, United States
Beth Alexander, Federated Logistics & Operations, United States

Supply chain management deals with how companies coordinate and cooperate with its business partners. Three factors have contributed to the needs of effective supply chain management. On the demand side, more sophisticated customers are increasingly demanding a customized value from the supply chain. In contrast, suppliers are increasingly embracing IT to obtain a forward-looking perspective of the entire supply chain so as to optimize the processes for meeting demand. Finally, on both the demand and supply sides, the emergence of global markets has stretched a supply chain to a longer distance. This case study examines technology usage in the supply chain of a regional distribution center for a national retail chain, focusing on the effect of IT on supply chain performance and coordination. From either technological similarity or geographic proximity, this study demonstrates how the strategic alliances of IT among channel members enhance a firm's competitive advantage.

007-0640: IT Investments, R&D Productivity, and Firm Performance

Vish Krishnan, University of California, San Diego, United States
Indranil Bardhan, The University of Texas at Dallas, United States
Gokcen Arkali, The University of Texas at Dallas, United States

Prior research has often been based on the assumption that investments in R&D are directly associated with product innovation and revenue growth. While past evidence has supported this view, recent data presents a mixed picture. It is unclear to what extent spending on new types of IT has allowed engineers and scientists to become more productive and contribute to the growth in firm revenues and margins. Here, we study the impact of IT in terms of its influence on R&D productivity and firm performance. We investigate whether IT spending moderates the impact of R&D spending on financial performance. We test our model by using archival data from 1998-2003 for a large cross section of 491 firms. Preliminary results suggest that IT spending has a significant impact of R&D on firm performance. These results shed new light on the relationship between R&D and firm performance.

127	Saturday, May 5, 3:30-5:00 Room: Royal Session: OM Topics in Emerging Economies	Track: Tutorial, 8	Chair: Mei Xue
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007-0113: OM Topics in Emerging Economies

Mei Xue, Boston College, United States
Aleda Roth, Clemson University, United States
Thomas Choi, Arizona State University, United States
Sridhar Seshadri, New York University, United States

The rapid growth of emerging economies (e.g. China, India and Korea) offers many opportunities while posing new and old challenges for operations managers and scholars. This panel session examines the special issues facing emerging economies that are particularly relevant to the OM profession. The panel includes Aleda V. Roth (Burlington Industries Professor of Supply Chain Management, Clemson University), Thomas Y. Choi (John G. & Barbara A. Bebbeling Professor, Arizona State University), and Sridhar Seshadri (Toyota Motor Term Professor of Operations Management and Information Systems, New York University). The panelist will share findings from their individual research projects about operations management in China, India and Korea and their insights about some common OM issues facing emerging economies.

128	Saturday, May 5, 3:30-5:00 Room: State Session: Service System Design	Track: Service Ops, 2	Chair: Panagiotis Kyriazopoulos
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007-0385: Using Organization Theory to Design More Effective Service Operations

Joel Goldhar, Illinois Institute of Technology, United States
Janelle Heineke, Boston College, United States

In recent years most of the emphasis in OM has been to use quantitative techniques to understand/design more efficient operations. This has come at the expense of mostly ignoring OM's 'roots' in the Bank Wiring Room and the work of early pioneers such as Fredrick Taylor. This emphasis has been both useful and successful for traditional manufacturing operations. In a service economy where labor intensive operations take the majority of individuals' budgets; we need to find a better balance between quantitative techniques/optimization theory and organization theory and design techniques create effective as well as efficient service operations. This paper will review organization theories including SocioTechnical Systems and the Economics of Organization Architecture and suggest ways to integrate them into the design of service operations and also into the teaching of the core OM and advanced courses.

007-0622: The Effect of Streaks in the Design of a Playoff Series

Timothy Urban, The University of Tulsa, United States

North-American professional basketball, hockey, and baseball use a seven-game playoff for their championship series. The home-away sequence, however, differs between the sports. Previous research has investigated alternative sequences with a home-court (ice, field) advantage; however, it has neglected the impact of winning/losing streaks on the outcomes. Using data from the NBA finals, the effects of team strength, home-court advantage, and streakiness are used to evaluate alternative formats. We consider both positive serial correlation (winning/losing streaks due to confidence/frustration) and negative serial correlation (making adjustments or trying harder after a loss). The effect on the expected number of games to be played in the series (economic implications) and the probability of the higher-seeded team winning the series (fairness issues) will be investigated.

007-0317: Measuring Retail Service Design Factors: An Empirical Analysis and Structural Model

Ted Shockley, Clemson University, United States

Lawrence Fredendall, Clemson University, United States

In practice, a company's business proposition is not always closely linked with the actual service delivery design. As the field of operations management calls for the need to develop a more scientific approach to problem-solving in services, establishing a design planning framework and empirically testable scales is critical to growing the body of service knowledge. This research presents results of an empirical study examining the managerial and structural design elements of 218 retailers in the southeastern US. It develops and tests the factors of a proposed design framework by constructing and validating measurements of service/product complexity, diagnosis in the service encounter, level of self-selection, and task empowerment. Finally, it considers these design factors within the context of a larger theory of retail service delivery design. Our structural model shows how ideal profiles of strategies for design are linked to better service system performance.

007-0124: Implementing Internal Marketing Through Employee's Motivation

Panagiotis Kyriazopoulos, Technological Education Institute of Piraeus, Greece

De Yannacopo, Technological Education Institute of Piraeus, Greece

Yannis Sisko, University of Piraeus, Greece

Evangelos Grigoroudis, Technical University of Crete, Greece

Athanasios Spyridakos, Technological Education Institute of Piraeus, Greece

According to Piercy and Morgan (1991) external customer satisfaction cannot be achieved without the fundamental contribution of the customer-contact employees who provide the service. The front-line employees of the bank interact with the majority of customers and generally handle a wide range of banking transactions. Because of the importance of the service provided, bank firms should support customer-contact employees in order to acquire communicative sale skills and make them feel comfortable and satisfied with their job. The present study examines the adoption of IM concept from bank branch employees and their engagement and commitment on it. This survey contacted of 356 branches from banking in Greece. The discussion of the findings contributes to understanding how Internal Marketing influences work commitment of the employees and how they are linked to the adequacies of a bank and its eventual performance in order to develop the Market Orientation concept.

129	Saturday, May 5, 3:30-5:00 Room: Terrace	Track: Health Care, 8	Chair: David Bamford
	Session: Impact of Healthcare Strategy and Public Policy		

007-0722: Information Security in Health Care Supply Chains: ISO 17799 versus HIPAA

Liam O'Neill, University of North Texas, United States

Chao-Hsien Chu, Penn State University, United States

A major barrier to the further adoption of information technology in health care are concerns over the privacy of patient health information. To address this concern, HIPAA (Health Insurance Portability and Accountability Act) has mandated the adoption of security standards for all health care providers. In this paper, we provide an overview of HIPAA and compare it to the international standard ISO 17799. In some instances, ISO 17799 is a more stringent security standard and HIPAA can be considered to be a subset of ISO 17799. We examine the weaknesses of the HIPAA provisions, as it has been reported as a law without teeth as privacy infractions are rarely prosecuted. Whereas HIPAA has served as a catalyst for IT investment in health care, we argue that it does not go far enough to serve its intended purpose.

007-0075: The Impact of HIPAA on the Supply Chain Performance in the Healthcare Sector

Albena Iossifova, Slippery Rock University, United States

Susan Meyer - Goldstein, University of Minnesota, United States

We conducted a longitudinal study of the impact of HIPAA adoption on the supply chain performance in the healthcare sector. The supply chain consists of the healthcare providers, the EDI clearinghouses and the insurance companies (payers). Supply chain performance is measured by the quality and the response time of the transactions between the healthcare providers and the payers.

007-0175: An Empirical Investigation into Service Strategy Within the UK Health System

David Bamford, Manchester Business School, United Kingdom

Robin Drummond-Hay, Manchester Business School, United Kingdom

An empirical case study was undertaken that investigated the impact the UK Department of Health 18-Week Patient Pathway (18 WPP) will have on an outpatient department (OPD). The research analysed existing patient pathway procedures in place within a UK Hospital Trust cardiology OPD. From the collected data, it was established the OPD was not managing patient demand and was struggling to meet the remit of the 18 WPP. At the invitation of the OPD Manager, a revised pathway was recommended for the Trust's consideration. From the research, other key influences have a significant impact on service improvement and managing change in the NHS. The contribution of this research has added to the knowledge about management of organisational change. This paper is of value to those working in the healthcare and wider public sector.

007-0064: Testing Models of Care Quality for Discharged Patients

Masood Badri, United Arab Emirates University, United Arab Emirates

Samaa Attia, United Arab Emirates University, United Arab Emirates
Abdulla Ustadi, Rashid Hospital, United Arab Emirates

We present a model of service quality and satisfaction in healthcare for discharged patients in public hospitals in the United Arab Emirates. Several structures are proposed and tested. Confirmatory Factor Analysis was used to estimate and test the parameters of the hypothesized model. Four models with different structures were tested. The recommended model is based on three constructs – Quality of care, process and administration, and information. Goodness-of-fit statistics supported the solution of the healthcare quality-satisfaction model, which captures attributes that characterize healthcare quality in the UAE and could represent other modern healthcare systems. It can be used as a basis for evaluation in healthcare practices from discharged inpatients' point of view. The study highlights the importance of patients' satisfaction with care as predictors of quality of care. The results confirm the construct validity of previously discussed healthcare quality scales.

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Saturday, May 5, 3:30-5:00 **Room:** Vista
Session: Implementing JIT/Lean Production

Track: JIT & Lean, 5

Chair: Susan C. Morton

007-0315: A Contextual Investigation of the Adoption of Lean and Flexible Manufacturing Practices

Michael Braunscheidel, The State University of New York College at Brockport, United States
Nallan Suresh, State University of New York at Buffalo, United States

The adoption of lean and flexible practices by manufacturing organizations has been studied for many years. The basic intent of these manufacturing practices is to improve the competitive position of these firms by reducing costs and improving responsiveness to customer demand. In this study, supply chain executives of 218 manufacturing firms are surveyed. The impact of firm characteristics such as firm size, manufacturing strategy and process selection variables is analyzed to compare the adoption of lean and flexible manufacturing techniques. A major objective of the paper is to determine if adoption of lean and flexible manufacturing practices is prevalent across the variables selected or if these practices are applicable to more specific manufacturing strategies or processes. For example, lean processes are typically utilized by organizations that employ a make-to-stock manufacturing strategy and/or use a repetitive assembly manufacturing process.

007-0007: Involvement and Lean Innovation: Practices and their Performance Implications

Jannis Angelis, University of Warwick, United Kingdom
Bruno Fernandes, Centro Universitario Positivo, Brazil

JIT/lean production is the globally competitive standard for product assembly of discrete parts. Successful lean application is conditioned by an evolutionary problem-solving ability of the rank and file. Such ability is contingent on employee involvement in various improvement programs and the implementation of appropriate practices. But the challenge of operating innovative lean systems lacks statistically valid guidance. This large empirical study is based on worker responses from twenty manufacturing sites in four Brazilian industry sectors. It identifies particular practices that impact employee participation in change or improvement activities and their performance outcomes. Implications are discussed, and recommended practices described.

007-0280: Strategies for Implementing Lean: The 3M Brazil Case Study

Rogério Calia, FGV Business School, Brazil
Francisco Barbeiro, 3M Brazil, Brazil

The paper presents a case study of how 3M Brazil implemented Lean Manufacturing and became a benchmark for other subsidiaries. The case study is based on interviews with key professionals involved in the Lean implementation, in order to understand the strategies and resources that resulted in significant improvements in service level, inventory turns and cost metrics. Firstly, the paper reviews academic researches on lean implementation and organizational change. Secondly, the paper presents the case study analyzing the strategic choices and the operational challenges of implementing Lean in a company with large amount of different products and high demand variability. Finally, the paper discusses the synergic role of the Six Sigma and the Theory of Constraints methodologies in this Lean implementation.

007-0149: Beyond Lean: Overcoming Resistance to Innovation to Improve Productivity

Susan Morton, Loughborough University, United Kingdom
Neil Burns, Loughborough University, United Kingdom
A R J Dainty, Loughborough University, United Kingdom

The importance of innovation to the continued success of organizations is illustrated by the many examples of direct and indirect support for innovation. Indeed, the UK Government views innovation as one of the main drivers of improved UK productivity. This paper presents results of research in the global automotive industry to understand and overcome the barriers to innovation evident in organizations. It reviews the literature surrounding resistance to innovation, looks at the influence of organizational culture and climate, and identifies areas where intervention may help overcome organizational barriers to innovation and foster productivity improvement. The paper will also focus on what elements of the innovation process can be measured and review the instruments that are currently available for the task. The innovation literature is broad but cannot be construed as comprehensive in this particular area of interest, thus the paper culminates with a summary of further opportunities for research.

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Sunday, May 6, 10:30-noon **Room:** Brasserie
Session: Technology Management

Track: Prod Innov, 9

Chair: Weiyu Tsai

007-0217: Technological Level of Enterprises in Some Brazilian Industrial Sectors

Maria Gouvêa, University of São Paulo, Brazil
Vicente Plantullo, University of São Paulo, Brazil

The objective of this study was to verify the technological level of enterprises belonging to different industrial sectors located in São Paulo in Brazil. Quantitative research with 165 executives of national and multinational companies from 2004, July to 2006, July was carried through. A list of technological techniques or tools was presented to the interviewees to make an assignment of a degree, from 1 to 7, of the implementation level in their company. A factor analysis was applied. An index of technological degree was obtained as the weighted average of factor scores with weights that corresponded to the percentage of variance accounted for each factor. The resulting rank of the companies provided the relative positioning of each in terms of technological advance.

007-0215: An Innovative Framework Based on PLM, RFID and XML Technologies for Promoting Innovation

Piero Lunghi, University of Perugia, Italy
Marco Botarelli, University of Perugia, Italy
Michele Ginocchietti, University of Perugia, Italy

In this paper we propose an innovative framework with the purpose of promoting innovation in three main directions (technological innovation, business model innovation, product innovation). The framework is defined through the Product Lifecycle Management methodology, and we discussed the possibility of implementing innovative technologies as RFID (Radio Frequency Identification), considered like enabled technologies for PLM and representing an informative support on the product for both producers and customers, and XML (eXtensible Markup Language and derivation), considered like an essential component to obtain shared information on the product between producers and customers over the different phases of the product lifecycle(31). By considering holistic property the proposed system achieves not only a valid and innovative framework for product innovation support, but also a framework that allows customer participation in the supply chain. The paper is supported by a case study of an Umbrian company which tested the framework proposed.

007-0674: RFID Chip Innovation and Technology Management

David Vequist, University of the Incarnate Word, United States

This research evaluates the industries and items/functions that have been reported to be utilizing RFID (radio frequency identification) chips. Various media sources were collected through a RSS feed (for the past year) and were analyzed to determine what types of industries and items/functions (e.g., products or processes) were linked to RFID usage. In addition, the media sources and manufacturing firms that were found from the research will be reported as well. The research will also suggest future trends for the RFID market based on the current findings. Finally, suggestions for using RSS in similar research projects will be offered.

007-0575: Accelerate the Technology Treadmill, or Step Off It?

Weiyu Tsai, University of Utah, United States
Bo Van der Rhee, University of Utah, United States
Glen Schmidt, University of Utah, United States

In technology markets, new features targeted at existing high-end customers are often introduced with each new generation of products. For example, Microsoft's Xbox 360 gaming system came with a more sophisticated controller for initiated gamers. We call this accelerating the technology treadmill. On the other hand, sometimes the new feature emphasizes an alternate performance dimension to attract new customers: Nintendo's new Wii video game system introduced an easier-to-use interface targeted at new customers. We refer to this as stepping off the technology treadmill. In a market with two competing firms, we find that the firms either both introduce new features targeted at existing high-end customers, both introduce new features targeted at new customers, or introduce different new features. Interestingly, in the last case the firm which introduces the new feature targeted at new customers prefers that it be only marginally attractive.

132	<p>Sunday, May 6, 10:30-noon Room: Continental Session: Global Supply Chains</p>	<p>Track: Supply Chn, 9</p>	<p>Chair: Thomas Choi</p>
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007-0580: Supplier Selection and Brand Perceptions

Ole Sandvik, Molde University College, Norway
Rohit Verma, Cornell University, United States

Despite the fact that the nourishing of organizational buyer-supplier relationships has received great attention from widespread areas such as marketing, supply chain management, operations management, and strategy the last four decades, supplier selection remains an important core purchasing activity. In this study, we examine the purchase managers' perceived importance of a set of supplier selection criteria and compare the results with the managers' actual choice of supplier. The empirical data for this study was collected from over 500 supplier management executives in the United States from several industries including automotive, food and beverage manufacturing, pharmaceutical, chemical, oil and gas, paper, and pulp.

007-0441: Evaluating SCM Practices with the SCM Scorecard: Evidence from an International Study

Jouni Kauremaa, Helsinki University of Technology, Finland
Sadami Suzuki, Tokyo Institute of Technology, Japan

Supply chain management (SCM) is concerned with system-level management of material and information flows. However there is a lack of systematic tools to collect comparable firm-level observations on SCM practices, as well as to study empirically the purported relationship between SCM practices and financial performance. One tool for such evaluation is the SCM Logistics Scorecard (LSC). This paper reports a study to compare firm-level Finnish (n=53) and Japanese (n=290) LSC responses as well as the relationship between LSC scores and financial performance within the Finnish dataset. Differences between the datasets from the two countries are evaluated along with the observation that higher LSC and LSC-based factor scores are mildly positively associated with some financial indicators. Finally, the role of the SCM Scorecard as an evaluation tool of SCM practices in the international context is discussed.

007-0521: Global Sourcing and Purchasing Strategy as Decision-Making Process

Julio Sánchez Loppacher, IAE Business and Management School, Argentina

Raffaella Cagliano, Politecnico di Milano, Italy
Gianluca Spina, Politecnico di Milano, Italy

As reported in literature, companies have been forced by increasing global competition to devise and pursue international purchasing strategies that hinge on reducing prices and optimising quality, fulfilment, production cycle times, responsiveness and financial conditions. As a result, purchase management has turned to increased internationalisation to support companies' globalisation processes. Specifically, research studies focusing on multinational companies (MNCs) corporate purchasing strategy influence on affiliates' global supply strategy development reveal a strong link between two key dimensions: supply source and purchase location. In this research, a sample of seven Italian MNCs operating in Latin America's MERCOSUR (Southern Common Market) region have been studied in an attempt to analyse their purchasing strategy definition and development processes. The study has zeroed in on the interactions between both dimensions and the variables used for definitions in each of them, reviewing also their impact on companies' decision-making processes.

007-0410: A Comparison of Four-country Supply Chain Management Practices: Germany, Sweden, Japan, and Korea

Daesik Hur, Yonsei University, Korea, Republic of (South Korea)
Thomas Choi, Arizona State University, United States

Our goal is to compare supply chain management practices in leading industrial countries in Europe and Asia. Survey data were collected from a total of 132 plants from Germany, Sweden, Japan, and Korea, and represent electronics, machinery, and transportation industries. This study focuses on practices such as information sharing and communication, joint improvement, relationship development, JIT material flows between focal manufacturing plants and downstream and upstream supply chain members.

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Sunday, May 6, 10:30-noon **Room:** Executive **Track:** Tutorial, 4 **Chair:** Carsten Dittrich
Session: Educating Business School Students in Supply Chain Management using Microsoft AX

007-0086: Educating Business School Students in Supply Chain Management Using Microsoft AX: Sharing Experience in an Engineering Program

Carsten Dittrich, University of Southern Denmark, Denmark
Janelle Daugherty, Microsoft Dynamics Academic Alliance, United States
Christian Gierahn, University of Southern Denmark, Denmark

At the University of Southern Denmark, the Faculty of Engineering, a new project organized education was established in 2003. The Faculty is using Microsoft Axapta fully integrated in the SCM education of Manufacturing and Management Engineers and of Global Manufacturing and Management Engineers. This presentation is bringing the experiences from the initial years of this teaching, as the first engineers, exposed to this method, now have their bachelors degree. They have met the live running Axapta in three semesters, where they have hands on as part of their project work. To support the SCM courses further, the students meet Axapta at a special ERP course at the end of the education. The ERP course has the purpose of preparing students for taking up the management role of handling a business ERP implementation in corporation with the external supplier. Future perspectives of the use of Axapta at the University of Southern Denmark, including the new Life Science solution, will be mentioned in the presentation.

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Sunday, May 6, 10:30-noon **Room:** Far East **Track:** Mkt-Opns, 9 **Chair:** Claudia Rebolledo
Session: Studies at the Operations Marketing Interface

007-0067: The Differentiation on Decision Making Process Between Young Men and Women into Consumer Goods

Irene Samanta-Rounti, Graduate Technological Education Institute of Piraeus, Greece

Young consumers have different shopping style (Dittmar, 1996). They are involved with apparel products and in fashion clothing. The research explores relationship between gender, materialistic values, and impulsive behavior on fashion clothing. This study investigates different decision-making styles and the influence of the marketing mix to the purchasing process. The research was conducted with a sample of 400 young people with rate of respond 74% (295 respond). Factor analysis using principle components with varimax rotation and Kruskal-Wallis test was conducted to reveal interactions and relationship between different variables. According to findings young people have developed materialistic values and material goods are used as symbols. The reinforcement of a person's self-image is probably a motivation that plays significant role in individuals purchasing decisions. Thus consumers are engaged in non-planned purchases, which are considered impulsive.

007-0196: A CPFR Analyst: A Credible Interface for Internal and External Integration?

Claudia Rebolledo, HEC Montreal, Canada
Martin Beaulieu, HEC Montreal, Canada

Internal cooperation between functions is believed to be related to a firm's competitiveness and profitability. With the deployment of a supply chain management strategy, this need for cooperation extends beyond an organization's internal departments to the interfaces between two firms. We discuss an unusual approach for internal and external integration: that of creating the position of CPFR analyst. The experience we document involves a major international cosmetics firm and a major retail chain. Our discussion will address three major issues: 1) what are the skills required to fill such an interface position? 2) We will seek to identify the jurisdiction of such a position; and finally, 3) we will look at where the allegiance of such individuals lies when they must deal with different departments (internal and external).

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Sunday, May 6, 10:30-noon **Room:** Florentine **Track:** Sustain Ops, 10 **Chair:** Vedat Verter
Session: Strategic Considerations in CLSC

007-0070: OEM Strategies on the Secondary Market

Nektarios Oraopoulos, Georgia Institute of Technology, United States

Mark Ferguson, Georgia Institute of Technology, United States

Beril Toktay, Georgia Institute of Technology, United States

We study a monopolist's incentives to manipulate the secondary market through relicensing fees. A high relicensing fee eliminates future competition but also reduces the residual value of original purchases. We investigate whether there are conditions under which the OEM would choose to shut down the secondary market.

007-0069: Investing in Product Reusability: The Effect of Remanufacturing Cost and Demand Uncertainty

Vedat Verter, McGill University, Canada

Andreas Robotis, McGill University, Canada

Tamer Boyaci, McGill University, Canada

Uncertainty in the supply of used products - both in terms of quantity and quality - has been identified by academics and practitioners as one of the most important challenges for firms to invest in closed-loop systems and product reusability. We focus on remanufacturing cost and demand uncertainties and their impact upon these investments. We consider a price setting firm which -after investing in product reusability- is able either to reuse materials and components and produce a product at a lower cost, or to produce a product using virgin materials. We find that high remanufacturing cost uncertainty should be an incentive for the firm to invest, while high demand uncertainty makes the investment less attractive. Moreover, the firm's pricing decisions will be such as the utilization of reusable content in the production of products is maximized.

007-0469: Product Variety Choice and Return Policy of a Make-to-Order Firm

Alex Grasas, University of Florida, United States

Elif Akcali, University of Florida, United States

Aydin Alptekinoglu, University of Florida, United States

Recent changes in consumer expectations necessitate companies to expand their product portfolio and offer flexible product return policies. To explore the interaction between product variety and return policy of a firm, we consider a make-to-order firm that allows the customers to return products if they are unsatisfied with the products, and the firm has the option of stocking these returns to satisfy future demand. In this setting, the firm's decisions involve specifying the number of variants to include in the product portfolio and determining the optimal stock levels for each product variant. Using a nested multinomial logit model to describe customers' purchase and return decisions, we model the profit maximization problem of the firm. We characterize the structure of the optimal product variety decision and provide insights on how various modeling parameters impact the optimal product variety and return policy decisions of the firm.

007-0155: Sharing Product Responsibility Across the Supply Chain

Brian Jacobs, Georgia Institute of Technology, United States

Ravi Subramanian, Georgia Institute of Technology, United States

Extended Producer Responsibility (EPR) typically holds producers - the last link in the value-adding chain - responsible for the environmental impacts of end-of-life products. Using a two-period two-echelon model, we determine the impacts of collection and recycling mandates on supply chain profits and virgin material consumption for both the integrated and decentralized supply chains. We define the conditions under which collection and recycling mandates can increase overall consumption of virgin material. We demonstrate how the sharing of EPR program costs between the echelons can move a decentralized supply chain closer to the coordinated profit benchmark but might also increase the consumption of virgin material. We generalize our two-period results to multiple periods and also propose a social welfare construct that considers consumer surplus, supply chain profits, and environmental externalities to aid the social planner in assessing the effectiveness of EPR programs.

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Sunday, May 6, 10:30-noon **Room:** Fountain
Session: Supply Chain Strategy

Track: Ops Strat, 9

Chair: Sidhartha R. Das

007-0574: Cooperation Networks Project: A Case of Success, Involving Government, University and Enterprises

Sergio De Gusmão, Catholic University of Rio Grande do Sul, Brazil

The exhaustion of the processes of enlargement of the business efficiency puts the companies front the need to improve their interorganizational relationships in a vertical way, along the supply chain and in a horizontal way, for the creation of relationship among companies of same activity sector. However for those of smaller size not always these constructions are easy to reach. This article presents a case of success in the construction of interorganizational relationships, which is the Cooperation Networks Project, an alliance happened among government, university and little companies. This project took the creation of 36 cooperation networks, involving around 1.000 commercial and industrial enterprises, located in the south of Brazil. The companies involved presents good results in terms of reduction of stocks; improvement in the marketing actions; reduction of operational costs; reduction in the power asymmetry with their suppliers and increment in more than 15% in the profits.

007-0509: Operations Strategy in a Network Context. The Case of Biotechnologies

Andre Tchokogue, HEC Montréal, Canada

Silvia Ponce, HEC Montréal, Canada

Although manufacturing comprises fragmentation, outsourcing, globalization and takes place in complex networks, operations strategy is largely devoted to the study of isolated and independent units of analysis -enterprise, division, units of production or plants. According to Jones et al. (2005), economic development increases the degree of fragmentation and, economists have demonstrated «that a large part of international trade consists of flows of goods within the same industries. Our research focuses on key elements mobilized by three biotechnology enterprises that manufacture their products through networks of production. Particular decisions concerning production systems and network configuration observed are: the small enterprise adapts its production system -modular production, not only because of capacity requirements but also due to choices concerning product (biotech) applications. The middle enterprise instead opts more easily for outsourcing whereas big enterprise exploits a wide variety of strategic options. Hypothesis are discussed and formulated.

007-0076: Align Plant Capabilities and Supplier Interaction: A Contingency Perspective

Roger Schroeder, University of Minnesota, United States

Rachna Shah, University of Minnesota, United States

David (Xiaosong) Peng, University of Minnesota, United States

This study investigates the association between supplier interaction and operations capabilities of the manufacturing plant, and the effect of product clockspeed on this association. The finding suggests that the association between supplier interaction and plant operations capabilities varies depending on the specific forms of supplier interaction and plant capabilities involved, and the product clockspeed of the operating environment.

007-0039: Manufacturing Strategy and Performance in Chinese Firms: The Role of Supply Chain Management

Sidhartha Das, George Mason University, United States

Xilong Liu, Shanghai Jiaotong University, China

Jianhua Ji, Shanghai Jiaotong University, China

The complex relationships in Chinese manufacturing firms among a buyer's manufacturing strategy, supplier quality, and manufacturing performance is investigated. We base our model on a conceptual research framework proposed in the SCM literature, and analyze data from companies based in the Shanghai industrial zone of China, using partial least squares causal modeling approach. Our analysis shows that for Chinese firms, a focus on competitive priority on quality leads to superior supplier quality, resulting in enhanced manufacturing performance. A negative relationship exists between the use of information technology in the supply chain and supply chain uncertainty, though both are found to be positively related to buyer-supplier relationships. No evidence was found for the relationship between buyer-supplier relationships and supplier quality. Interestingly, a negative relationship was found between buyer-supplier relationships and manufacturing performance.

137	Sunday, May 6, 10:30-noon Room: French Session: Humanitarian Relief Operations	Track: Hum Log, 3	Chair: Luk Van Wassenhove
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007-0493: Streamlining Humanitarian Relief Operations: The Case of United Nations Peace Keeping Operations

Angel Diaz, Instituto de Empresa, Spain

Björn Claes, Instituto de Empresa Business School, Spain

Gabriele Borla, International Court of Justice, Netherlands

The United Nations have seen an important increase of their peace-keeping operations (DPKO) in the past few years, maintaining up 15 simultaneous missions in 2006, mostly in Africa and the Near East. In response it has established an operations support base in Brindisi, Italy, which holds strategic deployment stocks (SDS) of materials and equipment that facilitates quick deployment of peace missions. The SDS is currently being reviewed to introduce fly away kits that facilitates the immediate constitution of new missions, with a substantial restructuring of the DPKO. The experiences of these peace keeping operations are analyzed in this paper under the perspective of the lean-agile paradigm. The current operations could be described as agile processes, and the introduction of lean principles (including multi-echelon structures, modular designs and classifications schemes) can help the United Nations to reduce cost while better achieving its objectives.

007-0486: Managing Information Flows in Disaster Relief Supply Chain Networks

Jamison Day, Bauer College of Business, United States

This paper identifies information management challenges in the supply chain networks that quickly form following large-scale and catastrophic disasters. We examine the activities of government agencies, organizations, and individuals, responding to and recovering from Hurricane Katrina, a major disaster that destroyed thousands of lives and businesses along the Southeastern Gulf Coast of the US in late 2005. The authors draw on experiences from entities participating in post-Katrina relief efforts to illustrate several challenges that information flow faces in disaster response and recovery. A distributed information management framework, called DRIMS (Disaster Relief Information Management System), capable of addressing these issues through innovative applications of proven technologies is suggested.

007-0188: Internal Consulting Skills: The Key to Enhancing Effective Relationships Between Human Resources and Operations Management

Robert Prescott, Rollins College, United States

Three of the most valuable organizational assets are cash, technology and people. The effective utilization of these assets to deliver goods and services can potentially provide for a more productive supply chain. The predicate for this increased effectiveness begins with a strong relationship between the Human Resource (HR) function and operations management. What is the role of HR in developing such a relationship? Internal consulting with operations managers may prove an essential key. The first step in this process is for HR professionals to understand and develop a strategy for successfully targeting these efforts. Next, using newly found competencies in consulting practice, the HR function can work more effectively in partnering with operations in creating greater efficiencies. Finally, by following a proven framework of consulting practices, continuous process improvement may be obtained in a systematic fashion.

138	Sunday, May 6, 10:30-noon Room: Garden Session: Technology-based tools in Operations Management Education	Track: Education, 9	Chair: Michael Way
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007-0638: Using Streaming Video to Improve Delivery of Online Spreadsheet Based Classes

Michael Way, California State University at Bakersfield, United States

Online quantitative classes in which spreadsheets are the primary tool of analysis are becoming prevalent. Difficulty arises from the need to illustrate analysis through the medium of the spreadsheet: the mechanics must be explained. Yet standard tools such as screenshots are awkward, time-consuming to create, and often inadequate to the task. This paper details an attempt to mitigate these problems through the use of computer generated streaming videos. These videos allow students to see a computer analysis being performed and hear the instructor's running commentary. Over the past year, this method was used for several online sections of a spreadsheet based course. The videos were used for the delivery of lecture material, to answer student questions, and for feedback on assignments and exams. Student performance is compared with that of regular sections of the same course delivered by the same instructor.

007-0592: Using Podcasting as Learning Aid in Operations Management

Pavel Albores, Aston Business School, United Kingdom

This paper describes the use of podcasts as learning aid in the teaching of operations management, particularly in a Simulation class. A podcast is a digital recording of a radio program, which is normally downloadable to a portable mp3 player. The paper presents the exercise that was used with the students and analyses their response to this new way of learning. An evaluation questionnaire was used to gather data from the perceived utility and benefit gained by using the podcasts. Both quantitative (e.g. percentage of students who found the use of podcasts useful) and qualitative (e.g. what the students think are the characteristics of a good learning podcast) data is presented in the paper. Lessons for the use of podcasts in OM are drawn.

007-0023: Learnings from the First Seven Years of Experience with the LINKS Supply Chain Management Simulation

Randall Chapman, Chapman and Associates, United States

As the LINKS Supply Chain Management Simulation enters its eighth year, much has been learned about effective (and ineffective) ways of teaching supply chain management with a large-scale, competitive simulation. LINKS has been widely used in undergraduate, MBA, executive MBA, and doctoral courses, as well as executive education contexts delivered in a traditional classroom environment and in distance-learning mode. This presentation organizes and summarizes to-date learnings about teaching supply chain management with LINKS. Reflections on future evolution and learning environment enhancements are offered.

007-0456: Teaching Process Management. A Multimedia-based Case Approach

Oswaldo Lorenzo, Instituto de Empresa, Spain

Jose Gimenez, Instituto de Estudios Superiores de Administracion, Venezuela

Angel Diaz, Instituto de Empresa, Spain

This paper analyzes the learning experience of MBA students exposed to a multimedia-based case environment. Produced by a specialized unit that creates multimedia and online educational material in a large Business School, over 100 multimedia cases currently exist. In Operations Management multimedia cases have been developed for teaching production planning as video games, for analyzing JIT and industrial parks, and for emphasizing process views of organizations. The last is presented in-depth in the paper. Based on a real distributor of chemical products, the case challenges students to prioritize business processes, to map "as-is" processes and to propose "to-be" improvements. Used at the beginning of on-line and regular programs, facilitates early awareness of the process nature of organizations, and of the tools used for its improvement. The case and learning experience are presented in detail, related to the literature on innovative education and key success factors in learning.

139	<p>Sunday, May 6, 10:30-noon Room: Green Room Session: Procurement Models</p>	Track: Purchasing, 1	Chair: Eli M. Snir
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007-0204: Risk Aversion and Dynamic Integration of Long-term Contract and Spot Market Sourcing Arrangements

Santosh Mahapatra, Clarkson University, United States

Srinivas Talluri, Michigan State University, United States

We examine the issue of optimally combining "contractual" and "open market" procurement arrangements to purchase a specified quantity of standardized product for a risk-averse buying firm. The problem is of increasing significance due to the emergence of electronic spot markets that allow firms to procure from competitive open market. The price processes of both the arrangements are exogenously specified. The contract price is deterministic and the market price is modeled as a stochastic diffusion processes. A multi-period robust optimization model is proposed to determine the optimal patterns of procurement across the two arrangements for specified price, risk aversion, switching cost, planning horizon parameters. The model is applied on a stylized, illustrative dataset to develop managerial insights and to evaluate the relative significance of strategic and tactical management of suppliers.

007-0653: Optimal Pipe Procurement and Cutting Pattern in Construction of Petrochemical Industries Using Mathematical Modeling

Naser Nikandish, Sharif University of Technology, Iran (Islamic Republic of)

Amirhosein Azmoon, Tehran Polytechnic, Iran (Islamic Republic of)

In this paper, we simultaneously optimize pipe procurement and pipe cutting pattern in construction of petrochemical industries. Efficient procurement planning and cutting pattern of pipes can reduce both materials holding costs and scraps percentage considerably. In real world construction problems, material procurement is a multi-stage decision-making problem. Engineering drawings are prepared in several phases and materials are delivered to the construction site in the beginning of each phase. Based on the drawings of each phase, contractor prepares the list of pipes which should be procured and cut them according to the drawings. Remaining of pipes at the end of a phase can be used in the next periods and the remaining of pipes at the end of the last period is considered as scraps. This paper uses dynamic programming and column generation methods to determine optimum procurement and cutting pattern of pipes in different phases of the project.

007-0029: A Heuristic for Commodity Procurement in the Presence of Price Discounting

Andrew Manikas, Georgia Tech, United States

Mark Ferguson, Georgia Institue of Technology, United States

Yih-Long Chang, Georgia Tech, United States

Procuring commodities is difficult due to the fluctuating prices intrinsic to the value of commodities. These price fluctuations can allow a firm to benefit from buying for current and future demand when prices are low. Additionally, obtaining large volumes at one time may allow a firm to take advantage of volume price discounts. We provide a heuristic to determine how much to buy at each purchasing opportunity in order to maximize expected profit. We compare our method with existing methods through simulation by using real plywood data from BlueLinx, a two-stage distributor of building products. We find that our heuristic performs better than existing methods for all tested scenarios of volume surcharge, no discounts, and volume discounts.

007-0550: Auctions for A+B Construction Contracts

Eli Snir, Southern Methodist University, United States

Diwakar Gupta, University of Minnesota, United States

This paper investigates procurement auctions for construction contracts. One mechanism employed by Departments of Transportation for large-scale civil engineering projects is A+B contracts. These contracts have a fixed-fee, A, and incentive pay for early completion, B. Incentives are based on the difference between announced and actual completion dates. Models using game theoretic behavior, assuming independent private values, generate meaningful results. Incentive payments induce effort to expedite. Coupled with internal incentives, based on time value of money, incentives are important in choosing the best contractor and in reducing delay cost. The results indicate that placing a bound on incentive payments reduces contractors' expediting incentive and induces artificial stated completion times. We also show that a buyer's optimal announced incentive rate is lower than her private delay cost. In addition, internal incentives substitute buyer incentives, suggesting structuring payments to increase internal incentives. The studied mechanism is also compared to other possibilities.

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Sunday, May 6, 10:30-noon **Room:** Oak
Session: Recycling Issues & Sustainability

Track: Environ, 1

Chair: Otavio Oliveira

007-0775: The Social and Economic Contribution of the Recycled Material Cooperatives to Urban Environment Management

Rosani Castro, Sao Paulo State University, Brazil

Jair Manfrinato, Sao Paulo State University, Brazil

Bruna Machado, Sao Paulo State University, Brazil

The accelerated urbanization process, with an increasing consumption of less durable products has provoked an increase in garbage volume and a diversification, and its spatial concentration. This garbage also represents income to thousands of families, that are being explored by resale organizations and submitted to the arduous job of picking garbage. For years, recycling is supported in Brazil, as in other countries in development, by informal picking of papers and other material, found on the streets and in city dumps. This work aims, through a pilot study in the city of Pederneiras, to demonstrate the economical viability of cooperatives of recycling material construction, also characterizing its social importance.

007-0758: Challenges and Difficulties of Destination and Recycling of Used Tires in Brazil

Otavio Oliveira, Universidade Estadual Paulista, Brazil

Rosani Castro, Sao Paulo State University, Brazil

Paulo Paula, College of Engineering of Bauru, Brazil

The outdoor waste of tires is very aggressive to the environment and is the main point of this paper, has purpose to discuss the environmental issues which comprise the waste of used tires, investigating what is their real destination in Brazil and which are sustainable alternatives for their reuse. It also carried out an exploratory research by consulting references. Field research in waste areas without any treatment, landfills and a tire manufacturing company was performed. It also applied a survey with questionnaire to 58 pedestrians in Brazil's most economically important avenue (Avenida Paulista), randomly selected, with the purpose of verifying the depth of awareness of this specific population about this topic.

007-0143: Increasing Sustainability Through the Management of Post Consumer Waste: A Study of Recycled Materials (for Municipal Solid Waste Management)

R Burnett, University of Miami, United States

Vaidyanathan Jayaraman, University of Miami, United States

Mark Friedman, University of Miami, United States

Jonathan West, University of Miami, United States

During the past two decades there has been increasing concern regarding the disposal of consumer products since many of these products contain large amounts of waste and substantial quantities of toxic heavy metals. We explore implications for the future of current trends, practices and policies in the generation and management of municipal solid waste (MSW) with a focus on recycling activities. We draw on the experience that county governments in Florida have had with recycling. Florida is used as a basis for our investigation because of the recent efforts adopted by its legislature to monitor recycling and to provide economic and environmental information. There are two major reasons why research on MSW is a fruitful area for exploration. First, huge quantities of are being generated around the world. Second, evidence suggests that solid waste has value. We hypothesize that the environmental costs of entities that aggressively adopt and maintain a high level of recycling should be low relative to those entities that do not maintain an equally high level of recycling activity.

007-0162: Perspectives of the Social-Environment Management in the Brazilian Industry: A Study of the Footwear Sector of Franca-SP

Camila Cultri, Unesp-Bauru-Braz, Brazil

Jair Manfrinato, Sao Paulo State University, Brazil

The corporative responsibility infuse aspects of social, economic and environment sustentability. However, for the distinct sectors and governmental spheres, the adoption of new projects of supported development becomes a challenge. This article describes the influence of the spread Brazilian social-environment management in the footwear industry of Franca, State of São Paulo. The research had exploratory and qualitative character, using the technique of case study. The marketing difficulties of the footwear sector leave second for plain the operacionalization of social-environment projects. In this context especially, the demand for public politics is still bigger to stimulate and to make possible the enterprise social-environment management.

007-0769: Organising Reuse: Managing the Process of Design For Remanufacture (DFR)

Steve Barker, University of Bristol, United Kingdom

Andrew King, University of Bristol, United Kingdom

Remanufacturing has become prominent as a method for waste disposal due to increasing ecological and economic pressures upon industry. As part of a project to study the design and construction of a Remanufacturing Design Platform Model, research has been conducted into the obstacles to the widespread introduction of remanufacturing, and how these affect the process of Design for Remanufacture. In addition to several technical and engineering barriers, we found that there are a number of operational and production-based issues that need to be overcome. This paper describes ongoing research into these issues, suggesting how they may affect successful remanufacturing operations, especially within the relationship between Original Equipment Manufacturer and Independent remanufacturers. The paper examines the link between management and engineering, and discusses how the issues of each discipline impact upon the other in respect to remanufacturing, drawing conclusions for the resolution of these issues.

141	Sunday, May 6, 10:30-noon Room: Panorama Session: Supply Chain Design for Disruptions Management	Track: SC Disrupt, 5	Chair: Sanjay Kumar
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007-0771: Desirable Features in a Proactive Process Framework for Managing Disruptions in Supply Chains

Maria Tsiakouri, University of Southampton, United Kingdom

There is a substantial literature which includes process frameworks for managing supply chain disruption; however, these frameworks vary in their chosen approach. Initially, this study identify the underlying causes of supply chain disruption and highlight the need for developing proactive and cost effective approaches in order to manage disruptions successfully. Then, an in depth study of the existing literature on supply chain disruption and risk management process frameworks presented, and a critical synthesis of these frameworks will be provided. Subsequently, the effectiveness of risk management processes related to supply chain disruption management will be addressed. Supply chain disruption management could be significantly improved by exploiting features of best risk management practice such as the development of formal processes and the recognition of risk efficient responses.

007-0523: Supply Chain Disruption Risk: A Systems Perspective.

Marco Habermann, University of Minnesota, United States

Rachna Shah, University of Minnesota, United States

Today, supply chain disruptions are at the forefront of academic and practitioner literature. We identify three supply chain structural characteristics that individually and jointly increase the risk of supply chain disruption. The structural characteristics are complexity, interdependence, and coupling. Using insights from systems theory, we link them to supply chain disruptions. Based on operations management and organizational theory literature, we propose tactical and strategic tools to reduce the risk for disruptions within supply chains. Finally, we show how managers can mitigate the impact of the supply chain characteristics on the overall supply chain disruption risk.

007-0732: Do Organizational Strategy and Supply Chain Architecture Matter? A Multi-Method Study Under Conditions of Supply Disruption

Laird Burns, Michigan State University, United States

This multi-method research study extends classical strategy-structure research by investigating why firms that employ a specific organizational strategy choose to participate in a particular supply network architecture, and how this strategy-structure-architecture choice affects firm and supply chain performance under non-typical conditions (i.e., supply disruptions). This study integrates three major issues of current and future concern to academic researchers and business practitioners: firm strategy, supply chain design/architecture, and risk management/risk planning. This study is expected to result in three major outputs of interest to the research and practitioner communities new theoretical frameworks and contributions for risk management and mitigation in supply chains, a simulation framework that can be used by researchers, students and executives for experimenting with issues of supply chain architecture and supply chain risk, and insights into how the dynamics of supply chain performance are affected by supply disruptions.

142	Sunday, May 6, 10:30-noon Room: Parisian Session: Applications of Empirical Science in OM	Track: Emp Res, 9	Chair: Aleda Roth
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007-0561: Quality Risk in Manufacturing Outsourcing

John Gray, Ohio State University, United States

Aleda Roth, Clemson University, United States

Brian Tomlin, University of North Carolina at Chapel Hill, United States

We examine the potential for an increase in quality risk when a firm outsources its production to a contract manufacturer. Based on theory drawn from multiple literature streams, we develop an empirical model and hypothesize that contract manufacturers' plants pose a higher finished-product quality risk than internal plants and ISO9000 certification does little to mitigate this risk. Applying the Delphi approach with a group of industry experts, we derive a new measure of quality risk from inspection data obtained from the Food and Drug Administration. Using ordered logit regression and controlling for several plant and firm characteristics, we find support for both of hypotheses. Importantly, quality risk may not be obvious to the buying firm, and ISO9000, which is often used as a proxy for quality, may not be a sufficient indicator of quality risk.

007-0366: The Effect of Supply Chain Base Adaptivity on Combinative Competitive Capabilities and Business Performance

Mehmet Kristal, York University, Canada

Aleda Roth, Clemson University, United States

In this study we investigate the effect of SCB adaptivity on combinative competitive capabilities and business performance. We define the SCB as the set of suppliers and customers whose strategies, products, technologies, and systems can be influenced by the focal company, and SCB adaptivity as the ability of the focal company to reconfigure and adjust its SCB operations in the face of changing competitive environments. Using survey-based data from 206 SC managers, we investigate the underlying structure of SCB adaptivity, which within a grounded-theory approach is defined as a portfolio of exploration and exploitation SC activities. We empirically show that these two facets of SCB adaptivity—exploitation and exploration—are both necessary for influencing combinative competitive capabilities and business performance. Our results provide evidence of the mediating role of combinative competitive capabilities between SCB adaptivity and business performance.

007-0438: Best Practice Interventions – Debates and Dilemmas

Niels Rytter, Aalborg University, Denmark

Chris Voss, London Business School, United Kingdom

Adrian Done, IESE, Spain

There is widespread use of short-term structured interventions to help companies introduce and develop new and best practices. Such interventions are particularly common in smaller companies. These interventions typically have both short term objectives, typically to make significant and visible process and performance improvements and long-term objectives to embed new practices in the organization. We use empirical data from a longitudinal case-based study to explore a number of issues with best practice interventions. There is an implied interplay and potential conflict between these two objectives. On the one hand over-emphasis on short-term objectives may lead to the neglect of longer-term ones. On the other hand, successful short-term outcomes may be a major contribution to the visibility and acceptance of new practices. We then explore whether short, one-off intervention can lead to sustained change in the organization's practices and hence performance?

007-0623: From Observation to Theory in OM Empirical Research: The Development of Competitive Progression Theory

Aleda Roth, Clemson University, United States

The development and testing of theory is central to empirical science in any discipline. Theory shapes the foundations of a discipline and provides order and meaning to studies and the accumulate body of knowledge. Yet a recent review of 230 empirical articles in leading operations management (OM) journals since 1990 revealed this: despite the significant growth of empirical research, the OM discipline falls short on theory relative to other management disciplines. Moreover, it is not enough for the OM discipline to have theories; it must have 'good' theories. This leads to the question of how good theory is formed. This presentation provides an illustrative example of how one new theory -- Roth's (1996) Competitive Progression Theory (CPT) -- was developed, and uses the Locke's (2005) criteria of good theory to evaluate it.

143	Sunday, May 6, 10:30-noon Room: Patio Session: COO Roundtable	Track: OAG, 4	Chair: Joel Goldhar
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007-0374: 4th Annual Chief Operating Officers (COO) Roundtable

Joel Goldhar, Illinois Institute of Technology, United States

Rafael Menda, McNeil Consumer Healthcare, United States

The COO is the true 'missing link' in organizational effectiveness and the profitable implementation of business and corporate strategy. A panel of COO's and Academics will discuss: the role of the COO; the nature of the job; the definition of a 'good/successful' COO; the skills and knowledge set required; and the impact of various organization structure alternatives. The session will end with a discussion of interesting/needed research on the COO position and successful strategy implementation.

144	Sunday, May 6, 10:30-noon Room: Pavilion Session: ERP Impact on Operational Performance	Track: Opns-IT, 5	Chair: Dana Johnson
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007-0111: Enterprise Information Systems Implementation and Manufacturing Firm Performance

Ling Li, Old Dominion University, United States

In this study, we focus on manufacturing infrastructure preparation prior to EIS implementation and report the results of a survey of 152 US manufacturing companies that have implemented EIS. Four major findings are: (i) The requirements from customers and trading partners are more powerful drivers motivating US manufacturing firms to implementing enterprise systems than internal business planning needs; (ii) One manufacturing infrastructural issue often has implications for other infrastructural items in implementing technology; (iii) Manufacturing infrastructure preparation prior to EIS implementation has significant positive effects on customer-focused performance, production / operations performance, and financial performance; and (iv) Better customer-focused performance contributes to better financial performance.

007-0260: Installed Base Information Management with Industrial Service Operations

Timo Ala-Risku, Helsinki University of Technology, Finland

Industrial services have been recognized as a lucrative source of revenue. Many capital goods manufacturers are getting involved with the after-market in their industry. The manufacturers typically have distinct support systems for their customer relationship management, equipment deliveries, service operations, and product development. Each of these systems includes valuable business information to support their service business. However, the limited interaction between these tools prevents organizations from forming a comprehensive view on their installed base, the target of their service operations. This paper presents results from an in-depth case study performed at a capital goods manufacturer with global service operations. The paper discusses operational benefits in service processes that result from creating installed base visibility by connecting the diverse support systems. The results draw attention to the value of service operations not only as a source of revenue, but also as a source of business intelligence.

007-0098: Hospital OR Inventory Process Improvement Prior to ERP Module Implementation

Daniel Mattson, Michigan Tech, United States

Dana Johnson, Michigan Tech, United States

This case study will provide details on how the operating room inventory management process was improved prior to implementation of an ERP Operating Room Management module of MEDITECH software at a small rural hospital. The methodologies included reviewing/observing existing processes, interviewing personnel, and reviewing documentation associated with materials/inventory management. Several different supply rooms were observed and the current processes were documented. A number of interviews of OR staff were conducted, both formally and informally. The outcomes included an overall reduction in the number of inventory items through the use of kits, establishment of a bin system commonly used in hardware stores and manufacturing was implemented to better locate supplies and manage the inventory, and a locational system to quickly locate inventory. After the process was streamlined, the inventory management portion of the module was successfully implemented.

145	Sunday, May 6, 10:30-noon Room: Royal Session: Human Side of Quality Management	Track: Qual Mgmt, 6	Chair: Seokjil Kim
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007-0156: Quality Control versus Quality Learning: Discrimination and Measurement

Dongli Zhang, University of Minnesota, United States

Kevin Linderman, University of Minnesota, United States

Roger Schroeder, University of Minnesota, United States

Quality management (QM) practices and the benefits related to these practices have been addressed in many studies. However, although these practices are sold as "universal remedies," there are mixed results and high-profile failures in their implementation. The purpose of this paper is to conduct a study that addresses the phenomenon from a contingency point of view. A central premise of this study is that there exist two different aspects of QM practices that have different objectives: quality control (QC) and quality learning (QL). The use of them should be more or less effective in different external or internal conditions. This study empirically validates the measurement of the two aspects of QM and establishes a foundation for future research on performance implication for implementing of different QM practices.

007-0199: Maximising the Economic and Social Impact of Six Sigma

Ben Clegg, Aston Business School, United Kingdom

This paper reports on how Six Sigma training can be made more effective. The research is empirically based. To date it has engaged over 100 respondents from 60 different organisations around the world. The questionnaire has been derived from refereed sources and expert practitioner experience and addresses both success factors and tool issues from three perspectives--academic, training, and practice--to help maximise economic and social impact of programmes. This topic is important because the popularity of Six Sigma adoption in organisations has grown over recent years. This is probably because many accounts of cost savings and quality improvements have been published by major international companies. However, other companies striving to emulate this success are finding that effective implementation needs experienced and well trained individuals. To date, there have been few such surveys and this benchmarking study provides unique insight.

007-0555: Project Quality Activities and Goal-Setting in Project Performance Assessment

Brad Masters, University of Texas at Arlington, United States

Greg Frazier, University of Texas at Arlington, United States

Improved project performance is desired by every project manager and firm. This study investigates similarities of two quality-related initiatives: Total Quality Management (TQM) and its impact on firm performance, and Project Quality Activities (PQA) and its impact on project performance. A brief review of TQM and PQA is presented. Several relevant theories from previous literature are discussed that address the relationship between quality and performance. Six propositions are presented based on the relationship of PQA (Independent Variable-IV) and project performance (Dependent Variable-DV). It is theorized that individual goal-setting mediates the IV/DV relationship, while goal feedback serves as a moderator variable. Based on the current literature and the propositions, future research areas for the advancement of project quality activities and increasing project performance are proposed.

007-0203: Quality Costs and Quality Level: A Dynamic Model

Seokjin Kim, Millersville University of Pennsylvania, United States

Behnam Nakhai, Millersville University of Pennsylvania, United States

Total quality management (TQM) and continuous improvement have attracted significant attention in the last two decades. As far as quality costs are concerned, the ideals of total quality and zero defects contradict with the traditional trade-off model which was dominant prior to the emergence of TQM. The economic conformance level (ECL) model known as the trade-off model demonstrates the trade-off between conformance and nonconformance costs and proposes a cost-minimizing quality level by balancing conformance against nonconformance costs. Following a review of literature on quality costs, we developed a dynamic model for explaining the relationship between quality costs and quality level. The model is utilized to examine the premises TQM and the trade-off view as well. Through illustrative examples, the dynamics of quality costs and quality level are examined and relevant managerial implications are highlighted.

007-0352: The Role of Services: Pricing, Product Line and Durability*Gad Allon, Northwestern University, United States**Achal Bassamboo, Northwestern University, United States*

In many industries with an increase in the commoditization of goods, traditional manufacturing firms often offer services as well. We study the problem of managing services and its impact on the profit of the firm. While analyzing this problem we track the role of services. For example, we address the question whether services are merely another revenue source, or do they serve other purposes driven by the fact that they are tied to a good.

007-0220: Are Reservations Recommended?*Martin Lariviere, Northwestern University, United States**Alexei Alexandrov, Northwestern University, United States*

We examine the role of offering reservations in capacity constrained services. Previous research has focused on reservations or advanced sales as a means to raise price or segment customers. We examine the restaurant industry where reservations generally do not impact what customers pay. Further, not all restaurants offer reservations. When reservations are offered, firms usually give them away and often impose no penalty for not keeping them. We show that a restaurant never offers reservations in a stable market. However, a restaurant may want to offer reservations if there is uncertainty in the number of customers in the market. The role of reservations is then not to manage demand when the number of customers exceeds available capacity. Rather, reservations are a means to increase sales when demand is low. That is, from the firm's perspective, reservations are more important on slow nights than on busy nights.

007-0129: A Bargaining Approach to Investing in the Security of global Supply Chains*Nitin Bakshi, University of Pennsylvania, United States*

Investment in disruption risk mitigation in global supply chains is modeled as a two person bargaining game with incomplete information. The two participants in the supply chain attempt to minimize expected losses from catastrophic disruptions using an axiomatic model for Bargaining with incomplete information, to determine how the costs of mitigation and risk management will be shared. The disagreement outcome in the Bargaining game is assumed to be the result of the corresponding non-cooperative game. We describe a contract that leads to First Best investment and is robust to adverse selection and moral hazard. We also show that bargaining results in greater improvement (surplus) for the inefficient type, which is in contrast with standard Principal-Agent results. It turns out that Auditing is not a valuable strategy i.e. it does not improve the bargaining solution.

007-0040: Competing Investment Strategies with Fixed Costs and Uncertainty*Shu-Jung Sunny Yang, Australian Graduate School of Management, Australia**Edward Anderson, Australian Graduate School of Management, Australia*

We propose a new model of strategic investment to explore investment-timing trade-offs in a two-period duopoly. Our model incorporates two distinctive elements compared with conventional output-setting games with two periods. First we allow firms to announce and commit to a generic investment strategy in advance. Three generic strategies are considered: wait-and-see (timing options), act-and-see (staging options), and preemption. Second we include a fixed cost for investment, since scale economies arising from fixed costs affect equilibrium behavior for investment, and are ignored by most previous theoretical work. By applying the proposed modeling framework to a symmetric-duopoly capital-intensive industry characterized by high fixed cost, we find that a symmetric preemptive equilibrium is the most likely outcome when the industry outlook is optimistic and the capital intensity is not too high. The result is in agreement with a number of empirical observations. Surprisingly, act-and-see strategies appear only rarely in firms' equilibrium behavior.

007-0482: A Stochastic Overbooking Model for Outpatient Clinical Scheduling with No-Shows*Mark Lawley, Purdue University, United States**Kumar Muthuraman, Purdue University, United States*

We formulate a stochastic overbooking model and develop an appointment scheduling policy for outpatient clinics. Each calling patient has a no-show probability, and overbooking is used to compensate for patient no-shows. The scheduling objective captures patient waiting time, staff overtime, and patient revenue. We derive conditions under which the objective evolution is unimodal and we investigate the behavior of the scheduling policy under a variety of conditions.

007-0483: A Mixed Integer Programming Approach for Allocating Operating Room Capacity*Pavan Murali, University of Southern California, United States**Maged Dessouky, University of Southern California, United States**David Belson, University of Southern California, United States**Bo Zhang, Georgia Institute of Technology, United States*

We show a methodology for allocating operating room capacity. Our methodology consists of a finite-horizon MIP that determines a weekly OR allocation template minimizing inpatients' length of stay. A number of patient type priorities (e.g., emergency vs inpatient) and clinical constraints (e.g., maximum hours allocated to specialties, staff availability, etc.) are included in the formulation. The optimal solution from the analytical model is inputted into a simulation model that captures randomness of the processes (e.g., surgery time, demand, arrival time, and no-show rate of the outpatients) and non-linearities (e.g., the MIP assumes proportional allocation of demand satisfaction (output) with room allocation (input)). The simulation model outputs the average length of stay for each specialty and the room utilization. On a case example of a Los Angeles County Hospital, we show how the hospital length of stay pertaining to surgery can be reduced.

007-0485: Strategic Medical Scheduling: Simulation Studies for Single Provider Access Management

Chris Duckworth, University of Tennessee, United States

Scheduling methods for improving a single provider's out-of-office patient utility will be shown in Monte Carlo simulation studies. This study uses multiple patient classes and utility functions to provide an evaluation framework for access management models. Methods in which all patients are accommodated with an appointment and methods in which only a partial set of patients are accommodated with an appointment will be investigated.

007-0488: Modeling Patient Attendance, Cancellations, and Non-Attendance Across Outpatient Clinics

John Norris, Purdue University, United States

Suresh Chand, Purdue University, United States

Herb Moskowitz, Purdue University, United States

Deanna Willis, Indiana University, United States

We utilize a data set of 5 years of outpatient appointments across 10 clinics, with variables including prior attendance history, weather, medical condition code, and lead time from appointment request to appointment date. We expand upon existing binary logistic models with multinomial logistic regression, looking at arrived appointments, canceled appointments, and missed appointments. We also compare multivariate techniques including Discriminate Analysis and Decision Trees.

148	<p>Sunday, May 6, 10:30-noon Room: Vista Session: Kaizen and Process Improvement</p>	Track: JIT & Lean, 6	Chair: Gopesh Anand
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007-0091: Process Improvement: A Kaizen Approach

Satya Chakravorty, Kennesaw State University, United States

Richard Franza, Kennesaw State University, United States

Kaizen can be loosely translated as "Continual Improvements". The theory of small continual improvements that add up to one large improvement was developed in Japan and is a current cultural practice that is performed almost to a point of unconscious behavior. But the full resources needed to implement a fruitful and active program are often not understood. This article outlines the various types of programs available, environmental factors needed to be present, and the pre- and post- Kaizen Event workloads. Simmons Company demonstrates these concepts through an example of a Kaizen event charged with redesigning one of their manufacturing plants.

007-0125: Process Improvement Program Management and Organizational Performance

Weiyong Zhang, Virginia Commonwealth University, United States

Arthur Hill, University of Minnesota, United States

Roger Schroeder, University of Minnesota, United States

Kevin Linderman, University of Minnesota, United States

This research is based on the premise that program management practices common to all process improvement programs deserve serious research. The paper investigates two important factors, Strategic Project Selection (SPS) and Disciplined Project Management (DPM). Using empirical data collected from 53 plants that supply one large high-tech electronics firm, this paper examines how the two factors impact program success at the organization-level. First, this research found that both SPS and DPM have a strong positive impact on Supplier Operating Performance (SOP) as measured by quality, cycle-time, delivery, and flexibility. Second, this research empirically validated a causal chain from DPM to SPS to SOP, with the relationship between DPM and SOP partially mediated by SPS. These important findings suggest that a viable strategy for process improvement program success is to focus on DPM in order to enhance SPS and ultimately achieve program success for the organization.

007-0207: The Role of Culture Types as Drivers of Quality Management Practices

Michael Naor, George Mason University, United States

Susan Meyer Goldstein, University of Minnesota, United States

Kevin Linderman, University of Minnesota, United States

Roger Schroeder, University of Minnesota, United States

Recently there has been interest in the literature to empirically explore the impact of culture on operations management practices. The current study addresses this need by investigating the role of culture types as exogenous drivers of infrastructure and quality management practices and, as a result, their impact on manufacturing performance. A model relating culture, quality management practices, and manufacturing performance is hypothesized and analyzed using data from 189 manufacturing plants. The results show that culture has more influence on infrastructure quality practices than on quality practices and that infrastructure quality practices have higher impact on performance than quality practices.

007-0208: Evolution of Process Improvement Programs and Six Sigma

Gopesh Anand, University of Illinois at Urbana-Champaign, United States

Peter Ward, The Ohio State University, United States

Mohan Tatikonda, *Indiana University, United States*

Rachna Shah, *University of Minnesota, United States*

Six Sigma is a continuous improvement program that has captured the interest of several organizations. However, the proliferation of improvement programs and the burgeoning number of consultants selling such programs sometimes cause Six Sigma to be portrayed as another fad undeserving of academic and practitioner attention. We sift through the implications of a fads label and clarify the reasons for the emergence and disappearance of continuous improvement programs from the limelight. This enables us to assess patterns of improvements and adaptations represented by the various programs which we incorporate in an evolutionary framework. We use this framework to assess whether and how Six Sigma is the next step in the evolution of continuous improvement programs. This assessment enables us to make the case that the promise of Six Sigma needs to be closely studied before dismissing it as old wine in a new bottle.

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Sunday, May 6, 1:30-3:00 **Room:** Brasserie

Track: Prod Innov, 10

Chair: Anita Tucker

Session: Knowledge, Learning & Intellectual Capital 2: Knowledge Creation and Knowledge Transfer within Frontline Workgroups

007-0606: Knowledge Management for Product and Process Design Teams

Gulru Ozkan, *Georgia Institute of Technology, United States*

Cheryl Gaimon, *Georgia Institute of Technology, United States*

A model is presented to analyze dynamic knowledge management strategies for product and process design teams engaged in a new product development. The profit-maximizing firm earns net revenue at the end of the planning horizon when the product is released to the marketplace. The net revenue is a function of time and the levels of knowledge each team embeds into the new product during the development period. The levels of knowledge of the product and process design teams increase from learning-by-doing, knowledge transfer, and training. We optimally determine the rate and direction for knowledge transfer between the product and process design teams and the rate of training for each team. The key results include the characterization of conditions leading to various knowledge creation strategies and the delay of product launch times. Also, we analyze the impact of either conflict or synergy when knowledge transfer occurs in both directions simultaneously.

007-0602: Managing Knowledge in the Workforce and the Technical System

Cheryl Gaimon, *Georgia Institute of Technology, United States*

We consider a manager responsible for improving the performance of the knowledge-based resources deployed to create products or services. First, we introduce a holistic treatment of how workforce knowledge changes over time. We capture the effect of workforce knowledge depreciation, forgetting, and learning-by-doing. Second, we examine a manager's investment in technological capability. The depreciation of the existing technology or the availability of advanced technology offered by vendors drive the technology upgrade decision. Third, we analyze technology implementation which links the management of workforce knowledge with the upgrade decision. For example, we model the obsolescence in workforce knowledge that occurs at an upgrade and the extent that obsolescence can be reduced if the manager invests in learning-before-doing prior to the upgrade. Finally, the manager's strategy to improve the performance seeks to maximize the profit (function of workforce knowledge and technological capability) less the costs incurred for training and technology upgrades.

007-0161: The Quality and the Quantity of Communication: Psychological Safety and Knowledge Sharing in Workgroups

Enno Siemsen, *University of Illinois at Urbana-Champaign, United States*

Aleda Roth, *Clemson University, United States*

Sridhar Balasubramanian, *University of North Carolina at Chapel Hill, United States*

Gopesh Anand, *University of Illinois at Urbana-Champaign, United States*

We examine how psychological safety influences knowledge sharing in a dyadic relationship. Reconciling recent conflicting findings in the literature, we show that while psychological safety is important for knowledge sharing, this relationship is moderated by the level of confidence of the knowledge provider. Linking this result to social network theory, we find that the confidence of the knowledge provider is related to the codifiability or explicitness of the knowledge involved, and psychological safety increases with the frequency of interaction between the knowledge provider and recipient. We further investigate direct and indirect antecedents of psychological safety. We find that structural and infrastructural operational decisions can influence psychological safety by altering interaction patterns between employees. The results of this latter part of our investigation provide insights for process managers by pointing to actions that they can take to influence psychological safety and increase the effectiveness of employee engagement in process improvement.

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Sunday, May 6, 1:30-3:00 **Room:** Continental

Track: Supply Chn, 10

Chair: Holly S. Lutze

Session: Supply Chain Network Design

007-0031: Strategic Positioning of Manufacturing Operations within Global Supply Chains

Watcharavee Chandraprakaikul, *Cranfield University, United Kingdom*

Tim Baines, *Cranfield University, United Kingdom*

Benny Tjahjono, *Cranfield University, United Kingdom*

Roland G. Lim, *Cranfield University, United Kingdom*

In global environment, a company has to make many decisions that impact upon its position in global supply chain networks such as outsourcing, offshoring, joint venture, vertical/horizontal integration, etc. All these decisions impact on the company's strategic position, and hence on competitive space and performance. Therefore, it is important for a company to carefully manage strategic positioning by making careful decisions about the adoption of alternative manufacturing and supply chain activities. Unfortunately, there is no complete process studied in strategic positioning of manufacturing operations within global supply chain. Therefore, the work presented in this paper has investigated leading research and industrial practices to create a formal and rational decision process. An analysis of previous literature, industrial practices, and the resulting decision process are all presented in this paper.

007-0258: The Supply Chain Design and its Implementation. An Analytical and Multisectorial Approach

Jesus Garcia-Arca, University of Vigo, Spain

Ana Mejias-Sacaluga, University of Vigo, Spain

Jose Carlos Prado Prado, University of Vigo, Spain

The paper presents the main results of a project undertaken by authors with the aim to determine how the complexity and uncertainty of markets can condition the design of the supply chains, and how some companies can adopt both suitable internal organizational structures (departments involved, level of coordination among them,...) and partners relationships in supply chain management that allow them not only to improve their competitiveness but also improve their leadership in the markets. To do so, in-depth compared analysis of the logistics function and the supply chains in 36 Spanish companies (all of them significant companies in the European markets and in some cases worldwide) of four different sectors (food, fashion clothing, kitchen furniture and stone) is carried out. The methodology used for collecting data is a structured questionnaire in personal interviews with the companies involved.

007-0150: Supply Chain Collaboration: A One-Best-Way Practice?

Giorgia Dal Pont, University of Padova - Department of Management and Engineering, Italy

Pamela Danese, University of Padova, Italy

Pietro Romano, University of Udine, Italy

Andrea Vinelli, University of Padova - Department of Management and Engineering, Italy

Supply chain (SC) collaboration in SC management literature is commonly considered a one-best-way recipe to improve performance. The basic assumption is "the more collaboration – the better the management of the supply network". This article challenges this assumption, by introducing explanations that different forms of SC collaboration exist and different aspects of collaboration might be important under different conditions. In particular, using the case-study method, this research investigates the relevant contingency effects that impact on SC collaboration in logistics processes. Using Galbraith's contingency theory as its starting point, this article proposes a contingency theory of SC collaboration. It is suggested that specific contextual conditions can affect the information processing required to implement SC collaboration. In turn, the characteristics of the information processing determine the information and communication technologies and liaison devices used to support collaboration.

007-0054: A New Reservation Contract For Capacity Management in High-Tech Industries

Alper Murat, Wayne State University, United States

Ratna Chinnam, Wayne State University, United States

Ibrahim Dogan, Wayne State University, United States

We analyze a capacity reservation problem in high-tech environments with a manufacturer and a retailer. A recent study (Jin and Wu 2006) proposed a deductible reservation contract that seeks a coordinated solution. However, their solutions are not stable when manufacturer is the leader. We instead consider a Stackelberg game under a modified reservation contract and show that there is a better coordinating solution for the manufacturer.

007-0318: Firms Achieving Excellent Supply Chain Performance are also the Ones that Perform Best in Commercial and Financial Terms

Estampe Dominique, Bordeaux Business School, France

Michrafy Mohamed, Bordeaux Business School, France

A supply chain can be defined as the collaboration between actors in a given value chain, ranging from a supplier's supplier to a customer's customer. Three axes that are used to ascertain how well a company is performing on behalf of its customers and shareholders are return on assets, economic efficiency and revenue growth. Managers and researchers mention how hard it is to establish direct correlation between supply chain, commercial and financial performance. In other words, does an efficient and effective supply chain lead to an increase in revenues? Do shareholders derive greater value from companies with a high performance supply chain than they do where this is not the case? To determine this correlation, we analysed the financial, commercial and supply chain results of 88 leading European companies, accounting all for 85% of total revenues in each sector.

151	Sunday, May 6, 1:30-3:00 Room: Executive Session: Panel Discussion: Editors of POM Journals	Track: Tutorial, 2	Chair: Johnny Rungtusanatham
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007-0707: Panel Discussion of Editors of POM Journals

Johnny Rungtusanatham, University of Minnesota - Twin Cities, United States

Editors from journals of Production and Operations Management, Journal of Operations Management, Manufacturing and Service Operations Management, and Decision Sciences will discuss directions and policies about their journals, and answer questions.

152	Sunday, May 6, 1:30-3:00 Room: Far East Session: Studies at the Operations Marketing Interface	Track: Mkt-Opns, 10	Chair: Henrique L Correa
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007-0616: Return on the Investments in the Agricultural and Industrial Systems: A New Methodology for Sugar Cane and Ethanol

Reinaldo Costa, University of Sao Paulo, Brazil

Karine Carvalho, University of Sao Paulo, Brazil

Antônio Rafael Muscat, Polytechnic School at University of São Paulo, Brazil

The use of countable and financial information always exerted a basic role of aiding the manager in decision-taking. However, the lack and distortion of this information derive from different forms of appropriation and classification costs and expenditures that end up compromising the values attributed to the transferences and, consequently influence the validity and measurement of the refined results. This study analyzed the sugar and ethanol price transmission, aiming to get a consensus between these systems of production, expressed under the relation between the sugar cane cost and the total industrial cost. For this, a methodology was proposed that could equal the return rates on the investments in the two systems: agricultural and industrial, allowing the determination the sugar cane transfer pricing as a percentage of the total cost of ethanol/sugar, that could be used in different situations when considering the agricultural, industrial and of market phases.

007-0768: Saving Money Using Statistical Models Before Launching a New Product

Wagner Damiani, Brigham Young University, Brazil
Alexandre Mafra, Fundação Getulio Vargas, Brazil

A reasonable amount of money and time is usually spent in the launching process of a new product or service. This work covers a real issue faced by one of three major credit card players in the world. The sales results can be improved while reducing time and cost by using neural network models based on information technology to support the revenue forecasting process for a new product or service deployment, among the actual customers even before starting to spend the corporate budget to advertise it. It is demonstrated the efficacy of statistical models combined to on line analytical processing technology being applied to real word problems aiming to profile potential buyers for new products and services targeting the actual customers' base through marketing clustering methodology. The financial analysis and simulation process can be largely enhanced through this path presented in this work. The available literature is also briefly revised.

007-0008: An Operations Management View of the Services and Goods Offering Mix

Henrique Correa, Rollins College, United States
Lisa Ellram, Colorado State University, United States
Annibal Scavarda, Royal Melbourne Institute of Technology, Australia
Martha Cooper, The Ohio State University, United States

For several decades, operations and marketing texts have differentiated services and goods along four characteristics: intangibility, heterogeneity, inseparability, and perishability. Recently, this distinction has been assailed by several authors as not very useful for managing the production and delivery of services and goods, and particularly products that combine services and goods into a value package offered to customers. The proposed framework, termed here as The Value Package Prism, is suggested for assessing the kinds of management processes and flexibility available in providing a range of value packages. The Value Package Prism is based on a new set of characteristics appropriate to describe value packages from the operations management point of view: stockability, intensity of interaction with the client, simultaneousness between production and consumption, and difficulty in performance analysis.

153	<p>Sunday, May 6, 1:30-3:00 Room: Florentine</p> <p>Session: Building the Triple Bottom Line in POM - A Panel Discussion</p>	<p>Track: Sustain Ops, 11</p>	<p>Chair: Rob Klassen</p>
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007-0057: Building the Triple Bottom Line in POM

Robert Klassen, University of Western Ontario, Canada
Markus Biehl, York University, Canada
David Johnston, York University, Canada
Olga Kaminer, York University, Canada

Historically, environmental and social issues have been treated as peripheral concerns for business. However, managers now must wrestle with a variety of pressures and make difficult choices for how to best social and environmental dimensions in business models and management systems. In a nutshell, sustainable development focuses on the inter-relationships between financial, social and environmental performance, also termed the triple bottom line. There is the very real potential for competitive advantage to be increasingly rooted in such new capabilities as pollution prevention, design for environment, worker safety, and social responsiveness. This interactive panel session will overview prior POM research along these lines, summarize current directions, and explore avenues for future research.

154	<p>Sunday, May 6, 1:30-3:00 Room: Fountain</p> <p>Session: Business Process Strategy</p>	<p>Track: Ops Strat, 10</p>	<p>Chair: Rafael Teixeira</p>
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007-0308: A Critical Analysis on the Effect of Synchronous Index in a Typical Manufacturing

Ashok Mehatha, Sri Siddhartha Institute of Technology, India
Ravi Shankar, Indian Institute of Technology Delhi, India

Many researchers/ business process analysts do emphasize to plan, schedule and coordinate manufacturing activities to achieve high productivity. Process delays are normally handled with low priority and can lead to substantial loss to the industry. Scheduling becomes complex and uncertainty may arise after scheduling any process with vital resources of the industry. Executives are normally engrossed in routine exercises and don't track the synchronization of the process being scheduled. Knowledge on the synchronous index of their own process can help them in designing effective strategies of their processes. Here an attempt is made to analyze such production complexities using the custom built software Synchronous Analyzer and analyze the Synchronous index of production lines. Upon continuous engineering analyses of this index, it is expected to provide a major break through in operation efficiency.

007-0545: An Empirical Study Into the Modelling of Key Organizing Processes

Robert Van der Meer, University of Strathclyde, United Kingdom
Umit Bititci, University of Strathclyde, United Kingdom

Catherine Maguire, *University of Strathclyde, United Kingdom*

This paper presents initial results of an empirical study into the modelling of key organizing processes in a variety of business firms. The study is conducted by a UK-based multidisciplinary team of researchers specializing in operations management, management science, psychology and human resource management. The paper includes the theoretical framework for the study and the methodology used for the empirical research. The theoretical framework combines Porter's (1985) value chain model with elements from the CIMOSA modelling framework. Childe et al. (1994) distinguish between 'operate', 'support' and 'manage' processes. The latter processes may be taken to refer to the processual components of organisation concerned with coordination/integration, control and reward (Child 2005). There are important questions about the extent to which these 'manage' processes can be mapped and modelled and whether reference models can be developed. The empirical methodology is based on the analysis of multiple in-depth case studies.

007-0294: The Relations Among Competitive Criteria: An Exploratory Study from a Performance Perspective

Rafael Teixeira, *Texas A&M University, United States*

The traditional wisdom in operations management states that some competitive criteria are incompatible each other, generating operational trade-offs. However, recent studies have used cumulative capabilities models to show that competitive criteria are interrelated. Thus, improvement of one competitive criterion simultaneously creates improvement in other competitive criteria. This result brought new insights about the existence of trade-offs. Some researches results showed trade-offs between some competitive criteria while others showed no trade-offs. Besides this controversy, the majority of researches based their results on opinion of operations managers or information inside firms, characterizing an internal perspective. This research aims to explore the relationships among competitive criteria from an external perspective. A survey was run with 243 firms using internet access services to measure their satisfaction related to operational criteria. Structural equation modeling was applied to explore the relations among competitive criteria. Results showed dependability is a key competitive criterion affecting other competitive criteria.

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Sunday, May 6, 1:30-3:00 **Room:** French
Session: Production Networks and Buffers

Track: PIMs, 4

Chair: Seok Ho Chang

007-0357: Production Allocation Problem with Penalty by Tardiness of Delivery Under Make-to-Order Environment

Yasuhiko Takemoto, *University of Hyogo, Japan*

Ikuo Arizono, *Osaka Prefecture University, Japan*

We consider a Make-to-Order manufacturing system which can be formulated as an open queueing network composed of plural GI/G/1 queueing systems. In the Make-to-Order manufacturing system, it is important to fulfill customer's requests quickly. Therefore, it has been sometimes considered how to shorten the lead time. The production allocation can be one of such the strategies. However, many researchers have focused on nothing but the expectation of lead time. In this study, we pay attention to not only the expectation of lead time but also its variance and evaluate a kind of loss by the excess of lead time over the prescribed delivery period, where we assess the maximal loss among all the lead time distributions with same expectation and variance. Then, the optimal production allocation is decided using production and tardiness costs. Lastly, we provide some numerical examples and perform the sensitivity analysis for the economical production allocation.

007-0396: Optimal Protective Capacity and Buffers in a Production System Experiencing Breakdowns

Divesh Ojha, *Clemson University, United States*

Lawrence Fredendall, *Clemson University, United States*

Vijay Singh, *Clemson University, United States*

We analytically find the optimal protective capacity and shop floor buffers in a manufacturing system experiencing machine breakdowns. We consider a three machine flow shop in which the middle machine is the bottleneck. Machines other than the bottleneck have extra capacity. Also there are inventory buffers between the machines which work in conjunction with the protective capacity to reduce the impact of breakdowns on the system. The objective of the model is to minimize the cost of protective capacity and inventory carrying cost of the system for a given level of utilization of the system. The resulting optimization model is a nonlinear function of the protective capacities of the two non-bottleneck machines and of the maximum size of the buffers in between the machines.

007-0346: Modeling and Exact Analysis of a Production Line with Two Unreliable Batch Machines and a Finite Buffer: Partial Batches

Seok Ho Chang, *Nanyang Technological University, Singapore*

Stanley Gershwin, *Massachusetts Institute of Technology, United States*

Chang and Gershwin (2005) presented an analytical model exact analysis of a production line with two unreliable batch machines and a finite buffer under the assumption of full batches. The purpose of this paper is to present a model, and exact analysis of a similar line under the assumption of partial batches; to present new qualitative insights and interpretations of system behavior; to present the comparison between full and partial batches. We present performance measures such as production rate, mean size of batch served in machines, probabilities of blocking and starvation, and expected in-process inventory. New phenomena are described and possible interpretations are presented.

007-0038: Bridging the Aggregation Gap: Supplementing Sales and Operations Planning with Inventory Profile Analysis

James Robison, *Sonoma State University, United States*

Sales and operations planning, S&OP, is used by many organizations to coordinate sales, production, and finished goods inventory. Rather than reviewing each stockkeeping unit (SKU) products are aggregated into product families. Actual sales, production, and inventory are then compared to forecasted sales, planned production, and planned inventory at the family level. The problem with this aggregation process, which is not unique to S&OP, is that overages of some items will mask shortages of other items within a product family. The S&OP templates recommended by most authors do not provide insight into the balance of SKUs within a product family. Inventory profile analysis (IPA) is an aggregation technique that does provide this insight. The addition of two IPA indices, coverage, and excess, to the traditional S&OP template can result in a significant improvement in the quality of the information, resulting in a more efficient decision-making process.

007-0661: Developing Undergraduate Student Research Experiences in Operations Management*Martin Stöblein, University of Dayton, United States**John Kanet, University of Dayton, United States*

This paper describes the efforts underway at the University of Dayton to provide research experiences for undergraduate students in Operations Management. The aim is to infuse an attitude of lifelong learning, to sharpen students' objectivity, enhance their ability to search and filter relevant information, and improve their writing and oral presentation skills. As part of a semester course in Supply Chain Management Strategies, students choose a topic from a prepared list of suggested topics and related research questions. Students are provided guidance on what constitutes good research and writing, and given timely feedback in one-on-one status meetings. Project results are disseminated via a 'student research conference', attended by fellow students, faculty, and regional business people. Initial experience with this format has been positive. Already after the first year, one research paper has won a national student paper competition.

007-0660: Problem-based Learning - Lessons Learned from an Undergraduate Operations Management Program*John Kanet, University of Dayton, United States**Martin Stöblein, University of Dayton, United States*

This report describes the pedagogical experience in one application of Problem-Based Learning (PBL) in the teaching of Supply Chain Management in the undergraduate Operations Management program at the University of Dayton. Students are intellectually challenged to define and decompose unstructured problems in a web-based Supply Chain Game with a simulated scenario. In order to solve problems students are stimulated to look themselves for appropriate methods, which define their information requirements. Their 'learning-by-doing' process is supported by timely feedback on their intended SCM strategy. Even before the game starts they can adapt their market forecast, location planning and parameters for allocation, transportation, and inventory. Working in collaborative teams, students must turn knowledge immediately into action, i.e. to make strategic, tactical, and operational decisions. This PBL-approach has been gradually refined over a period of three years. We present first results on evaluating its effectiveness.

007-0216: Investigating Academic Success Factors for Undergraduate Business Students*Mehdi Kaighobadi, Florida Atlantic University, United States**Marc Alle, Florida Atlantic University, United States*

Student academic performance is of major interest to higher education institutions. This study questions whether or not statistical analysis of information that is readily available in most universities' official records system can be used to predict overall academic success. In particular, this study is an attempt to understand factors that affect academic success for business students by examining gender, age, ethnicity, and performance in two required core knowledge courses, Operations Management and Financial Management as predictors of academic success for a large sample of undergraduate students at an AACSB-accredited business school. Previous research has focused on a number of variables affecting the academic performance of students in their future educational programs. However, non has focused specifically on common business core courses. The methodology applied in this research is truncated regression analysis.

007-0369: Adding Value to an Undergraduate Supply Chain Class with SAP*Barbara Osyk, University of Akron, United States*

We are in our second year as part of the University Alliance with SAP. Various modules of SAP have been incorporated into undergraduate Supply Chain Management classes to increase the students' understanding of basic functions covered in those courses, including purchasing, sales order processing, and forecasting. The various benefits and limitations of this approach from a pedagogical viewpoint will be discussed.

007-0453: Obstacles and Enablers for SMEs as Suppliers for the Public Sector*Katri Karjalainen, Helsinki School of Economics, Finland**Katariina Kemppainen, RSM Erasmus University, Netherlands**Ari Vepsäläinen, Helsinki School of Economics, Finland*

Despite many obvious social and innovative benefits of small businesses (SMEs) acting as suppliers for the public sector, there is limited knowledge on the factors affecting the SME involvement across different levels of state and municipal procurement. Using survey data collected from Finnish small businesses we will analyze what characteristics of suppliers and purchasing authorities influence their involvement in public procurement. One focus will be on the impact of electronic purchasing of SMEs as they tend to be less e-enabled than large firms and thus run the risk of being permanently disintegrated from public supply networks. The objective is to form a framework of possible factors and perceptions that determine the potential of SMEs to act as public sector suppliers.

007-0347: Towards a Better Understanding of Successful Implementation of MRP: An Empirical Study.*Mona Ali, The German University in Cairo, Egypt*

This study aims at categorizing the critical factors leading to the failure of implementation of MRP systems within SMEs of the Egyptian industrial sector. Although this issue has been addressed before, this study is different in the following ways: The study is based on finding correlation coefficients between critical factors as one variable and degree of success of implementing MRP as another. Based on the coefficients found the factors are categorized and the most critical factors recognized. Questionnaire has been designed to collect data from production, material and supply managers in Egyptian manufacturing companies. The analysis of Data reveals that only a few of the identified factors are most important for successful implementation of MRP. The final results are not yet accomplished (but will be soon) The information provided by this study could be utilized by practitioners as a meaning of approaching successful application of MRP systems.

007-0118: Improving Supplier-Buyer Relationships: An Empirical Study in Manufacturing

Cid Gonçalves-Filho, Fumec University, Brazil

Gustavo Souki, Fumec University, Brazil

The relations between buyers and suppliers in the industrial context could probably affect the performance of supply chains, as they have could impact stock levels, prices, operations flexibility, opportunistic behavior, commitment and trust among the players. But researches that explore and measure these constructs in this scenario are scarce and rare, because this type of data is difficult to collect. In this study, the relationship among buyers and suppliers is analyzed. Using a survey approach, suppliers evaluate their relationship with the buyer and expose their behavioral intentions. Using Structural Equation Modeling, it was verified the impacts of Relationship Quality, Commitment, Trust and Satisfaction with the buyer, in the behavioral intentions of the suppliers, mouth to mouth communication and price sensitiveness. This work contributes to understating buyer-supplier relationship and proposes an important analytical model to improve this important link embedded in the field of the supply chain management research.

007-0375: Achieving Customer Responsiveness Through Strategic Sourcing and Networking

Ednilson Bernardes, Georgia Southern University, United States

Rachna Shah, University of Minnesota, United States

George Zsidisin, Michigan State University, United States

Roger Schroeder, University of Minnesota, United States

Customer responsiveness is touted as an important firm based capability necessary for firms to thrive in the current competitive landscape. Additionally, sharing market knowledge with members of a supply network is supposed to lead to higher customer responsiveness for a focal firm. Therefore, leveraging the latent knowledge available in the supply network can be a major source of customer responsiveness for focal firms. In this study, we develop a framework that postulates how focal firms can leverage the knowledge latent in their supply network and, thereby, improve their capability to respond to their end customers' needs. We develop 5 hypotheses to reflect the causal relationships embodied in the conceptual framework and examine them using structural equation modeling with 204 responses from supply managers. The results support our hypotheses but also highlight important antecedents and mediating variables that are critical to achieving superior customer responsiveness.

158	Sunday, May 6, 1:30-3:00 Room: Oak Session: Environmental Management Systems	Track: Environ, 2	Chair: Steven Melnyk
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007-0752: A Study on the Integration of ISO 9001 and ISO 14001 Management Systems in a Brazilian Furniture Company

Paulo Fernando Graef, Universidade Estadual Paulista, Brazil

Otavio Oliveira, Universidade Estadual Paulista, Brazil

The adoption of modern management systems has become a basic condition for organizational endurance, to reduce waste and reducing the emissions of pollutants in the environment. The main objective of this paper is to analyze the implementation of an environmental management system based on ISO 14001:2004 in a Brazilian company operating in the furniture sector, which already had a quality management system based on the ISO 9001:2000 and to propose general guidelines to integrate it. It will show how the organizational structure and internal processes of the mentioned company were adjusted to the ISO 9001 and 14001 requirements. To carry out this study, qualitative research was performed based on case study methodology. We present theoretical references with the following macro-items: system standardization and certification, environmental management and ISO 14000, quality management and ISO 9000, and integrated management systems.

007-0219: Life Cycle Management for Environmental Innovation – 3M Brazil's Product Development Against Minerals Dust Pollution

Rogério Calia, FGV Business School, Brazil

Lienne Pires, 3M Brazil, Brazil

Jose Barbieri, FGV Business School, Brazil

This article presents a case study of how 3M Brazil utilized the Life Cycle Management method in new product development for creating a mineral dust suppressant. Daily, tons of iron ore is shipped to Brazilian ports in open railroads cars causing pollution by mineral dust. Approached by one of the country's largest iron ore producers, 3M Brazil developed a spray that reduces the amount of dust emitted by moving trains, so that trains now can transport faster. Along the development of this product, a cradle to grave screening comprising environmental, health, safety and regulatory issues was made based more on qualitative than quantitative values. Some hot spots were identified and the development team could take advantage and promote improvements in the product without decreasing its performance. A patent was asked for this product and many 3M subsidiaries are interest to export the product.

007-0645: An Integrated Preventive Production Planning Program with Waste Minimisation

Sibel Uludag Demirer, Cankaya University, Turkey

Sedef Elker, Cankaya University, Turkey

The paper illustrates a study focusing on developing an alternative production planning and scheduling technique in order to prevent the production of hazardous materials while covering the needs of production planning principles. A case study is realized in a battery manufacturing company whose wastes are classified as hazardous. In the first part of the study, the production planning methods adopted in the facility are examined to find out their relations with waste minimisation and an optimisation model is generated. In the second part, the benefits obtained from the optimum scheduling plan are determined in terms of waste and cost minimisation. A literature survey about Economic Lot Sizing is then accomplished to compare the effectiveness of the optimisation model generated. This study is unique as being one of the few studies aiming the design of job scheduling to reduce waste at the source.

007-0266: Teaching Environmentally Responsible Management: Challenges and Opportunities

Steven Melnyk, Michigan State University, United States

The environmentally responsible supply chain is becoming important for many reasons (including the growing importance of China). Consequently, there is a need to each students at the undergraduate, graduate and executive level about it. Yet doing so is not easy. This presentation focuses on some challenges and opportunities encountered in developing and teaching such a course in supply chain program. It identifies frameworks and cases that the presenter has found to be effective. It ends with a discussion of the opportunities now present.

159	Sunday, May 6, 1:30-3:00 Room: Panorama Session: Disruptions in Supply Chains	Track: Supply Chn, 20	Chair: Anand Nair
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007-0614: Dealing with the Inevitable: Managing Supply Chain Disruptions

Jennifer Blackhurst, Iowa State University, United States
Johnny Rungtusanatham, University of Minnesota - Twin Cities, United States
Christopher Craighead, Auburn University, United States

Disruptions to supply chain product flow are an inevitable risk all supply chains encounter in today's global environment. These supply chain disruptions have been shown to be costly and can potentially bring portions of the supply chain to a complete halt. This study investigates tactics for managers to manage supply chain disruptions as they occur within the network. Findings from the study call into question the wisdom of pursuing such current supply chain

007-0422: Managing Disruptions in a Supply Chain

S.N.Lakshmi Narasimhan, Sri Siddhartha Institute of Technology, India
C. Sahasra Nam, Sri Siddhartha Institute of Technology, India

The inability to deliver a supply due to disruptions in a complex supply chain can have a significant impact on the performance of a supply chain. Recent high-profile disruptions such as September 11 is one motivation. One reason for disruptions is the application of lean supply chain philosophy, which advocates slimmed-down systems with little redundancy. Another reason for disruptions is that firms are less vertically integrated and their supply chains are globally distributed. This paper explains various strategies for managing disruptions in a supply chain. We provide an illustration to show the effect of disruption and an approach to manage disruption.

007-0095: Integrating Scenario Planning with Supply Disruption Risk Assessment and Management

Paul Kleindorfer, INSEAD, France

Assessing and managing supply disruption risk for companies that have significant commodity risk exposure has some special features that make it worth separate study. In particular, commodity risk management allows in the short and medium term the integration of supply contracting with spot markets and other market institutions. Disruption risks by their very nature suggest idiosyncratic shocks that need to be discovered, assessed and managed. This presentation will provide the results of an on-going case study on how long-term risk assessment, based on scenario planning, can be integrated with shorter-term supply operations in a company facing major commodity risks in its global operations. The results of an initial scenario planning exercise are presented, and the evaluation of contingent responses derived from this long-term assessment is integrated with shorter-term response and hedging strategies. Competitive advantage strategies and risks, and open research questions, are highlighted in the process.

007-0522: Robustness of Supply Networks Against Disruptions – A Complex Adaptive Systems Perspective

Anand Nair, University of South Carolina, United States

Several supply chain networks exhibit incredible robustness against disruptions. In this study the relationship between supply network topology and the robustness of the network against potential supply chain disruptions is examined. A complex adaptive systems approach is adopted for the research investigation. Potential implications for strategic supply chain decisions such as facility location and network design are analyzed.

160	Sunday, May 6, 1:30-3:00 Room: Parisian Session: Customer Retention and Customization	Track: Emp Res, 10	Chair: Johnny Rungtusanatham
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007-0397: An Empirical Analysis of Supply Chain Customer Retention Under Vendor-Managed Inventory

Yuliang Yao, Lehigh University, United States
Yan Dong, University of Minnesota, United States
Martin Dresner, University of Maryland, United States

Manufacturers do not directly interact with end consumers but rely on downstream partners to deliver products and services. Customer retention is dependent on the amount of effort expended by their supply chain partners. When the partner has multiple sources of supplies, he may not be as interested in expending customer retention effort on the manufacturer's product as the manufacturer would prefer. We empirically examine how the use of VMI between a manufacturer and its distributors improve the manufacturer's customer retention via higher distributor retention efforts. We construct econometric models to analyze firm-level panel data gathered from more than 200 distributors serving 4 manufacturers in 2 industries. We find that, under a VMI arrangement, lower inventory at the distributor is associated with a higher conversion rate of lost sales stockouts to backorders, suggesting that lower inventory may be used as an incentive for improved customer retention.

007-0279: Comparison of Change Order Management Practices in Make-to-Order Manufacturing

Antti Tenhiälä, Helsinki University of Technology, Finland

The coordination of front-end and back-end operations is a known challenge of make-to-order manufacturing. Basically, the tasks should be simple: front end's responsibility is to translate customers' requirements into such specifications that can be efficiently fulfilled in manufacturing. In return, the back end should deliver the products on time and as specified so that the front end can effectively serve its customers. The complexity begins when schedules or specifications must be changed across the interface between customer projects and manufacturing processes. Mass customization practices standardize the basic processes but the solutions for managing exceptions vary. This study evaluates different solutions for communicating change orders between sales offices and manufacturing units. Data from 29 organizations support the hypotheses of formal communications outperforming meeting practices and integrated software packages surpassing decentralized systems. The results also suggest that solutions' suitability is contingent upon the kinds of uncertainties that companies face in different environments.

007-0681: Transitioning from Mass Production to Mass Customization: Hindrance Factors and Transition Hazard

Johnny Rungtusanatham, University of Minnesota - Twin Cities, United States

Fabrizio Salvador, Instituto de Empresa, Spain

We conduct a quasi-longitudinal case study of a manufacturing facility belonging to a division of a Fortune 1000 discrete manufacturing firm as it seeks to transition from MP to MC. We empirically derive, define, and justify five factors hindering the MP-to-MC transition within the research site, and propose five corresponding analytical generalizations explaining how and why these factors threaten the likelihood of a successful to MP-to-MC. These five factors and analytical generalizations constitute a theory of hindrance factors and transition hazard in the pursuit of Mass Customization with a Mass Production firm. To lend credibility to these theoretical insights, we juxtapose the five factors and corresponding analytical generalizations against the more general constructs and prescriptions of Structural Inertia Theory. We conclude with a discussion of the scientific and pragmatic significance of the findings and opportunities for future research.

007-0789: The Impact of Component Sharing on Reliability

Taylor Randall, University of Utah, United States

Kamalini Ramdas, University of Virginia, United States

Component sharing – the use of a component on multiple products within a firm's product line – is widely practiced as a means to offer high variety at low cost. While many researchers have examined tradeoffs involved in component sharing, little research has focused on the impact of component sharing on quality – defined in this paper as component reliability. The design literature suggests that a component designed uniquely for a product will result in higher quality due to better fit of the component within the architecture of the product. However, learning curve literature suggests that higher volume of a component will increase component reliability. Sharing a component across multiple products increases volume and hence should increase reliability. We explore the tension and tradeoffs between these two arguments using data from the U.S. automobile industry.

161	Sunday, May 6, 1:30-3:00 Room: Patio Session: Teaching Project Management to MBA's: Panel Discussion	Track: Proj Mgmt, 1	Chair: Dwight Smith-Daniels
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007-0641: Project Management and MBA's: Beyond the Basics

Karen Brown, University of Washington, United States

Ted Klastorin, University of Washington, United States

Dwight Smith-Daniels, Arizona State University, United States

A number of recent industry studies have illustrated that the majority of business organizations are still far short of their desired levels of Project Management performance, despite their efforts to educate their workforce in the basics of Project Management. In this session, our panel, all of whom have taught Project Management to MBA's for many years, discuss innovations that they have used in the classroom to develop skills that MBA's can use to manage in the "World of Projects," required to execute change in business organizations.

162	Sunday, May 6, 1:30-3:00 Room: Pavilion Session: Responsive Learning Technologies	Track: Tutorial, 6	Chair: Sam Wood
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007-0290: Responsive Learning Technologies

Samuel Wood, Responsive Learning Technologies, United States

In 2004 POMS awarded the Wickham Skinner Award for Teaching Innovation for the Littlefield Technologies web-based software. The online games are used to engage students in Operations Management courses at the undergraduate and graduate levels in more than 100 institutions around the world. This 90-minute session has three objectives for attendees: (1) A general understanding of what online games are available to teach operations and supply chain management; (2) A sufficient understanding of Littlefield Technologies to use it in a course; (3) Exposure to techniques for effectively using online simulations in courses. The session will be highly interactive, allowing attendees to play an accelerated Littlefield Technologies game during part of the session. Although not required, attendees are encouraged to bring a laptop to the session.

163Sunday, May 6, 1:30-3:00 **Room:** Royal**Track:** Tutorial, 7**Chair:** Martin K. Starr**Session:** What Hath Holt, Modigliani, Muth and Simon Wrought?**007-0018: What Hath Holt, Modigliani, Muth and Simon Wrought?***Linda Sprague, China Europe International Business School (CEIBS), China**Martin Starr, Rollins College - Crummer GSB, United States*

In 1959 the Carnegie Foundation and the Ford Foundation independently evaluated business schools. Each concluded: standards were too low; foundation courses in math, statistics, social sciences, and the humanities were needed. Faculty research and teaching were second-rate. These critiques forced business schools to change. Rapid introduction of "scientific" materials into POM courses followed. Holt, Modigliani, Muth and Simon's Planning Production, Inventory and Workforce (Prentice Hall, 1960) became the science flagship in MBA curricula. Bennis and O'Toole published "How Business Schools Lost Their Way" (Harvard Business Review - May 2005). They criticize business schools for inappropriate goals and suggest that professional schools' models are more appropriate.

164Sunday, May 6, 1:30-3:00 **Room:** State**Track:** Service Ops, 3**Chair:** Liana Victorino**Session:** Service Quality**007-0716: A Longitudinal Exploration of Service Quality***Michael Stodnick, University of North Texas, United States**Ching-Chung Kuo, University of North Texas, United States*

Service quality is one of the most well represented and researched concepts in service management literature. Hundreds of empirical studies have investigated not only how to measure service quality but also what the antecedents and consequences of delivering service quality are. However, one of the limitations of empirical service quality research is that the vast majority of it is cross-sectional in nature. Although there have been many calls for longitudinal service quality research, very few studies of this nature exist. This research attempts to bridge this gap by exploring how service quality perceptions change over time and how variables such as quality expectations and customer satisfaction are related to said changes. The results of this research, when paired with the cross-sectional results of previous research, will paint a clearer picture of the character of service quality perceptions.

007-0146: The Role of Power in Service Quality, Purchase Intentions, and Purchase Actions*Daisy Wang, Southern Illinois University Carbondale, United States**Suresh Tadisina, Southern Illinois University Carbondale, United States*

Service quality is related to customer satisfaction and purchase intentions though the casual relationships among these are still controversial. Previous studies hardly discuss the inconsistency between purchase intentions and purchase actions. In this paper, we claim the relationship that purchase intentions lead to purchase actions is moderated by power dependence. When customers are less powerful than the service provider, low service quality would lower purchase intentions. However, their purchase actions would still occur since they depend on the service provided by the firm. On the other hand, when customers are more powerful than the service provider, high service quality and high purchase intentions may not direct purchase actions. In addition, firms with more power tend to have low service quality while firms with less power incline to provide better service. Due to this power imbalance, the service quality will be different accordingly.

007-0644: Antecedents of the Intention to Use Self-service Technologies*Kiattisak Phongkukulchit, Southern Illinois University, United States*

Despite the high installation of self-service technologies (SSTs) in enterprises, the low utilization rate of SSTs cautions us as operations management scholars that SSTs have not been used efficiently. This paper attempts to explore reasons leading to this low utilization rate. Many customers concern quality being served by SSTs. New technologies have been constantly and radically introduced to customers around the globe. This fast-paced introduction may have caused technology anxiety (TA) in customers. Perhaps, customers may not trust the company enough, so they choose not to use SSTs. Therefore, we intend to empirically examine the influence of expected service quality of using SSTs, technology anxiety, and trust in the company on the intention to use SSTs. Expected service quality and trust are anticipated to have a positive relationship with the intention to use SSTs while a negative relationship is expected between TA and intention to use SSTs.

007-0304: Scripting the Service Encounter: An Exploratory Analysis*Liana Victorino, University of Utah, United States**Rohit Verma, Cornell University, United States*

A script allows the service encounter to be a highly standardized process and also provides a consistent level of service across all customer types. However, is it possible to ever truly delight a customer in such a predictable service environment? More specifically, what affects does scripting have on the perception of service quality and provider performance? In addition, when should scripts be utilized and when is a customized approach more appropriate. In this study, we plan to explore the preceding research questions through a triangulation of empirical research methods. In conclusion of our empirical analyses, we intend to address under which situations scripting is more appropriate as well as the influences scripting has on provider performance and quality.

165Sunday, May 6, 1:30-3:00 **Room:** Terrace**Track:** Health Care, 3**Chair:** Mike Magazine**Session:** Managing Patient Flow**007-0761: Maximizing Cardiac Surgery Throughput Using a Simulation Model***Carter Price, University of Maryland, United States*

Bruce Golden, *University of Maryland, United States*
Edward Wasil, *American University, United States*
Timothy Babineau, *University of Maryland Medical Center, United States*
Bartley Griffith, *University of Maryland Medical Center, United States*

Postoperative Intensive Care Unit (ICU) capacity and Intermediate Care Unit (IMC) capacity can often produce bottlenecks in the patient flow of surgical service lines. Nursing shortages and constrained bed capacity often exacerbate one another in creating these bottlenecks. Subsequently, elective operating room schedules are adversely affected by such bottlenecks. A simulation model is used to analyze the appropriate bed mix for a cardiac surgery ICU and IMC to maximize throughput of a cardiac surgery service line. The model uses historical length of stay data from more than 1,700 cardiac surgery encounters to estimate the maximum capacity of a 30 bed postoperative unit. The results of the simulation indicate that by altering the current mix of ICU beds and IMC, the maximum number of surgeries could be increased by more than 17%.

007-0786: Cost of Triaging - Is Triaging Preferable in an Emergency Department?

Arvind Sainathan, *University of Rochester, United States*
Greg Dobson, *University of Rochester, United States*

The paper looks at triaging in an ED and analyzes whether it helps in reducing patients' waiting costs. We consider two classes of patients to an ED - urgents and non-urgents. Paper has two parts. In the first part, we consider exogenous budget and in the second, endogenous budget. We numerically compare two systems, TN-plus-physician and physician-only system, using stylized queueing models in these cases. We also prove some mathematical properties of the waiting costs in these cases. We conclude that there are three cases when triaging is potentially preferable - high probability of arrival of urgent patients, high waiting cost of the urgents compared to non-urgents, and insufficient budget.

007-0332: Mitigating Emergency Disruptions: Dedicated Emergency Operating Room or Not

Ying Li, *Texas A&M University, United States*

At a large midwestern hospital the schedule of elective procedures was occasionally disrupted by medical emergencies. The administration considered dedicating an operating room for handling emergency procedures only. This paper investigates whether a dedicated emergency operation room (DEOR) reduces emergency disruptions and if so, under what condition a DEOR should be adopted. This study focuses on two performance measures: schedule reliability, which measures emergency disruptions, and staffing costs, which are driven by overtime usage. Queueing models are used to describe the flow of elective and emergency procedures. Structural results outline the factors that drive the performance measures in different directions. The ultimate impact of having a DEOR is examined numerically. Special methods are proposed so that performance measures can be evaluated efficiently. The numerical study also sheds light on the role various parameters play in a hospital's decision regarding DEOR.

007-0017: Joint Capacity and Contract Management for Operating an Outpatient Medical Imaging Facility

Abraham Seidmann, *University of Rochester, United States*
Yabing Jiang, *Fordham University, United States*

Capacity planning is a major challenge for free-standing diagnostic medical imaging centers. These facilities are usually capital intensive, and with a fixed capacity level they can process only a limited number of tests per unit time. Random variations in test time and the stochastic arrival of test requests can give rise to queueing delays at the center for patients. Investors who provide the necessary capital for the development of such free-standing facilities must determine the optimal capacity to be installed, as well as the proper compensation and incentive structure for the hired executives, who are typically responsible for marketing the diagnostic services and therefore are given incentives to increase demand. In this paper, we extend the principal-agent framework and integrate the investor's incentive contract design with its stochastic capacity decision processes. We show how to improve profitability, service level, and productivity through proper incentives and capacity pricing.

166	Sunday, May 6, 1:30-3:00 Room: Vista	Track: JIT & Lean, 7	Chair: Rachna Shah
	Session: Charting the Course of Lean Enterprise - A Panel Discussion		

007-0611: Charting the Course of Lean Enterprise - A Panel Discussion

Rachna Shah, *University of Minnesota, United States*
Peter Ward, *The Ohio State University, United States*

Despite enormous practitioner interest, studying the lean phenomenon has been slow to take root in the academic community. This unique and interactive panel session is organized to help us identify extant theories that can be used to explain the phenomenon underlying lean thinking using a scientific lens. The added focus will hopefully move us towards bridging the gap between the practitioner and the academic views. Our hope is to help lean production move beyond its faddish nature and to help it become more established in the OM field and the OM journals. Our panel consists of experts in lean thinking including Rachna Shah, Morgan Swink, Chris Voss, and Peter Ward. The tentative questions for the panel discussion are as follows What are the underlying theories with a potential for application? How does lean interact with other improvement approaches? What specific methods should be used to study lean?

167	Sunday, May 6, 3:30-5:00 Room: Brasserie	Track: Prod Innov, 13	Chair: Manuel Sosa
	Session: Markets, Industries, and Economies		

007-0381: Architectural Innovation as an Incumbent's Strategic Weapon: Prior Experience, Architectural Knowledge, and Hierarchy

Jin-Kyu Park, *Florida International University, United States*
Chanchai Tanpong, *North Dakota State University, United States*
Young Ro, *University of Michigan - Dearborn, United States*

The widely accepted notion that incumbent firms falter in the market when dealing with architectural innovation begs the question of whether they can successfully introduce architectural innovations in a mature industry. If so, what factors determine whether incumbents succeed in architectural innovation endeavors? To address this question, we investigate the U.S. road and mountain bicycle driving-train component industries from 1980 to 1992 via in-depth case analyses. This study highlights the importance of an incumbent's prior innovation experience, new product architecture knowledge, and hierarchy mode, i.e., controlling relevant components, for successful architectural innovation. Since much previous research takes creating new product architecture knowledge as a major factor affecting the dominance of entrant in the face of architectural innovation, the finding of this research is, we believe, very valuable.

007-0564: Modularity in Design: Exploratory Case Studies on Transferring Added Value Activities Through the Supply Chain

Paulo Miguel, University of Sao Paulo, Brazil

Evandro Prieto, University of Sao Paulo, Brazil

The decision of adopting integrated product architecture has been replaced by a modular approach for designing new products. The impact of this decision can be viewed in terms of internal activities of product development and production or transferring those activities to suppliers. In this context, the purpose of this paper is to investigate added-value transfer when adopting modularity. It is part of an ongoing research project designed to investigate current managerial practices that could be categorised as transferring added-value activities through the supply chain. Case-based research was employed as the methodological approach. A conceptual model of added-value transferring in the literature was used to analyse the cases. The results identified issues that characterise activities that have been transferred from the first to the second tier supplier. The value of the paper is towards an exploration of modularity decision in the automotive supply chain within the context of a developing country.

007-0571: Studying the Dynamics of Software Modularity

Manuel SOSA, INSEAD, France

Jurgen Mihm, INSEAD, France

Tyson Browning, Texas Christian University, United States

In this paper we report the results of an exploratory study to investigate how the modularity of software products evolves over time. We introduce a product representation that takes into account two important features of complex software products: hierarchies and clusters. We illustrate our approach by examining the evolution over several versions of an open source product. Implications for research are discussed.

168	Sunday, May 6, 3:30-5:00 Room: Continental Session: Panel: Teaching Management of Technology	Track: Prod Innov, 5	Chair: Gary Scudder
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007-0596: Panel on Teaching Management of Technology

Gary Scudder, Vanderbilt University, United States

The topic of Management of Technology is taught at many schools in their MBA programs, but the content and coverage is often quite different. In most programs, these courses are electives, but at Tuck, there is a required core course on this subject. The panelists will share how they approach this important topic in the classroom, along with the learning objectives they are trying to achieve in their courses. These brief presentations will be followed by discussion and questions and answers.

Participants: Cheryl Gaimon, Georgia Tech; Eric Johnson, Tuck School, Dartmouth; Alan MacCormack, Harvard Business School; Debasish Mallick, College of St. Thomas; Gary Scudder, Owen School, Vanderbilt (Moderator)

169	Sunday, May 6, 3:30-5:00 Room: Executive Session: Supply Chain College Best Student Paper Competition	Track: Tutorial, 3	Chair: M. Eric Johnson
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007-0047: Supply Chain College Best Student Paper Competition

M. Eric Johnson, Dartmouth College, United States

Feature presentations of the four finalists.

170	Sunday, May 6, 3:30-5:00 Room: Far East Session: Innovation	Track: Prod Innov, 14	Chair: Clovis Hegedus
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007-0251: The Effect of Externalization Of Employment On Orientation to Innovation In Organizations

Antonio Ruiz Moreno, GRANADA, Spain

Francisco Javier Llorens Montes, Granada, Spain

Teresa Ortega Egea, Granada, Saint Helena

Leopoldo Gutierrez, Granada, Spain

Recent analyses of labour market tendencies suggest that there was a gradual movement from full-time employees toward part-time or temporary. Many authors referred to this development as externalization of employee relations. This process can have considerable consequences on organizations. We see the creation of new products, ideas and processes as of vital importance in organizations. However not only organizational systems, structures are necessary for the implementation of innovation, but also certain kinds of positive attitudes and behaviours toward innovation. This paper focuses on consequences of externalisation from the perspective of employees. We analyse how externalization is related to orientation to innovation. We examine how this relationship can be moderated by variables of context. To verify the hypotheses, we used a sample of 313 permanent workers. The results indicate that externalisation has a negative effect on orientation toward innovation.

007-0501: Innovation in Service Industries: Influential Variables. An Approximation to the Spanish Tourism Sector

Raquel Gomez Lopez, University of Cantabria, Spain

Concepcion Lopez Fernandez, University of Cantabria, Spain

Ana Serrano Bedia, University of Cantabria, Spain

Innovation is considered to be a key factor both for company competitiveness as well as for economic growth. The service sector and, in particular, tourism has constituted, for the past several decades, a sector with significant and growing importance both in the world and in the Spanish economy. However, it is not until relatively recent times that innovation in this context has begun to be the subject of research studies.

Consequently, the aim of this paper is to make a literature review about the approaches to study the innovation processes in services and tourism and to verify the importance of certain influential variables in the Spanish hotel companies. The empirical test was carried out using the CIS (Community Innovation Survey) data for Spain as well as the Spanish Hotel Guide.

007-0790: Material Innovation for Die Casting Molds

Jaby Mohammed, Morehead State University, United States

Quest for a material to suit service performance is almost as old as the human civilization. Traditional die casting steel mold materials fail due to metal-fatigue cracking, corrosion, erosion, soldering etc when subjected to cyclic mechanical and thermal load. The objective of this work is to find an optimal mold material composition and process parameters for the use in die casting industry using direct metal manufacturing. Design of experiments and Response surface methodologies are used in identifying the coating materials and optimizing the process parameter in order to develop the innovative coating material. The newly developed coating material is then evaluated for its mechanical and thermal properties. With the newly developed material and process, the production time and the cost is considerably reduced.

007-0720: A Better Understanding of the Diffusion of Innovations Among the Population

Clovis Hegedus, Instituto Mauá de Tecnologia, Brazil

We have studied Roger's diffusion of innovations proposal of five different types of people response to an innovation, finding that it is possible to classify the population in different revenue categories with the top revenue class acting like innovators in Roger's categories, as well as the poorest people reacting similar to the laggard category. The research was based in the evolution of some home appliances ownership among Brazilian houses since 1970. The findings can be useful to direct some company strategies in questions like production ramp-up and needed resources by the time of the production development.

171

Sunday, May 6, 3:30-5:00 **Room:** Florentine
Session: Product Recovery Issues

Track: Sustain Ops, 12

Chair: Michael Ketzenberg

007-0272: An Analysis of Monopolistic and Competitive Collection Schemes for Recycling

Vedat Verter, McGill University, Canada

Fuminori Toyasaki, McGill University, Canada

Tamer Boyaci, McGill University, Canada

We investigate the impact of monopolistic and competitive collection schemes on manufacturers, recyclers and consumers. Such systems are commonly used in Europe for WEEE and are being considered in the U.S. and in Canada. Since the number of major recyclers is much smaller than that of manufacturers in most industries and their total recycling capacity is often limited, we assume that in a game-theoretic setting the recyclers act as leaders. In addition, there is price competition among the manufacturers, in order to capture larger market share. In the monopolistic scheme, the manufacturers are members of a non-profit organization that allocates the collected end-of-life returns to the recyclers and reflects the associated costs on the manufacturers. In the competitive collection scheme, however, the manufacturers directly work with the recycler of their choice. We identify the conditions under which each of the two schemes are preferable by each stakeholder.

007-0489: A Revenue-Management Approach to Product Recovery

Mark Ferguson, Georgia Institute of Technology, United States

Moritz Fleischmann, RSM Erasmus University, Netherlands

Our problem is motivated by the asset recovery process at an electronic equipment manufacturer. Products coming off of lease are returned to the OEM's remanufacturing facility where a disposition decision is made to either remanufacture the returned unit or to disassemble it to recover spare parts. In general, remanufacturing and reselling a unit is more profitable than salvaging it for parts but the final selling price of the remanufactured unit is uncertain due to unknown market conditions. In contrast, margins on spare parts are known at the time of the disposition decision. Thus, the disposition decision contains the basic properties of a traditional revenue management problem. We exploit this analogy and formulate a revenue-management model of the disposition problem. We show that a revenue-management approach can significantly enhance the value recovered, relative to current practice. Furthermore, we discuss interrelations with spare-part sourcing decisions.

007-0458: Designing Buildings for Value Recovery

Gregory Graman, Michigan Technological University, United States

Rick Loduha, Finlandia University, United States

The demolition of buildings that have reached their end-of-useful life can place enormous burden on landfills and contain environmentally hazardous materials. Construction design and techniques, past and present, create barriers to recovering the value of buildings slated for demolition. The goal of our research is to develop improved applied practice for builders, architects, engineers, and investors that guide them on how to improve their practices. Our purpose is to establish a building design approach that enhances value recovery and includes financial, managerial, and economic topics related to sustainable building. Correspondingly, a framework describing the various stages of building deconstruction from reuse through disposal is developed to guide the decision-making process of disposal as well as serving to help identify the key issues in building design needed to facilitate deconstruction.

007-0024: When is Customer Segmentation the Major Driver in the Profitability of Remanufacturing Operations?

Ana Muriel, University of Massachusetts Amherst, United States
Yue Jin, Bell Labs Ireland, Ireland

We investigate the profitability of offering remanufactured products for a monopoly firm in a single period setting. We characterize a threshold for the remanufacturing cost below which it is optimal to offer remanufactured products, and focus on analyzing its dependence on the consumer profile. This analysis allows us to identify when it is customer segmentation and not price differences that drive the remanufacturing decision. That is, we find conditions under which it is optimal to offer remanufactured products even if they are as costly to produce as new products. Consequently, it becomes cost effective to substitute them and offer new products as remanufactured when the later are scarce. These results are also applicable to the evaluation of the common marketing practices of branding, i.e. offering virtually identical products under different brands, and generics, i.e. offering generic versions of a landmark label.

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Sunday, May 6, 3:30-5:00 **Room:** Fountain
Session: Mass Customization

Track: Ops Strat, 11

Chair: Gareth Phillips

007-0408: Dynamics Between Contract Manufacturing And Operational Performances: An Empirical Study of the U.S. Manufacturers

Liang-Chieh (Victor) Cheng, University of Houston, United States

U.S. manufacturers have been facing increasing pressure of cost reduction and customization from both domestic and global markets. One crucial response to these competitive pressures is the prevalent outsourcing strategies. While sporadic case studies have investigated the cost reduction potentials of outsourcing, cross-industry, empirical analysis examining outsourcing operational performance are lacking. This paper investigates the trends and impacts of outsourcing for U.S. manufacturing sectors. The theoretical framework hypothesizes that higher level of outsourcing is associated with higher industry-level financial and operational performance. The 1997 & 2002 Economic Census of the U.S. Census Bureau serve as the main data sources, including entire 473 manufacturing industries. Preliminary regression runs suggest that outsourcing is positively associated with ROI and ROA, but negatively associated with capacity utilization. The findings offer critical insights to the potentials of outsourcing strategies for researchers, practitioners, and policy makers.

007-0214: Differentiation of Municipalities from São Paulo State Based on Constitutional Transferences and Income Tributary Taxes

Maria Gouvêa, University of São Paulo, Brazil

Milton Farina, University of São Paulo, Brazil

Patricia Varela, University of São Paulo, Brazil

This study indicated that some municipalities from São Paulo that are characterized by social responsibility index as “pole municipalities”, “healthy municipalities, but with small economic development field” and “municipalities with small social and economic development fields” can be distinguished by per capita transfer amounts from the Municipalities Participation Fund – MPF, Product and Service Circulation Tax Quota and collected tributary income. The evaluation was carried out by multivariate analysis of variance. The results suggested that the MPF distribution criteria contribute to the available income fairness, giving support to the municipalities’ government in the development of public policy. One expects that this study contributes for deepening knowledge of the reality of these municipalities.

007-0148: A Holistic Manufacturing Strategy (HMS) for Mass Customisation Within a Specialist Manufacturing Company

Gareth Phillips, Cardiff University, United Kingdom

Andrew Thomas, Cardiff University, United Kingdom

For companies to remain competitive in an increasingly demanding global market, they must discover innovative ways in which to work effectively whilst ensuring that new markets are penetrated and sustainable growth is achieved. Mass customisation requires companies to provide personalised products at mass production prices. This now places a further burden on companies and therefore a holistic manufacturing strategy must be developed in order to ensure that the factory of the future is able to meet this new demand. This paper proposes a holistic manufacturing approach which integrates the manufacturing efficiencies achieved through Lean and Agility, with the need to break into new markets through effective marketing and product innovation strategies such as, FEA as a part of a NPI/D program. Through a series of measures it can be partially proven how successful it will be and how the company will strengthen and achieve long term economic sustainability.

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Sunday, May 6, 3:30-5:00 **Room:** French
Session: Batching, Dispatching and Inventory

Track: PIMs, 5

Chair: Ananth Krishnamurthy

007-0364: Effect of Batch Sizes in Multi-product CONWIP Systems

Ananth Krishnamurthy, Rensselaer Polytechnic Institute, United States

Kumar Satyam, Rensselaer Polytechnic Institute, United States

This paper presents a new approach for analyzing queuing models of multi-product CONWIP systems with setups and batching. The system is modeled as multi-class closed networks with synchronization stations. In a general setting these networks cannot be analyzed exactly, and therefore, approximation methods based on parametric decomposition are proposed. Using new characterizations for waiting times and departure processes parameters in the closed network, efficient algorithms are developed for performance evaluation. The models help to derive useful insights with respect to the interactions of batch sizes, flow times, and throughput in pull systems with product variety.

007-0576: A Dispatching Logic for Real-time Control of Material Flow in a Semiconductor Fab

Jungdae Suh, Kyungwon University, Korea, Republic of (South Korea)

Bruce Faaland, University of Washington, United States

Jaejin Jang, University of Wisconsin-Milwaukee, United States

Pyung-Hoi Koo, Pukyong National University, Korea, Republic of (South Korea)

To dispatch carriers of wafers in a semiconductor bay, this paper presents the Unload Request Logic (URL), which determines the destination of a carrier of wafers when a carrier finishes its operation, and the Load Request Logic (LRL), which determines the next carrier to fill the newly available buffer space when a carrier leaves a buffer. In the bay, material handling equipment can handle multiple carriers. The dispatching logic first determines the transportation time of each carrier to its destination by each unit of transportation equipment and determines the destination machine by URL or target carrier by LRL. When there is no available buffer space at the machine tool, the logic allows carriers to stay at the current buffer and determines the delay time, which is used to determine the destination in URL. Performance of the dispatching logic is verified by a simulation study.

007-0484: Optimization of Inventory of Materials Under a Random Demand Scenario Using Optimizer 10.06 – An ERP Software

Ravi Shankar, Indian Institute of Technology Delhi, India

Ashok Mehatha, Sri Siddhartha Institute of Technology, India

Industries are the backbone for a growing economy. These are characterized by many departments integrated within which coordinates itself to a well-set system, in attaining organisation goal through planned individual strategy and planning. Excess or shortage of Inventory situation is a salient killer. It is established by many researchers across the world that MRP is a tool which can be utilized for more accurate and systematic planning. This paper discusses a case study under a random demand scenario the application and benefits of MRP in inventory control to benefit industry through cost savings. Custom made ERP software Optimizer 10.06 is applied for scientific analyses. This leads to develop MIS on how much to invest into inventory and avoid money lock up in stores. This activity if handled carefully can turn raw steel into gold else it turns to rust steel if not properly planned and scheduled.

007-0363: Performance Evaluation of Multi-Product Fabrication/Assembly Systems

Ram Ramakrishnan, Rensselaer Polytechnic Institute, United States

Ananth Krishnamurthy, Rensselaer Polytechnic Institute, United States

Fabrication/Assembly systems with multiple end assemblies are considered, where each assembly involves multiple components. The components are supplied by shared and dedicated fabrication lines operating under CONWIP control. The system with multiple end assemblies is modeled as a closed queuing network with fork/join stations. Performance measures of interest are the throughput and queue length in the system. The analysis involves constructing multiple fabrication/ assembly systems with single end assembly that is solved using recently developed algorithms. Numerical results from the analysis are compared with statistical estimates from simulation.

007-0742: Stabilizing a Production Plan Using Flexibility Requirements Profile

Ertunga Ozelkan, University of North Carolina at Charlotte, United States

Churlzu Lim, University of North Carolina at Charlotte, United States

Production plans need not only be stable enough to avoid anxiety due to production fluctuation in a manufacturing environment, but also be flexible enough to accommodate changing customer demands. Planning systems based on traditional material requirements planning apply a 'frozen horizon' to reduce plan variability. While a frozen horizon will reduce the anxiety in the operations organization, it will not necessarily respond to changing demands from customers as fast as needed to optimize responsiveness and profitability. Instead of a 0% flexibility versus 100% within and outside the frozen horizon, an alternate approach is the application of the 'flexibility requirements profile' (FRP) which is the focus of this study. It is shown that FRP approach can be useful in responding to changing customer demand while limiting the variability of production plans within controlled bounds. Our study extends the use of FRP in conjunction with optimization.

174	<p>Sunday, May 6, 3:30-5:00 Room: Garden</p> <p>Session: Emerging Issues in OM Education</p>	Track: Education, 11	Chair: Sushil Gupta
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007-0765: Design and Development of Management Programs for Overseas Markets

Tomislav Mandakovic, Florida International University, United States

Sushil Gupta, Florida International University, United States

In this paper we outline the strategy and process for developing management programs to be offered at international sites by a university in the United States.

007-0680: Teaching Responsible Operations

Brad Meyer, Drake University, United States

Describes the author's current format for a unit on Responsible Operations taught in the core OM course for undergraduates. The unit includes discussion of ethics, ergonomics, and environmental impacts of operations with the content being supplied mostly by the students in fulfillment of an assignment for which they must create a product that can be posted on a web site. The students create Word documents, PowerPoint presentations including some with voice annotation, movie files or Macromedia flash files and then review each other's content. The presentation will include a description of the assignment and samples of the students' work. This unit has been well received and has proven to call attention to issues that students feel passionate about, unlike the more cut-and-dried quantitative and conceptual material in the rest of the class. The unit also includes a lecture on promoting ethical behavior as a manager.

007-0654: Challenging the Perceived Differences in the Issues of Managing Operations in the Service versus Manufacturing Sectors

Russell Johnson, Metropolitan State College of Denver, United States

A significant challenge for anyone teaching operations management is the perception that the issues challenging operations managers in the service sector are very different from those faced by operations managers in manufacturing. Offering separate curricula for each area is often impractical. In the case where a single course is offered, the focus may be more on one content area than the other often resulting in dissatisfaction for some students. This paper describes a process that allows a facilitator to simply and quickly test this perception. The participants, drawing from their experience, provide examples of why it is difficult to successfully manage day-to-day operations and then uses the Affinity Diagram of the Quality Management Tools and some of the logic (Thinking Process) tools of the Theory of Constraints to determine if the challenges facing operations managers in the service and manufacturing arenas are more similar or different.

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Sunday, May 6, 3:30-5:00 **Room:** Green Room
Session: Global Perspectives in Sourcing

Track: Purchasing, 4

Chair: Seung-Kuk Paik

007-0391: Financial Supply Management – a New Finance-Oriented Perspective on Supply Management

Michael Henke, Technical University Munich, Germany

Constantin Blome, European Business School, Oestrich-Winkel, Germany

Christopher Jahns, European Business School, Oestrich-Winkel, Germany

Purchasing and Supply Management (PSM) have undergone a positive development from operative purchasing to strategic Supply Management. However, there are justified doubts about the sustainability of this development, at least as long as the success of PSM is not clearly visible in financial statements. But until now no convincing solution has been presented. This paper is meant to highlight a new area of research: "Financial Supply Management". "Financial Supply Management" establishes a new perspective on PSM and offers a key contribution to coping with the problem of making PSM's success visible in financial statements. Based on a case study of an internationally active and renowned company of the telecommunications industry, a new approach for solving this problem is shown. Also, the conceptual framework of "Financial Supply Management" including Supply Planning, Supply Controlling, Supply Risk Management, and Supply Performance Measurement will be described with the help of an eclectic explanatory approach.

007-0101: Supply Development in Small and Medium Sized Enterprises

Seung-Kuk Paik, California State University Northridge, United States

Purchasing and supply development in small and medium sized enterprises (SMEs) is an important and worthwhile subject for a research study because purchasing is one of the essential business functions and little attention has been paid to supply management activities within SMEs. The main objectives of this research are to develop an in-depth understanding of the state of supply development in small and medium sized enterprises and to investigate the relationship between supply development and firm's performance within these companies. Based on this research, managerial implications are given to these companies for their better business performances.

007-0360: Integration in Hybrid Global Sourcing Organizations

Gerhard Trautmann, European Business School, Germany

Virpi Turkulainen, Helsinki University of Technology, Finland

Despite a clear trend towards global sourcing, many companies are struggling with implementation (Narasimhan & Carter 1989; Trent & Monczka 2003). We claim that global sourcing should be understood in terms of the implications of it for organization design. Our objective is to increase understanding of organizational integration of global purchasing activities and we focus on hybrid organization designs due to a clear trend examined in practice (Johnson & Leenders 2004). We consider this useful because it remains very unclear how global purchasing activities in hybrid organizations are integrated, and conceptual and especially empirical articles on integration in the purchasing organization are extremely scarce (Mattyssens & Faes 1997). We apply well-established theoretical ideas and concepts from international business and organization theory literature to analyze integration needs and mechanisms and report empirical findings from an in-depth case study at a large German MNC.

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Sunday, May 6, 3:30-5:00 **Room:** Oak

Track: Environ, 4

Chair: Prem Vrat

Session: Modeling Issues in Environmental and Reverse Logistics Management

007-0145: Current Practice in Reverse Logistics: Findings from Three Case Studies

Xiaoming Li, Tennessee State University, United States

Festus Olorunniwo, Tennessee State University, United States

Reverse Logistics (RL) manages materials from a use point to a recovery or disposal point. This article reports a pilot case study involving three companies with a focus on establishing their thinking on current practices in RL. The research involves mainly interviews and plant visits to these companies, which have some reverse logistics activities. The aim was to examine various issues relating to their practices in returns processing, information sharing, collaboration, and performance metrics. Results yield the typical return process and present patterns in RL that will be used to design a larger study.

007-0126: A Survey Based Framework for Recovery and Re-manufacturing Issues of Orphan Products

B Mahadevan, Indian Institute of Management Bangalore, India

Mrinmay Deb, Indian Institute of Management Bangalore, India

The impact of business on environment is a growing concern for public and government. New regulations require companies to take responsibility for products at the end of their useful life. Historical waste from products sold before take-back laws came into force pose a different challenge, especially when producers of such waste do not exist. To prevent occurrence of such orphan products, recent regulations mandate that producers provide financial guarantee for the end-of-life environmental costs. Although a better alternative to disposal is remanufacturing of orphan products, there is very little in the literature that addresses this issue. Based on a survey of over 150 published papers during the last decade, we analyze product recovery and remanufacturing issues pertaining to orphan products. We also develop a framework that distills the factors governing strategic behavior of players involved in product recovery. Using the framework we identify research areas on recovery of orphan products.

007-0077: Optimal Blending Model for Paper Manufacturing with Competing Input Materials

Rupesh Pati, Indian Space Research Organization, India

Prem Vrat, U.P Technical University, India

Stringent environmental regulations and growing shortages of raw materials have brought the concept of reverse supply chain into limelight. This paper presents a linear programming model for minimizing paper manufacturing by optimal blending of two competing input materials of wood and recycling wastepaper. The objective function includes forward and reverse supply chain costs encountered during paper manufacturing from the manufacturer's viewpoint. The model includes economic implications of using alternative input materials on the environment, paper quality and possible reuse of the non-relevant wastepaper collected during the segregation stage. The model can assist the manufacturer to determine the optimal amount of wood and wastepaper required to satisfy demand under a given situation. To gain further insight into system behaviour, sensitivity analyses have been carried out which highlights various strategies under different conditions.

007-0779: How Green is Your Closed-Loop Supply Chain?

Joao Quariguasi Frota Neto, Rotterdam School of Management, Netherlands

Grit Walther, T.U. Braunschweig, Germany

Jacqueline Bloemhof, Rotterdam School of Management, Netherlands

Thomas Spengler, TU Braunschweig, Germany

Jo van Nunen, Erasmus University Rotterdam, Netherlands

The primary objective of closed-loop supply chains (CLSCs) is to reap the maximum economic benefit from end-of-use products. Nevertheless, literature advocates that closing the loop helps to mitigate the undesirable footprint of supply chains. In this paper we assess the magnitude of such environmental gains for Electric and Electronic Equipments (EEE). We detail our analysis for the different phases of the CLSC, i.e. manufacturing, usage, transportation and end-of-life activities. We show that for different products, within the same group of EEE, results greatly vary. Based on environmental hot-spots, we propose extensions of the existing CLSC models to incorporate environmental dimension.

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Sunday, May 6, 3:30-5:00 **Room:** Panorama

Track: Human Res, 1

Chair: Martin K. Starr

Session: Effective Relationships Between Human Resources and Operations Management

007-0516: The Value of Mission-Driven Interviewing™ in Supply Chain Management

Cathy Lee Gibson, Cornell University, School of Industrial and Labor Relations, United States

Finding candidates with relevant and appropriate experience is challenging. Narrowing that population to spotlight those few individuals who can contribute meaningfully to an organization's overarching goals can seem unrealistic, or even unattainable. The mission-driven interviewing™ (MDI™) model enables hiring managers – in partnership with HR professionals – to distinguish those candidates who will advance the organization's mission from those who are merely well-qualified. MDI™ also provides a creative and flexible structure within which to develop unique interview questions that will yield more relevant information about candidates than could ever be gleaned from the stable of time-worn, highly-predictable questions of which most employment interviews currently consist. In summary, a MDI process can invigorate and revitalize the ways in which candidates for production and operations jobs are identified, as well as the impact that employees hired for those jobs can have on the organization's bottom line.

007-0253: Employee Motivation to Adopt Lean Behaviours: Individual-level Antecedents

Jo Beale, Cardiff University, United Kingdom

Arguments that employee motivation and commitment are essential for successful implementation of Lean manufacturing practices have been met with minimal research. Using a multidisciplinary research lens, the paper focuses on the individual-level factors (stable and transient) underlying employee willingness to adopt Lean behaviours. Interview, focus group (n=38) and survey data (n=331) collected from employees in a manufacturing firm initiating Lean change suggests that employee motivation for Lean is directly influenced by their attitudes, organisational commitment and perceptions of their ability and the social pressures to adopt Lean behaviours. Indirect antecedents include confidence to adopt Lean behaviours, job satisfaction, personality, age and union membership. The findings carry important practical implications for HR professionals and Lean practitioners seeking to embed Lean change. Through appropriate interventions (communication and training), organisations should be able to manage, to some degree, workforce motivation for Lean. Limitations of the current study and future research avenues are discussed.

007-0198: HRM and POM Partnership to Manage Better Global Supply Chains

Martin Starr, Rollins College, United States

POM success is measured by supply chain effectiveness which is dependent on HRM for the integrity of the supply chain management structure. Interconnected management sourcing decisions determine product and service qualities, cost advantages, timeliness of delivery and overall, competitive advantage. This condition applies to every aspect of supply chains including manufacturing, retail, e-tail, healthcare, other service systems, and reverse supply chain systems. Global transport and communication expand supply chain geography. Multiplicity of locations, languages, and cultures must be managed. It is a great challenge to hire, train, and motivate competent people with diverse special skills. Locating and hiring people with good combinations of specific-to-industry/country/culture detailed knowledge as well as generic managerial supply chain skills is required of human resource managers. HR trains and retains people with valuable skills while responding to supply chain dynamics that require additional skill sets.

007-0626: Developing Productivity and Competitiveness by Knowledge Management

Luis Antonio Delgado Gutierrez, Universidad de Guadalajara, Mexico

Alejandra Gomez Padilla, Universidad de Guadalajara, Mexico

Jose Ascencion Rodriguez Garcia, Universidad de Guadalajara, Mexico

This paper shows the proposal of a model of KM implementation in four stages: preparation, implantation, assimilation and growth. The tasks needed to achieve each are exposed. The productivity measurement the intellectual capital: human, structural and relational are explained. KM drive Mexican artisan micro organizations to adopt with modern organizational models and the approach towards an innovating culture to develop its own productivity and competitiveness. Organizations align their efforts to produce quality claimed by clients, increase the effectiveness, share information and use documentation processes, clearly identify responsibilities, adopt intelligent organization labor, improved performance, reflecting organizational change, besides to focus towards to its own technological development so that the company is competitive.

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Sunday, May 6, 3:30-5:00 **Room:** Parisian
Session: Knowledge Management

Track: Emp Res, 11

Chair: Ilhyung Kim

007-0121: Productive Cooperation Networks, Knowledge, and Innovation: The Case of Sorocaba Metropolitan Region

Cláudio Leandro, University of São Paulo, Brazil

João Amato-Neto, University of Sao Paulo, Brazil

This study aims at analyzing the process of building competences to innovate through co-operation networks among private and public actors (companies, local government, universities, and non-governmental organizations) focusing a project of Sorocaba Metropolitan Region (SMR). The methodological approach of this paper is the case study, which is structured in the following steps: mapping the homogeneous characteristics (regional industrial identity) among firms; after recognizing the common features among firms, the second step explores the competences for innovation required within the production chain; the third step explores the design of system knowledge within the inter-firm network, it means how firms acquire, codify and transfer knowledge among them to coordinate innovation activities; the fourth step refers to the design and alignment of resources structure required within the network and how the public government, non-governmental organizations and universities can act together to work on the structure of distinctive resources.

007-0549: Case Study Research: How it Compares with Surveys and the Skills it Requires

Erik de Bruijn, University of Twente, Netherlands

Harm-Jan Steenhuis, Eastern Washington University, United States

In recent years, a shift has been noted towards more empirical research in the field of Operations Management. Much of this shift has been towards survey-based research but case study research has also become more acceptable. In this paper, first an overview is provided about different types of empirical research. After this, a comparison is made between survey-based research and case study research and pros and cons of both are discussed. Although both of these approaches use empirical data, there are significant differences between them. Lastly, specific implementation issues for case studies are discussed. One important difference between surveys and case studies is the timing and relationship between data collection and data analysis. Consequently, the required skills for case study researchers and their supervisors is different than the skills for survey research.

007-0404: Measuring Transfer of Knowledge Within and Among Organizations

Ilhyung Kim, Western Washington University, United States

This research focuses on assessing the extent to which knowledge transfers within and among organizations. Specifically, the following three important empirical questions are considered: (1) Is learning from others sufficiently large to be a plausible source of long-run productivity growth? How much knowledge does an organization learn from each of three sources: learning by doing, learning from other units in the same organization, and learning from other organizations? (2) Is learning from others a one-time event which occurs at the beginning of a new product or process or a continuous event which occurs throughout the life of a product or process? (3) Are learning patterns significantly different among organizations? If yes, what are the factors which could explain the differences? A learning model has been applied to the benchmark dataset of Liberty ships built in sixteen shipyards during World War II.

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Sunday, May 6, 3:30-5:00 **Room:** Patio
Session: Management of Complex Projects

Track: Proj Mgmt, 2

Chair: Dwight Smith-Daniels

007-0724: Lockheed Martin Space Systems Company Optimizes Infrastructure Project Portfolio Selection

Cigdem Gurgur, Colorado School of Mines, United States

Charles Morley, Lockheed Martin Space Systems Company, United States

Every year Lockheed Martin Space Systems spends millions of dollars to the maintenance and modernization of its infrastructure. The funds that are not spent within a given timeframe are relinquished. Projects may be delayed and unplanned carryover of their costs into the next fiscal year may cause the postponement or cancellation of other projects due to in-budget transfers. Hence, managers are keenly interested not only in the ability to predict the total amount of expenditure during the year, but in the timing of those expenditures as well. We use multi-attribute utility theory and chance-constrained programming to optimize the selection of infrastructure projects. Our solution ensures that high-value projects are selected to maximize the financial performance subject to the constraints that the selected portfolio does not exceed the available budget and that the carryover of the unspent funds to the next fiscal year does not exceed predetermined limits.

007-0546: Best Practices in the Economic Justification of B2B Supply Chain Management Projects

Richard Mathieu, James Madison University, United States

Raktim Pal, James Madison University, United States

A business-to-business (B2B) supply chain management (SCM) project is a special class of business project that is characterized by high levels of unpredictability, risk and technical complexity. SCM technologies typically must span vertical architectural levels and must integrate horizontal business processes and enterprise applications. SCM project management has become one of the most demanding business professions. As with any other significant capital investment, SCM expenditures must show significant benefits to warrant their continuation and expansion throughout the enterprise. Surprisingly, little academic research has focused on best practices for the economic justification of B2B SC projects. This research utilizes a case study approach to examine the economic justification B2B SCM projects within three publicly held multi-national companies. Results from our research show that B2B SC projects contain several unique characteristics which suggest the deployment of new economic justification practices.

007-0547: Managing Complex Projects: Linking Project Slack and Project Flexibility to Performance

Mahmood Rahimi, University of Calgary, Canada

Frances Bowen, University of Calgary, Canada

Thomas Rohleder, University of Calgary, Canada

Despite vast resource allocations of project-driven investments, project failures in the form of budget and schedule overruns, compromised performance and missed opportunities are still too common across industries. Some researchers have attributed the high rate of project failures to the inherent complexity of the projects. Flexibility has been considered as a mechanism to respond to change and mitigate the need for preventative or corrective action in complex situations. While both researchers and practitioners have come to recognize the importance of flexibility in handling complex projects, cumulative knowledge and empirical evidence about the interplay between flexibility and complexity is lacking. Building upon the organizational theory and manufacturing flexibility literature, we propose a conceptual model of the relationship between slack resources and project flexibility, and their impact on project performance under varying degrees of complexity. Finally, some practical, as well theoretical implications of this model are discussed.

007-0609: Risk Management in Multi-Project Planning Through Alternative Life-Cycle Models

Dwight Smith-Daniels, Arizona State University, United States

We present an overview of the literature on multi-project planning models, from the perspectives of a number of different approaches to classifying projects for strategic and tactical purposes. We provide a framework and future research directions for project classification according to risk characteristics and resultant project life-cycle choices. Our framework highlights risk management as well as resource-planning and allocation decisions at aggregate and disaggregate levels.

007-0044: Quality in Public Sector Project Management

Kirit Patel, Middlesex University, United Kingdom

Public sector projects are complex as they target a diversity of stakeholders locally, regionally or nationally. One of the key issues here is that of quality in project management which needs to be examined as in the UK billions of pounds are spent on projects to deliver a multitude of services. This paper is part of an on going study which examines what the quality issues are in managing projects within local government. The study is based on interviews and surveys and examines what the issues are in theory and then comparing them with the real experiences of project managers in local government. Some of the issues to be examined here will be how far standards (e.g. the PMBoK) and methodologies (e.g. PRINCE2) contribute to attaining quality in project delivery.

180	Sunday, May 6, 3:30-5:00 Room: Pavilion Session: Discrete Forecast Horizons: Analysis and Computations	Track: Tutorial, 1	Chair: Srinagesh Gavirneni
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007-0744: Discrete Forecast Horizons: Analysis and Computations

Sanjeeva Naranpanawe, SAS Institute, United States

Suresh Sethi, University of Texas at Dallas, United States

Milind Dawande, University of Texas at Dallas, United States

Srinagesh Gavirneni, Cornell University, United States

We present structural and computational investigations for a class of minimal forecast horizons obtained under the assumption that future data are integer multiples of a given positive real number. Apart from being appropriate in most practical situations, the discreteness assumption offers a significant reduction in the length of a minimal forecast horizon over the one using the classical notion of continuous future data. The discreteness assumption also allows an easy characterization of such forecast horizons as feasibility/optimality questions in 0-1 mixed integer programs. Through an extensive computational study of dynamic lot-size models, we demonstrate that integer programming can provide an effective approach to compute and analyze discrete horizons. We believe that our approach can be extended to investigate forecast horizons for a wide variety of multi-period dynamic decision problems.

181	Sunday, May 6, 3:30-5:00 Room: Royal Session: Quality Management Frameworks	Track: Qual Mgmt, 8	Chair: Vidyaranya Gargeya
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007-0282: Do the Certified Organizations Take Advantage of Internal Quality Management System Audits?

Arturo Fernández-González, University of Vigo, Spain

José Carlos Prado Prado, University of Vigo, Spain

It is often said that internal audits are a key tool for improving the quality management system. All the ISO 9001-certified firms must, at regular intervals, conduct internal audits. But the methodological possibilities that this leads to are multiple. For instance, how often should they be conducted? Is it better to conduct several partial audits over a period or a single full one? Should the organization use in-house personnel or external professionals? Furthermore, do organizations adequately orientate their internal audits? Do they make due use of their findings to adopt the corresponding improvement actions? All this influences the utility of this practice and, therefore, affects the efficiency of the organization's quality management system. These issues, particularly interesting for the SME's, are covered in this communication. Also, the main results of an empirical study carried out in firms in Spain and Portugal are presented on the use and utility of internal audits.

007-0615: A Comparison Between the Scoring Systems of Malcolm Baldrige and National Quality Award of Brazil

Paulo Miguel, Methodist University of Piracicaba, Brazil

Quality award programs are today considered as an effective way to pursue performance excellence in many countries. One of the precursors is Malcolm Baldrige National Quality Award (MBNQA) in the USA. It consolidates as a worldwide reference framework all over the world. Following this trend, many other nations have also established quality awards, like the Brazilian National Quality (PNQ) award. The question addressed in this theoretical paper is the differences between MBNQA and PNQ specially with regard to important parts of them: categories and items, point values, and the scoring system. When comparing those two criteria for performance excellence, the result shows that PNQ has evolved to reach its own model. The number of categories, the point values, and the scoring systems are distinct despite of some similarities. In addition, this first theoretical study has raised a perspective of investigating award recipients in an empirical basis.

007-0652: Small Business Baldrige Award Winners: The Importance and Implementation of Baldrige Performance Excellence Criteria

Leslie Toombs, University of Texas of the Permian Basin, United States

Mildred Pryor, Texas A & M University - Commerce, United States

This paper focuses on the perception of the importance and implementation of the leading-edge management practices known as the Criteria for Performance Excellence by the winners of the award in the Baldrige National Quality Award Small Business category. The authors use an empirical survey to extend the existing work examining small businesses (SMEs) in general, rather than the Small Business Baldrige Award recipients. The analysis of the gap between importance and implementation will allow the authors to compare similarities, as well as differences, between the award winner population and results reported from earlier studies focusing on SMEs in general. The authors discuss potential reasons for these similarities and differences regarding the gap and offer useful insight into the difference in practices between the award winner group and other SMEs.

007-0319: The Malcolm Baldrige National Quality Award: Twenty Years and Counting

Vidyaranya Gargeya, The University of North Carolina at Greensboro, United States

Sharon Darnell, Federal Aviation Administration, United States

The One Hundredth Congress of the United States of America established the Malcolm Baldrige National Quality Award (MBNQA) with the Malcolm Baldrige National Quality Improvement Act of 1987 (MBNQIA of 1987). The purpose of the MBNQIA of 1987 is to provide for the establishment and conduct of a national quality improvement program under which (1) awards are given to selected companies and other organizations in the United States that practice effective quality management and as a result make significant improvements in the quality of their goods and services, and (2) information is disseminated about the successful strategies and programs. This paper is a preliminary effort in understanding the extent to which the purpose of the Act of 1987 has been achieved. It is the attempt of the authors to provide a state of the MBNQA in the process of continuous improvement for the U.S. economy.

007-0159: Implementing Shingo's Scientific Thinking Mechanism

Satya Chakravorty, Kennesaw State University, United States

Douglas Hales, University of Rhode Island, United States

Shingo's mistake proofing (Poka-Yoke), and Single Minute Exchange of Die (SMED, a.k.a. quick changeover) process improvement systems have been used in industry for many years and are now being applied in Supply Chain Management. They have been applied using Shingo's Scientific Thinking Mechanism (SSTM) process. Despite their pervasiveness, little is known about how SSTM systems are implemented or work in real world settings. This study contributes to the literature by (1) demonstrating how to systematically implement Shingo's systems, 2) the theoretical reason SSTM works, and (3) that SSTM is not always conducted in a recursive manner, as suggested by Shingo (1988). This will assist practicing managers in efficiently implementing Poke-Yoke and SMED systems, and academics in understanding why they work so that future research can predict and improve the performance of Shingo programs.

182	Sunday, May 6, 3:30-5:00 Room: State	Track: Service Ops, 4	Chair: Richard Metters
	Session: Flexibility in Service Operations and Revenue Management		

007-0494: Antecedents for Performance of Cross-trained Nurses

Adelina Gnanlet, University of North Carolina at Chapel Hill, United States

Aleda Roth, Clemson University, United States

Labor flexibility is an important operational lever in healthcare services. In general, research shows that specialists are more efficient than employees who have competence similarity due to cross-training. In healthcare services, practitioners report that cross-trained nurses do not perform as well as dedicated nurses because of non-familiar protocols, and different skill set requirements. In this paper, we develop and empirically test multi-item measurement scales pertaining to the performance of cross-trained nurses relative to the performance of dedicated nurses. We build a conceptual framework to identify structural, behavioral, demographical variables that affect the performance of cross-trained nurses. Important structural and behavioral variables include the nurse and charge nurse (supervisor) attitudes, managerial support, training depth, learning and forgetting effects, skill matching and degree of functional similarity. We test several hypotheses, including the influence of negative attitudes towards floating on performance and the influence of learning and greater managerial support on performance.

007-0058: Adaptive Critics for Airline Revenue Management

Abhijit Gosavi, SUNY - Buffalo, United States

We present an approximate dynamic programming technique, called adaptive critic, for solving an airline revenue management problem. The revenue management problem is cast as a semi-Markov decision problem (semi-MDP). The adaptive critic has originated from the pioneering work of Werbos who first suggested the use of policy iteration in approximate dynamic programming. Barto, Sutton, and Anderson wrote a paper that provided a learning mechanism for the technique. A recent paper by Konda and Borkar analyzed the technique for its convergence properties. All three of these works focus on the MDP. We combine notions from these works to solve the associated semi-MDP and prove its convergence. We provide computational evidence to demonstrate the efficacy of our method. In addition, we extend our technique to cost functions sensitive to Markowitz risk, which appeal to risk-sensitive managers seeking to avoid bankruptcy.

007-0020: The “Killer Application” of Revenue Management: Harrah’s Cherokee Casino & Hotel

Richard Metters, Emory University, United States

Carrie Crystal, Georgia Institute of Technology, United States

Mark Ferguson, Georgia Institute of Technology, United States

Harrah’s Cherokee Casino and Hotel is an extreme example of revenue management techniques. Typical revenue management installations yield revenue enhancements of 3-7%. Harrah’s, chainwide, has seen 15% improvements, with Harrah’s Cherokee Casino and Hotel perhaps the most excessive beneficiary, despite serving no alcohol and having no table games. We investigate what drives this phenomenal success.

007-0587: Management Model to Project Companies - Analyses of the Implementation Process During

Flávia Souza, Escola Politécnica da Universidade de São Paulo, Brazil

Otávio Oliveira, Universidade Estadual Paulista, Brazil

Silvio Melhado, Escola Politécnica da Universidade de São Paulo, Brazil

The objective shows the analyse done about the characteristics of seven project companies wich work in the market estate in São Paulo City and analyse this market. This analyse is about powerful and fragile points of companies, of point of view from own companies and theirs customers, the opportunities and adversities that the market offers to these companies and which strategies they adopted to take advantage of these opportunities and adversities and to characterize the way that the companies follow in relation of own competitive strategy.

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Sunday, May 6, 3:30-5:00 **Room:** Terrace
Session: Innovative OM Education Approachs

Track: Education, 14

Chair: Glen Schmidt

007-0588: Five Possible Diffusion Strategies (Case Study)

Glen Schmidt, University of Utah, United States

Cheryl Druehl, University of Maryland, United States

The well-known Bass model describes diffusion as progressing due to innovators and imitators. In this case study we use industry examples to illustrate another useful framework for describing diffusion processes, identifying five possible strategies a firm might use to open up a new market and/or encroach on an existing market. (We use the term encroachment to denote that the new product takes sales away from the old product. Cannibalization is a special form of encroachment where both products are sold by the same firm.) The different encroachment patterns result in quite different diffusion and substitution processes that have significant implications on the firm and on the nature of competition between firms. Our framework extends insights offered in two recent best sellers, The Innovator’s Solution, and the Blue Ocean Strategy.

007-0133: BOMR Project: A Local Business Operations Management Review

John Howard, University of South Alabama, United States

Nancy Lambe, University of South Alabama, United States

Alan Chow, University of South Alabama, United States

Most students taking a survey course in Operations Management are not Management majors and few have any concept of how pervasive OM is across all businesses entities. An instructor can lecture, show videos and lead in-class exercises, but true internalization only comes from getting close to a real operation. Recognizing the value of participative examples and activities, we present a class project that provides students with real OM exposure. Our solution involves finding and evaluating local businesses to partner with, carefully defining the areas of study for the students, coaching students during their investigations, assessing student performance through class presentations, and conducting pier reviews. We present the methods used, problems encountered and results over several semesters.

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Sunday, May 6, 3:30-5:00 **Room:** Vista
Session: Stochastic Modeling and Analysis of JIT and Lean Production

Track: JIT & Lean, 8

Chair: Sushanta Sahu

007-0339: Stochastic Modeling and Analysis of Generalized Kanban Controlled Unsaturated Finite Capacited Multi-Stage Production

Mitnala Rao, J. N. T. University, India

Korada Sharma, J.N.T.U. College of Engineering, India

A generalized Kanban control (Buzacott[1989]) mechanism gained popularity as it deals with uncertainties effectively while maintaining pull philosophy. In literature, many models are developed to gain insights on generalized Kanban control mechanism. However they were developed under the assumption that external demand for finished products of a production system in its control is very large. In present globalization of market, most products face finite rate of demand and stochastic. In the present paper, Generalized Kanban Control unsaturated finite capacitated Multi-Stage Production of serial type system has been considered with uncertainties in external demand and processing times. A model is of decomposition Continuous Time Markov Chain type for analyzing its performance measures, namely, fill rate, average inventory and throughput. Insights on issues relevant to deployment of safety stocks, such that specified fill rate is achieved with minimum average inventory, are presented.

007-0399: Pooling Loss in Cellular Manufacturing: Updated Perspectives and Expanded Models

Nallan Suresh, State University of New York at Buffalo, United States

The loss of pooling synergies when converting to cellular manufacturing has been well researched over the years through both simulation and analytical models. This paper extends past analytical models based on several new developments, such as the application in chaining in resource flexibility, models to include part family major and minor setups, conditions when pooling synergies do not materialize, such as uncorrelated part demands, when part families with disparate process time variability exist, etc. The paper also relies on use of G/G/c queuing models and new approximations. The models are validated through simulation experiments relaxing the assumptions used in the analytical models. The conditions under which cellular manufacturing systems outperform efficient functional layouts are derived based on these updated models.

007-0092: Performance Improvement of Biotech Manufacturing Systems Using Approximate Queuing Models

Rajan Suri, University of Wisconsin-Madison, United States

Sushanta Sahu, University of Wisconsin-Madison, United States

Mary Vernon, University of Wisconsin-Madison, United States

Manufacturing systems in the biotech industry differ from traditional manufacturing. Jobs are split at multiple machines and after processing are consolidated. A single scientist carries a job through its completion and works on one job at a time. This policy can result in low utilization of scientists and low throughput performance. Analysis of this system can help with management decisions to improve performance. However, existing analytical models for manufacturing systems do not apply to this industry. We present new models based on Mean Value Analysis (MVA) of closed queuing networks (CQNs). As a first step, we develop an approximation for predicting performance of CQNs with multi-server stations. The exact model is too complex for large systems and existing approximations introduce high errors. Our new approximation enables efficient analysis of networks with multi-server stations, multiple customer classes, and general service time distributions. Comparisons with simulation demonstrate the accuracy of our approach.

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Monday, May 7, 8:30-10:00 **Room:** Brasserie

Track: Prod Innov, 12

Chair: Jasna Prester

Session: Product Innovation and Technology Management: Global Evidence

007-0261: Determinants of Institutional Cooperation in R&D Activities: Empirical Evidence for Spanish Innovative Firms

Concepcion Lopez Fernandez, University of Cantabria, Spain

Gema Garcia Piqueres, University of Cantabria, Spain

Ana Serrano Bedia, University of Cantabria, Spain

For the development of new innovative products or processes firms can engage in different types of co-operation. One of them is institutional co-operation, which takes place between firms and research institutions. This paper examines the factors that influence why Spanish manufacturing and service firms co-operate with these institutions in their innovation activities. We use a logit regression model to verify the importance of certain variables, selected and constructed according to the literature review, on the decision to co-operate. The empirical test was carried out using Spanish CIS data for the year 2000. Our results allow us to identify different factors determining institutional co-operation among Spanish service and manufacturing firms, as well as to make a comparison with outcomes of other papers which have been carried out in the European context.

007-0119: Innovation in Transition Countries: Case of Croatia

Jasna Prester, University of Zagreb, Croatia

Innovations are a core competence (Loewe and Dominiquini, 2006). A question is how to foster innovation, and what specific innovation strategy to pursue. This research project is conducted in most European countries led by Fraunhofer Institute from Germany. The survey is conducted in parallel by all participating countries in order to facilitate cross-country comparisons. We only consider questions addressing innovation and try to find in which way should Croatian companies seek and foster. With structural equation modeling we constructed latent variables; process innovations, management innovations and new product variables. We investigated their impact on the results latent variable. Our primary hypothesis that management innovations are most promising for Croatia is not supported giving place to other very interesting results.

007-0226: Digitising the National Health Service in the UK

Kirit Patel, Middlesex University, United Kingdom

Hong Woo, Middlesex University Business School, United Kingdom

The NHS is the largest employer in Britain. It is not only the key arm of the welfare system in Britain but also one of the biggest purchasers of goods and services in Europe. The vastness of the requirements alone makes specifications for goods and services complex. This makes managing technology particularly challenging. Initiated in 2002, the latest big project, the National Programme for Information Technology (NPFIT) aims to connect doctors, nurses and health care professionals for 50million people. This programme was budgeted at £6billion over its ten-year completion schedule, but the cost has since grown to £12billion. A senior health minister suggests that the full cost of completion is nearer £20billion. This paper examines the main issues surrounding the NPFIT as part of an on-going research analyzing the management of technology in the NHS, with particular focus on Health Authorities in North London

007-0355: Platform Thinking in the Automotive Industry

Mike Danilovic, Jonkoping University, Sweden

Mats Winroth, Jönköping University, Sweden

Automotive industry faces two major problems. One is to develop standard platforms to reach high volumes and low cost. The other is to use platforms for enabling variation of models that suit customer needs, local market demands, and restrictions. Platform thinking embraces several industrial levels, systems integrators, global and local suppliers, and markets. How can the dualism between standardization of components and model variation be managed? In this paper we identified and analyzed different approaches to platform concept from the technical as well as organizational, production, and product development perspectives. Platform technology improves flexibility in production and product development. However, when radical changes are made, new design of platform is not easily made, i.e. propagation of requirements and changes in models vs. platforms. When this happens, several production systems have to be entirely rebuilt causing major capital investments, redesign at suppliers etc. Hence, platform technology reduces product development flexibility.

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Monday, May 7, 8:30-10:00 **Room:** Continental
Session: SCM from Four Different Industry Perspectives

Track: Supply Chn, 12

Chair: Larry R. White

007-0211: Physicians and Supply Chain Management Do Not Mix: Myth or Truth?

Candido Perez, Instituto de Estudios Superiores de Administración, Venezuela

This paper shed some lights on the convenience of relying on physicians as hospital supply chain managers by means of comparing their performance through a well-known individual-group task (Beer Game). My sample includes 56 physicians enrolled as hospitals' directors (private and public) and 256 business executives from other economic sectors. I present evidence against the hypothesis of relying on specialized professionals--usually industrial engineers--to manage supply chains and against the anchoring effect caused by the initial inventory situation. Besides, I found evidence of memory recency effect via representativeness.

007-0147: Automotive Cockpit Modularity:Migration Issues for Local Tier 1 Suppliers

James O'Kane, Northumbria University, United Kingdom

Robert Trimble, University of Sunderland, United Kingdom

One area that is seen to be crucial in future car production is that of the vehicle cockpit module as this represents an important element that can be outsourced and lead to potential gains in quality and delivery performance for both automotive manufacturers and their suppliers. This paper examines some of the key issues facing cockpit module suppliers. Through an exploratory approach the motivations for cockpit component suppliers becoming cockpit module suppliers are explored and the issues and implications associated with this local transition are outlined and analysed. Findings from the study suggest that the development of local supplier expertise, combined with an expanded supply chain management role, increased financial risk and proximity related operational issues are key factors that need to be carefully considered before organisations make the transition to cockpit modular supplier.

007-0619: The Impact of Combating Counterfeit Products on Supply Chain Operations: Lessons from the Pharmaceutical Industry

Larry White, Eastern Illinois University, United States

Counterfeit products have become an increasing concern for industry in recent years with an estimated annual loss to the U.S. economy in excess of \$200 billion. Pharmaceutical manufacturers are among the most affected. Stimulated by law and federal regulation, companies involved in the U.S. pharmaceutical supply chain have been forced to make changes to their operations to reduce the risk of counterfeit drugs reaching consumers. We examine the risks faced by the pharmaceutical industry and its customers and the actions being taken throughout the supply chain to mitigate those risks. We focus on how the lessons learned in the pharmaceutical industry can be used in the supply chains for other industries and make recommendations for how other industries can reduce the risk of counterfeit products being sold to consumers.

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Monday, May 7, 8:30-10:00 **Room:** Far East
Session: Planning Problems

Track: Sustain Ops, 15

Chair: Mark Errington

007-0591: Relay Remanufacturing Planning

Rommert Dekker, Erasmus University Rotterdam, Netherlands

Relays are traditional devices used in railways to allow train detection. Often they are regularly replaced preventively. However, most of them are in such a good state that they can be reused or remanufactured. This paper presents a model for the planning of the inspections and remanufacturing of such relays. The model is based on a real case and contrary to other papers, it takes three inventories into account, viz. returns, remanufacturables and serviceables, which complicates the planning.

007-0457: Portfolio Management of New and Remanufactured Products with Finite Life

Krishanu Rakshit, Indian Institute of Management Bangalore, India

Mrinmay Deb, Indian Institute of Management Bangalore, India

Remanufacturing has gained importance industry and academics because of the concern on the impact of business on environment and consumer preference for green products. Firms recover products due to commercial returns, end-of-use and at the end-of-life. This leads to firms managing a combination of new and remanufactured products. Research has addressed issues of portfolio decision-making under competition, possible cannibalization of new products, presence of green segments. We study a dynamic management of product portfolio for a monopolist with new and remanufactured products, which diffuse over the life cycle according to the Bass Diffusion model. We find the optimal mix and prices of new and remanufactured products at each period depending on the diffusion in subsequent periods. The model is first developed for a classic monopoly and extended to a duopoly situation for Bertrand and Cournot conditions.

007-0298: Pure Pallet Program Viability for Military Retrograde Shipments

William Jackson, Air Force Institute of Technology, United States

William Cunningham III, Air Force Institute of Technology, United States

Alan Johnson, Air Force Institute of Technology, United States

The military's pure pallet program consolidates material early in the supply chain into user-specific pallets, allowing them to transit the defense transportation system without being broken down en route. This successful program avoids intermediate handling and increases in-transit visibility. However, can the pure pallet model efficiently accommodate reverse supply chain flow? We report the results of interviews with key stakeholders and of a cost-benefit analysis for potential pure pallet movement of military vehicles and components requiring depot repair after operations in Afghanistan and Iraq. Our goal is to determine the pure pallet program's usefulness for reducing costs and improving the military's reverse supply chain customer responsiveness.

007-0046: Towards a Formal Process for Beyond Economical Repair Decision Making

Mark Errington, University of Exeter, United Kingdom

Closed Loop Supply chains often involve repair, refurbishing and remanufacturing of post consumer products. A crucial question is to identify which items are profitable to process. This task includes determining if there is a market for an item once it has been processed, accurately assessing the value of a product once it has been returned to use, and accurately estimating and costing the amount of work required to bring the item back to market. The research uses case studies to develop ideas about how these decisions are currently made in industry and to develop tools that will help to assist with and standardise the processes involved. This paper provides an introduction to the area of study and the results that have been obtained so far. It provides new knowledge to help to conceptualise the field of repair, remanufacturing and refurbishing in closed loop supply chains.

881	Monday, May 7, 8:30-10:00 Room: Florentine	Track: Sustain Ops, 13	Chair: Joel Goldhar
	Session: CLSC for Process Industries and Environmental Performance		

007-0312: How Green is Green? A Framework for Environmental Performance Assessment in Operations

Breno Nunes, Aston Business School, United Kingdom

David Bennett, Aston Business School, United Kingdom

This paper presents a framework based upon a relationship between environmental benefits and the investments and costs needed to implement and run company operations. As the results of environmental management becoming more evident it is proposed that the benefits rather than the environmental impacts are measured in the analysis of environmental performance. Four categories, or stages, are defined in this paper: creative-green, expansive-green, inefficient-green, and finally, the complacent stage. The paper describes the characteristics of each category and provides examples of indicators that could be used to measure environmental benefits. Qualitative and quantitative methods are necessary to classify companies according to the framework. It is believed that this paper can assist companies and public organisations to assess operations and projects considering their level of sustainability. The proposed framework can impact FDI and environmental policies in the public arena, and foster innovation on environmental practices within the private sector.

007-0006: Supply Chain Sustainability: The Fragility Index

Peter Stonebraker, Northeastern Illinois University, United States

Joel Goldhar, Illinois Institute of Technology, United States

George Nassos, Illinois Institute of Technology, United States

Organizational and operational sustainability has been of increasing concern to operations managers. Though reasons for this concern are myriad, certainly three factors are central. Initially, increased complexity of products and production processes is a central factor; however, the increasingly global nature of commerce and production, and the extension of supply chains to better use efficiencies of scope and scale of globally integrated supply chains may be an even more important factor. Unfortunately, little research has emerged to define the factors and identify the risks associated with supply chain sustainability, and less has been put forward to posit the factor relationships and to model supply chain sustainability. To this end, the authors propose a "Fragility Index", which can be used by practitioners to model their supply chains, and by academics to anticipate and model the contingencies of supply chain risk, and thus posit factor relationships.

189	Monday, May 7, 8:30-10:00 Room: Fountain	Track: Ops Strat, 1	Chair: Morgan Swink
	Session: The Impact of Servicisation on Manufacturing Operations		

007-0061: Servicisation of Manufacturing

Tim Baines, Cranfield University, United Kingdom

Morgan Swink, Michigan State University, United States

The servicisation agenda is arguably one of the most important facing western manufacturers. In a world of severe international competition, it can be the basis of distinct competitive advantage, and a means to differentiate a company's products from goods produced in low cost economies. The concept of Product Service Systems (PSS) is, in particular, a special case of servicisation. With PSS, the market proposition is designed as a system that exploits synergies between products and services while, at the same time, seeks to reduce the economic and environmental costs of delivery. Although key to sustaining western manufacturing operations, major issues arise with design and management of engineering, manufacturing and supply chain activities for successful implementation of such a service-led competitive strategy. This session includes presentations which examine the opportunities and challenges associated with servicisation in more detail.

007-0255: PSS as a Service Based Strategy for Western Manufacturers

Tim Baines, Cranfield University, United Kingdom

Andy Neely, Cranfield University, United Kingdom

A product-service system (PSS) is a subtle blend of products and services that are offered as an integrated solution to customers. Much existing work on PSS has originated from Scandinavia and has been motivated by a sustainability agenda. Although valuable, this form has limited appeal to western manufacturers. However, by expanding the concepts of PSS to also embrace leading thinking on large scale complex service systems and informed products and services, it is possible to put forward the basis of a service business model that offers the means to differentiate from competitors who simply offer lower priced products. This paper aims to build this case. It reports the state-of-the-art of PSS, defines the concept, reports on its origin and features, discusses examples of applications, and finally proposes a research strategy for future work on this topic.

007-0225: Perspectives on Servitisation

Chris Voss, London Business School, United Kingdom

There is increasing attention being paid to the role of manufacturing as a service. The pioneering work of Dick Chase into the Service Factory is now being extended into a much broader context. This paper will take a critical view of the current developments such as product service systems. First, it will examine a spectrum of product service systems. At each position of this spectrum there is the potential to both add value and contribute towards sustainability, but also each position has strengths and weaknesses. Second, it will examine servitisation from an innovation perspective. Innovation is required in IT, instrumentation and product design. In addition analyzing servitisation as process innovation will yield important insights into its development and the changes needed to make it successful.

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Monday, May 7, 8:30-10:00 **Room:** French

Track: PIMs, 6

Chair: Jan Fransoo

Session: Lead Time Updating and Optimal Ordering

007-0737: Dynamically Updating Leadtimes in Advanced Supply Chain Planning

Jan Fransoo, Technische Universiteit Eindhoven, Netherlands

Baris Selcuk, TU Eindhoven, Netherlands

Ton de Kok, TU Eindhoven, Netherlands

We study the effectiveness of updating the lead times of a supply chain in a hierarchical planning context using the clearing function concept. A two-stage serial supply chain is considered with each stage responsible to produce a single item. Orders are released by a planning model such that the delivery schedule is determined through the planned lead times. The capacity loading decisions are separated from the order release decisions, and depend on the hierarchical coupling mechanism. The planning system is implemented in a rolling horizon setting such that the lead times are updated according to the current workload status and the anticipated future production requirements.

007-0042: Optimal Control of Assembly Systems with Multiple Stages and Multiple Demand Classes

Mohsen Elhafi, University of California, United States

Saif Benjaafar, University of Minnesota, United States

Chung-Yee Lee, Hong Kong University of Science & Technology, China

Weihua Zhou, Hong Kong University of Science and Technology, China

We consider an assembly system with multiple stages, multiple items, and multiple customer classes. At each decision epoch, we must determine whether or not to produce an item and should demand from a particular class arise whether or not to satisfy it. Hence, at each epoch, we must make decisions about both production and inventory allocation in order to balance inventory holding costs against shortage costs. We characterize the structure of the optimal policy and show that production, the optimal policy for each item is a state-dependent base-stock policy; and for inventory allocation, the optimal policy is a multi-level state-dependent rationing policy. Using numerical results, the performance of the optimal policy is measured against a heuristic policy that uses state-independent control parameters. We find that such a policy is effective in systems with lost sales but can perform poorly in systems with backorders.

007-0447: An Analytical Model and Solution for Joint Procurement-Production and Delivery Scheduling in a 3-Stage Supply Chain

S Ali Torabi, Tehran University, Iran (Islamic Republic of)

Naser Nikandish, Sharif University of Technology, Iran (Islamic Republic of)

Kourosh Eshghi, Sharif University of Technology, Iran (Islamic Republic of)

This paper proposes an analytical model to effectively integrate and synchronize the procurement, production and delivery activities in a three-stage supply chain consisting of a single raw material supplier, multiple manufacturers and multiple retailers.

Each retailer purchases its own specialized item from the specified manufacturer and sells it to the customers. Each manufacturer produces multiple items on a single facility utilizing common raw material under a common rotation cycle policy of not incurring shortages at any retailers. The objective is to find the production sequences of multiple items in each manufacturer, the common production cycle length, and the delivery frequencies and quantities that minimize the average total cost. Total cost function of the model consists of ten cost elements. In this paper, the mathematical programming model of the problem and its analytical solution procedure is presented.

007-0169: A Hierarchical Ordering Approach to Control Outsourced Operations in a Supply Chain

Youssef Boulaksil, Technische Universiteit Eindhoven, Netherlands

Jan Fransoo, Technische Universiteit Eindhoven, Netherlands

We consider the situation where an OEM outsources some production activities to a contract manufacturer who serves more customers on the same capacitated production line. The contract manufacturer is not willing to share all relevant information with the OEM, and therefore, a complex situation arises for the OEM to control the outsourced operations properly. We propose the hierarchical ordering approach that can be used to plan and control outsourced operations in a supply chain such that the probabilistic behaviour of the contract manufacturer is (partly) incorporated. This approach consists of three decision levels where each level forms a constraint for the lower decision level; production plans are generated based on (deterministic) mathematical programming models. A simulation study shows that the hierarchical approach performs significantly better than the situation without the hierarchical ordering approach. Some ideas for future research are discussed.

007-0268: Workshop on SCM and Education*Berit Helgheim, Molde Unievrstiy College, Norway*

Many universities have Supply Chain Management (SCM) on their syllabus. However, what kind of courses the SCM program includes, differ from one school to another. It seems to be a trend that schools tend to teach within their traditional subjects. It is important that universities on all levels have in mind that students will be employed in real business life and apply their knowledge to different professions. From this perspective it is important to know what a supply chain manager actually does in order to create the most appropriate SCM education. We will present some examples on what subjects are included in the SCM syllabus and how this is done.

007-0167: A Teaching Simulation of Power Dynamics in Outsourced Supply Chains*Andy Tsay, Santa Clara University, United States**Jason Amaral, Emeraldwise LLC, United States*

Traditional Operations and Supply Chain Management education fails to address the "wheeling and dealing" aspect of inter-firm interactions and procurement. With this motivation we created a role-playing simulation called "The Outsourcing Game," to illustrate the changed nature of decision-making in an outsourced supply chain environment. This game was introduced in an MBA elective at Santa Clara University, and has been experienced by hundreds of participants in MBA, executive, and industry training courses across the world.

007-0704: Solving Disassembly Sequences of Multiple Products Using Genetic Algorithm*Prasit Imtanavanich, Northeastern University, United States**Surendra Gupta, Northeastern University, United States*

Generally, once electronic products reach their end-of-life (EOL), they are sent to one of the EOL processes (Ex. remanufacturing, reuse and recycling). In most of the processes, a certain level of disassembly may be necessary in order to extract components from the products. Therefore, optimal disassembly sequences are very important to increase the efficiency of the disassembly process and must be generated in order to help minimize the disassembly complexity and time. Since the complexity of solving the disassembly sequencing problem dramatically increases with the increase in the number of product and component types, it is essential that an efficient methodology be developed. In this paper, we implement Genetic Algorithm, which employs heuristic search algorithm concept, to solve the problem. A numerical example is considered to demonstrate how the methodology can be applied to effectively solve a problem with multiple product and component types.

007-0662: Inventory Balancing in Disassembly Line: A Multiperiod Problem*Badr Johar, Northeastern University, United States**Surendra Gupta, Northeastern University, United States*

Product recovery has been the center of attention of OEMs in recent years because of the imposed environmental regulations and the economical benefits behind it. The process of disassembly (demanufacturing) involves many challenges that complicate the process further. Additional inventory control and planning complications arise because of the disparity between demand and the line yield. In previous research we proposed a model to balance the inventory at the different workstations. In this paper we will validate the model in a Multiperiod case where the inventory and demand forecasting of future periods is considered in the model. Controlling the quantity of product disassembled will minimize the impact of disassembled parts inventory. An example of a PC module is considered to illustrate the approach.

007-0702: A Fuzzy Mathematical Programming Approach for Supplier Selection in a Closed-Loop Supply Chain Network*Satish Nukala, Northeastern University, United States**Surendra Gupta, Northeastern University, United States*

Traditionally, in supply chain literature, the supplier selection problem is treated as an optimization problem that requires formulating a single objective function. However, not all supplier selection criteria can be quantified, as a result of which, only a few quantitative criteria are included in the problem formulation. To this end, in this paper, we develop an integrated multi-criteria decision making methodology using Taguchi loss functions, AHP and Fuzzy Programming that evaluates the suppliers and determines the order quantities under different degrees of information vagueness in the decision parameters in a closed-loop supply chain network. While the Taguchi loss functions quantifies the suppliers attributes to quality loss, the AHP transforms these quality losses into a variable for decision making that can be used in formulating the fuzzy programming objective function to determine the order quantities. A numerical example is considered to illustrate the proposed methodology.

007-0336: Pricing Strategies for Product Recovery Facilities Competing to Dispose*Sagar Kamarthi, Northeastern University, United States**Surendra Gupta, Northeastern University, United States**Srikanth Vadde, Northeastern University, United States*

This work presents pricing strategies for product recovery facilities (PRFs) for effective inventory management. The economic progress of PRFs is often bogged down by two factors that complicate inventory management: inconsistent inflows of discarded products and fluctuating inventory levels of recovered components. This research considers a scenario where a parent company imposes an upper bound on the total quantity disposed from two PRFs which are part of the company but operate in geographically diverse marketplaces with different customer segments and cost structures. The pricing strategy of one PRF depends on the other's pricing policy and disposed quantity. The problem is modeled as a two-player pure strategy game and the Nash equilibrium conditions are identified. An analytical investigation is performed to study the sensitive parameters in the model and managerial insights are drawn.

007-0247: Closed Loop Supply Chain Model for the Built-to-Order Environment Using Genetic Algorithm*Govindan Kannan, National Institute of Technology, India**Noorul Haq, National Institute of Technology, India*

There are many reasons for interest in reverse logistics. The most prominent reason concern for the environment and cost reduction. Next to environment, consumers demand clean manufacturing and recycling. Hence customers and retailers expect original equipment manufacturer to set up a proper reverse logistics system and expects returned products to be processed and recovered in an environmentally responsible way. Another reason is cost reduction. The main objective of this paper is to design an integrated forward logistics multi echelon distribution inventory supply chain model (FLMEDIM) and closed loop multi echelon distribution inventory supply chain model using genetic algorithm. The proposed model is validated by considering the case study in a tyre manufacturing industry in India. This paper utilizes the multi echelon distribution inventory supply chain model proposed by Haq and Kannan (2006) for FLMEDIM.

193Monday, May 7, 8:30-10:00 **Room:** Panorama**Track:** Human Res, 2**Chair:** Hesam Quazi**Session:** Impact of HR Practices on Organizational Performance**007-0050: Impact of Strategic HR Practices on Perceived Organization Performance***Teng Heng Chan, Nanyang Technological University, Singapore**Hesam Quazi, Nanyang Technological University, Singapore**Michael Connor, Nanyang Technological University, Singapore**Joo Seng Tan, Nanyang Technological University, Singapore**Chow Hou Wee, Nanyang Technological University, Singapore*

We developed a questionnaire to measure perceived and objective performance of firms based on constructs and items identified in previous studies by Delaney and Huselid (1996), Koch and McGrath (1996), Khatri (2000), Hyeon, Mitsuhashi and Bjorkman (2003), Paul and Anantharaman (2003), Tung (2004), and Shaw, Gupta and Delery (2005). The questionnaire included items associated with strategic human resource practices: talent management, learning and development, performance management, human resource planning, career management, compensation and benefits, human resource information systems, and communications. Our findings based on hierarchical multiple regression analyses indicate that communications and compensation are the most frequent significant influences on perceived company performance, followed by HRIS, and performance management. This may imply that supporting communications in relation to compensation with HRIS plays a significant role in enhancing organisation performance. We did not find any significant effect of HR variables on objective performance.

007-0612: Employee Productivity: Why Personality Matters*Helene Caudill, St. Edward's University, United States*

A central focus of operations management has always been employee productivity. But why is it that even when efficient systems and measures are designed and implemented employee productivity may not always improve? One possible answer to this dilemma is that some employees are simply more productive than others because they have the right personality or "fit" for their positions. From scientific management to today's continuous process improvement, an emphasis on employees' personalities cannot be overlooked if an organization is to be successful. I will present several personality theories such as self-monitoring and communal orientation to illustrate the importance of understanding personality characteristics from an operations management viewpoint.

007-0242: Impact of Work-Life Programs on Employee Outcomes: An Empirical Study in Singapore*Hesam Quazi, Nanyang Technological University, Singapore*

The global trends of increasing female labor force participation coupled with the emergence of dual-earners and single parent families have resulted in research interests in understanding how such employees balance their work and life (W-L) domains. Adopting W-L benefits have been viewed as practical response to help employees manage multiple work and life responsibilities. Previous studies have reported on how flexible working hours and other family-supportive HR policies could influence various employee outcomes. This study reports the findings of a similar study in Singapore. It investigates the impact of various W-L initiatives on employee outcomes, like job satisfaction, family satisfaction, organizational commitment and turnover intentions. Moderating effects of supervisory support on W-L initiatives are also examined. Preliminary analysis indicates that W-L initiatives impact on a number of employee outcomes, which in turn enhances employees' organizational commitment resulting in reduction of voluntary turnover.

194Monday, May 7, 8:30-10:00 **Room:** Parisian**Track:** Emp Res, 12**Chair:** Chaodong Han**Session:** Inventory and Production Management**007-0105: Cooperative Complexes and Local Economic Development: A Study of 12 Brazilian Cases***João Amato-Neto, University of Sao Paulo, Brazil*

The aim of this article is to present a study carried through to 12 Brazilian cooperative complexes belong to the following sectors: agribusiness, fishing/mariculture, handicraft, textile and metallurgist. The present research is characterized as an exploratory study, supported by the multiple case study method, being composed for: documentary research, analysis of the main characteristics of the cooperative complexes belonging to different productive chains, comparative analysis of such enterprises. The study is based on the concepts as the externalities, joint actions and inter-organizational cooperation level.

007-0398: Empirical Analysis of Gains or Losses in Inventory Levels of Firms Due to Adoption of Information Technology*Deepak Iyengar, University of Kentucky, United States**Rahul Kale, University of North Florida, United States*

The use of information technology (IT) has made firms more competitive. Anecdotal evidence, analytical studies, and simulations have been used in past research to look at productivity in inventory due to IT adoption. However, not much empirical research has been done to find out gains in inventory management due to IT. This paper empirically examines whether spending in information technology has led to a decrease in inventory levels. A five year period covering 2000-2005 is chosen for the study. Archival data from publicly available sources is used to test the hypotheses. Firms from different industries are included in the analysis. Results are analyzed using regression.

007-0071: Antecedents of Inventory Levels in the U.S. Manufacturing Industry

Chaodong Han, University of Maryland, United States

Inventory literature either takes a macroeconomic perspective or focuses on firm specifics. Without dialogue between them, it is hard to understand the macro-micro paradox of inventory effects: destabilizing at the macro level but stabilizing at the firm level. Current research sets out to bridge this gap through a middle-ground analysis of inventory antecedents at the industry level. A panel of 184 five-digit NAICS manufacturing industries is collected from US Census of Economics and Annual Survey of Manufacturers. A SUR model is employed to simultaneously estimate the impact of macroeconomics (e.g., interest rates, inflation, imports and exports) and microeconomics (e.g., IT investment, capital expenditure and worker productivity) on inventory levels at all three stages. Preliminary results show that raw materials and finished goods inventories are positively associated with imports and exports level respectively, suggesting cost savings from global outsourcing and gains from exports may be offset by higher domestic inventory levels.

007-0176: Bundling Technologies in Retail Supply Chain Operations: An Empirical Analysis of Food Retailers

Kingshuk Sinha, University of Minnesota, United States

Yang Dong, University of Minnesota, United States

Xiaowen Huang, Miami University, United States

Drawing upon the complementarity literature, we empirically examine the impact of bundling technologies on store financial performance based on survey data collected from conventional supermarket stores. The empirical analysis results provide support for three proposed hypotheses. First, we find that stores adopt in-store and supply chain technology applications as a bundle. Second, we find that stores that adopt a bundle of complementary in-store and supply chain technology applications for more than two years financially outperform stores that either adopt a few of the complementary technology applications for a comparable period of time, or adopt the complementary technology applications over time (i.e., over a couple of years) to eventually form a bundle. Third, we find that the stores realize the effect of learning when they adopt complementary in-store and supply chain technology applications as a bundle.

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Monday, May 7, 8:30-10:00 **Room:** Patio

Track: Proj Mgmt, 3

Chair: Daniel Hesier

Session: Various Tools and Their Applications in Project Management

007-0035: Capability Maturity Model Integrated: Issues in Implementation

Kirit Patel, Middlesex University, United Kingdom

Given the increasing cross corporation boundaries, global production of products, reduced project schedules and cross disciplinary development teams in the IT sector process improvement has become complex. In response to this challenge many organisations have adopted CMMI, which is intended to create a single model across the full enterprise cycle to create integration of process and product teams. However, there are issues in the implementation of this model. This paper examines implementation issues for one organisation in its quest for adopting CMMI. Using data from detailed interviews conducted with a range of staff and examination of internal CMMI project documentation this paper will outline and analyse some of the key issues which emerge. Various issues around implementation traps and other key management models (e.g. knowledge management and change management) which also need to be considered in the adopting CMMI will be analysed.

007-0579: Project Scheduling: A Holistic Approach Using Simulation Derived Critical Chain Project and Feeding Buffers

Robert Ash, Indiana University Southeast, United States

Critical Chain Methodology (CCM) has gained a significant foothold among practitioners for project scheduling. However, academics continue to demonstrate its weaknesses. This paper presents extensions to CCM that satisfy practitioners' needs for a straightforward project scheduling methodology and academics' needs for a rigorously sound foundation. The extensions are a heuristic approach to resource constrained project scheduling and Monte Carlo simulation for determining critical chain buffering. When combined with CCM these extensions present a holistic methodology that eliminates the academically recognized weaknesses of CCM. The paper demonstrates the superiority of the proposed methodology over basic CCM. It provides a method for resource constraint resolution, it provides a method for setting buffered due dates, it provides the project manager with information about the probability of hitting a buffered due date, and it provides the project manager with information for setting start dates for non-critical tasks.

007-0212: Normative Attributes in Business Process Management Performance

Maria Gouvêa, University of São Paulo, Brazil

Francisco Netto, University of São Paulo, Brazil

João Ferreira, University of São Paulo, Brazil

The concept of process management, which has been known since the beginning of the last century with the scientific administration movement, has echoed more intensely in the business world in the last two decades. It is noticed that there is a gap in the academic literature when it comes to mechanisms for measuring the BPM performance considering the process end-to-end, which contribute for the organizations to reach their strategic goals. This study adapted the theoretical model of evaluation of business process management (BPM) that is available in the bibliographic revision in the context of business process for National Support Program to the State Exchequer (PNAFE). Through the application of bivariate and multivariate statistical techniques, the adapted model was validated. It was also possible identifying the normative attributes that present the higher correlations with the general evaluation of the business process management.

007-0603: Introducing the Traffic (Time-Resource-Flow Chart) Method for Project Management

Daniel Heiser, DePaul University, United States

Successful project managers must balance the competing demands of resource constraints, schedule deadlines, and completion of the project scope. Unfortunately, the traditional graphical interfaces for project planning and scheduling, the Gantt Chart and Network Diagramming, neglect illustration of resource conflicts - a common source of project failure. The proposed new TRFC ("traffic") interface combines elements of a cross-functional flowchart with those of the traditional Gantt Chart, to provide a unified view of project constraints (time, resources, and scope). In addition, the TRFC method serves to highlight the handoffs between project team members – providing a powerful intra-team communication tool and crucial foci for project control.

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Monday, May 7, 8:30-10:00 **Room:** Royal
Session: Issues in Quality Control

Track: Qual Mgmt, 9

Chair: Ikuo Arizono

007-0439: Properties of Proportional Mean Residual Life Model

Syed Alam, Indian Institute of Technology Kharagpur, India

Asok Nanda, Indian Institute of Technology Kharagpur, India

Subarna Bhattacharjee, Indian Institute of Technology Kharagpur, India

Recently, the Proportional Mean Remaining Life (PMRL) model has been introduced in literature for modelling and analysing failure time data. In this paper, some properties of the PMRL model related to reliability analysis are investigated. Closure properties of a few aging classes and those of partial orders under the proportional mean residual life model are discussed.

007-0442: Properties of Aging Intensity Function

Syed Alam, Indian Institute of Technology Kharagpur, India

Asok Nanda, Indian Institute of Technology Kharagpur, India

Subarna Bhattacharjee, Indian Institute of Technology Kharagpur, India

The concept of the aging intensity (AI) function has been introduced in the literature for evaluating the aging property of a unit (that may be a system or a living organism) quantitatively. We discuss the properties of the AI function and study its nature for various distributions. The closure properties of the aging classes defined in terms of the AI function are also presented. We define an ordering, called aging intensity ordering, and study its closure properties under different reliability operations, formation of k-out-of-n system, and increasing transformations.

007-0673: Harnessing Taguchi Methods in Software Development

R Gupta, NDS, India

Tapan Bagchi, Indian Institute of Technology Bombay, India

Several factors and approaches influence the successful development of software, but most practitioners tend to use their own preferred methods with overriding subjectivity. This paper reviews recent attempts of using orthogonal array experiments to determine the effect of various factors that the developer has the freedom to choose from. Such approaches were popularized by Genichi Taguchi for hardware artifacts and have been shown to be of substantial value in product and process design optimization. The paper subsequently presents a framework for conducting empirical studies during SW development that have a high potential of yielding significantly improved quality and performance of the SW under development.

007-0420: Rectifying Sampling Inspection by Variables for Assuring Average Outgoing Surplus Quality Loss Limit Indexed by Taguchi's Loss

Maiko Morita, Osaka Prefecture University, Japan

Yasuhiko Takemoto, University of Hyogo, Japan

Ikuo Arizono, Osaka Prefecture University, Japan

Instead of the quality evaluation based on percentages of nonconforming items, Taguchi has proposed the concept of "quality loss" as quality evaluation based on variable properties. Recently, from the viewpoint of assuring Taguchi's quality loss, a single sampling inspection plan based on operating characteristics has been proposed. However, the disposition of the rejected lot isn't specifically declared in the sampling inspection plan mentioned above. While in the sampling inspection plan by attribute, the sampling procedure with screening exists as a concept of the sampling plan. In this article, the quality evaluation based on Taguchi's loss function is adopted instead of the quality evaluation based on the percentage of nonconforming items as lot quality. Then, we propose a single sampling inspection plan with screening by variable indexed by Taguchi's loss function for the purpose of assuring the upper limit of the maximum expected surplus loss.

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Monday, May 7, 8:30-10:00 **Room:** State
Session: Service Systems Optimization

Track: Service Ops, 5

Chair: Ping Ma

007-0417: Optimal Staffing Policy for Queueing Systems with Cyclic Demands: Waiting Cost Approach

Pen-Yuan Liao, National United University, Taiwan, Republic of China

Although lost profit from lost business is quite difficult to estimate for queueing systems with cyclic demands, this paper presents an approach to formulate waiting cost including balking loss and reneging loss. The balking probability is defined as the balking index β multiplying by the expected queue length L_q and the reneging probability is defined as the reneging index γ multiplying by the expected waiting time in queue w_q . Using the estimation of waiting cost allows decision maker to have the capability to determine the optimal number of servers for each planning period by minimizing total cost including service cost and waiting cost.

007-0343: Service Staff Scheduling with Possibility to Split Tasks between Service Resources

Pasi Porkka, Helsinki School of Economics, Finland

With the increase of service industry and the consolidation of service providing companies, optimization of movements of service resources within very short planning windows, such as work shifts, shows potential for substantial savings. Still there is not much literature on scheduling and allocation of mobile service resources on hourly or minute basis. In this research, a combined allocation, routing and scheduling model is presented for mobile service resources that can be people, vehicles, other machines or their combinations. The contribution of the model is, that it allows tasks to be flexibly split and performed by one or more service resources within a planning period. The objective of the model is to minimize traveling times and simultaneously take into account priorities, different skills and capacity limits. An optimal mixed integer formulation and a heuristic solution approach are presented.

007-0689: An Inventory/Distribution System for One-Warehouse, N-Retailers

Huimin Wang, Hohai University, China

Ping Ma, Hohai University / University of Texas at Dallas, United States

Chen Huang, Yum Holding Co. Ltd, China

We address a two-echelon inventory system with one warehouse and N-retailers. The demand at each retailer is assumed to be partly known and partly stochastic. Shortages are not allowed and lead times are fixed. Costs at each facility consist of a setup charge of per order and a holding cost. The objective of inventory control model is to determine the policies which minimize the overall cost, that is, the sum of the setup costs and holding costs at the warehouse and the retailers. We propose a heuristic procedure to test the effectiveness and compare the performance of the different procedures.

861	Monday, May 7, 8:30-10:00 Room: Terrace Session: Empirical Studies of Execution	Track: Emp Res, 3	Chair: Serguei Netessine
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007-0329: Removing Obstacles to Patient Safety: An Executive-level Intervention to Support Front-line System Improvement

Anita Tucker, University of Pennsylvania, United States

Alyson Falwell, Stanford University, United States

Jennifer Hayes, Stanford University, United States

Sara Singer, Harvard University, United States

We conducted an intervention with 24 randomly selected U.S. hospitals to improve patient safety. The structured 18-month program required hospital executives to spend time on the front lines with care providers to directly observe obstacles that interfere with patient safety. In total, front line staff identified over 1,400 obstacles. We describe the types of obstacles identified. For example, some staff reported difficulty obtaining accurate patient weights required for weight-specific medication doses, while others had untimely supply of sterile equipment during evenings. In addition, hospitals varied in their problem solving approaches to the obstacles. Drawing on the problem solving literature (e.g. MacDuffie 1997), we develop and test hypotheses related to problem solving approaches and resolution success.

007-0073: Retail Store Execution: An Empirical Study

Jayanth Krishnan, University of Pennsylvania, United States

Serguei Netessine, University of Pennsylvania, United States

Marshall Fisher, University of Pennsylvania, United States

We describe a methodology by which a retailer can identify action steps that are likely to increase sales and customer satisfaction and demonstrate the methodology using proprietary data from a large retailer with over 500 stores. We use monthly store-level data on a number of operational variables including in-stock rate, store staffing level as measured by payroll and store employee turnover, together with customer responses to satisfaction surveys, to develop a nested three-stage econometric model to analyze the marginal effects of various execution levers on sales, customer satisfaction and customer perceived in-stock. Our model explains approximately 75%, 97% and 71%, respectively, of the residual variation in sales, customer satisfaction, and customer perceived in-stock.

007-0165: Product Launches in the North American Automotive Industry - Location Decisions and Productivity Effects

Matthew Reindorp, University of Maryland, United States

Manu Goyal, University of Maryland, United States

Serguei Netessine, University of Pennsylvania, United States

Choosing the right manufacturing facility is a key element in the launch of a new or updated automotive product. From a study of recent data on North American automobile production, we find that prior experience with the launch platform and/or flexible production methods significantly influence a plant's chances of being chosen as a launch site. Correspondingly, we demonstrate that productivity in the launch phase tends to be higher when a plant has prior experience on the platform or when flexible production methods are employed. We also isolate factors that enable a plant to regain productivity after the product launch is completed.

007-0131: Why do Some Managers Use a 'Non-optimal' Inventory Policy?

Justin Ren, Boston University, United States

Gokhan Usanmaz, Optiant Inc., United States

Sean Willems, Boston University, United States

This paper investigates why some inventory managers choose not to use the optimal policy in managing inventory. We collect data from a large nationwide dealer network for a tractor manufacturer. The manufacturer recommends all dealers use a non-stationary base-stock policy, and work with each dealer on their monthly inventory level planning. While many dealers adopt the recommended non-stationary base-stock policy, we found that a significant portion of them choose to use a constant-base-stock (CBS) policy despite the manufacturer's recommendation. A CBS policy is clearly non-optimal, as their demand are non-stationary cyclic (with seasonality). But why do they choose to do so? Through our analysis we find that a multitude of factors jointly determine dealers' inventory policy choice, such as demand pattern, holding cost, competition, management capability and infrastructure. Our results shed new light on inventory management and supply chain execution.

199	Monday, May 7, 8:30-10:00 Room: Vista Session: Workshop: Using Excel Visual Basic for Applications in Teaching Operations Management and Management Science Courses	Track: Education, 2	Chair: Weiyu Tsai
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007-0041: Using Excel Visual Basic for Applications in Teaching - An Introductory Workshop

Weiyu Tsai, University of Utah, United States
Don Wardell, University of Utah, United States

This session is for faculty who are interested in how to write/incorporate Excel Visual Basic for Applications (VBA) programming in teaching Excel-related courses. We start with a brief introduction to what Excel VBA is and how to write basic VBA code. We provide three Excel VBA examples that we use to teach several statistics concepts, simulation, and Bayes theorem, and also to facilitate exam and assignment automation for large classes. Please come to meet other like-minded faculty and bring comments/questions that you may have about using Excel VBA in teaching OR/MS.

200	Monday, May 7, 10:30-noon Room: Brasserie Session: Innovation and Product Structure	Track: Prod Innov, 11	Chair: Glen Schmidt
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007-0788: Introducing Innovations in Small Economies

Pedro Oliveira, Universidade Católica Portuguesa, Portugal
João Assunção, FCEE - Universidade Católica Portuguesa, Portugal

We study whether smaller economies constitute a major obstacle to the introduction of innovations and explore how firm's strategy is shaped by the nature of the environment they operate in.

007-0093: Analysis of the Structure of Technology Spillover on Industries by Analyzing Patents

Ha-Gyo Jung, Korea University Business School, Korea, Republic of (South Korea)
Kyu-Seung Whang, Korea University Business School, Korea, Republic of (South Korea)

The objective of this paper is to examine the structure of technology spillover from UAV(Unmanned Air Vehicle) technology on other industries by analyzing patents. The network analysis of the USPTO(United States Patents and Trademark Office) patent data from 1981 to 2000 was adopted to investigate the characteristic change of the technology spillover. The results show that the influence of UAV technology on other industries has grown over the twenty-year period. For weapons system development, this study provides a research basis to estimate the technology spillover effects on industries. Searching a structural hole from the inter-industrial knowledge flow structure may be a useful technique to find core technologies which generate large technology spillover on the other industries.

007-0213: Adoption Barriers of Broadband

Maria Gouvêa, University of São Paulo, Brazil
Leonardo Sá, University of São Paulo, Brazil

Internet has been detached as communication means in many different ways. This development would not be possible if data transmission technology through internet had not have been developed enough to allow adequate speed for many applications. However, in small business market one can still find significant part of dial-up internet users that have not adopted broadband. This work has the objective of identifying the reasons that lead to this resistance (adoption barriers). Based on literature regarding quality service and technology acceptance models, this study was composed by three parts: qualitative research with a broadband provider, qualitative research with dial-up internet users, and quantitative research with broadband users and not users.

Among many interesting results, it was found that some relevant factors for differentiating broadband users and not users are: behavior intention, viability and social influence.

007-0714: A Strategy for Opening a New Market and Encroaching on the Low End of an Existing Market

Glen Schmidt, University of Utah, United States
Cheryl Druehl, University of Maryland, United States

We build on the frameworks of Schmidt and Porteus (2000) and Schmidt and Druehl (2005), which describe alternate ways in which a new product might open a new market and ultimately encroach on an existing market. Here we identify and analyze the scenario where a firm first opens up what we call a "detached" market, by offering a new product that meets a customer need that is very different from (i.e., detached from) the need met by the old established product. For example, cell phones opened up a new market by meeting the customer need for mobility; a need very different from the traditional attribute of reception quality, and ultimately began encroaching on land lines. We go on to relate our results to the finding that "willingness to cannibalize" is a key factor in an incumbent firm's growth and survival, and to the "blue ocean strategy."

201	Monday, May 7, 10:30-noon Room: Continental Session: Supply Chain Collaboration	Track: Supply Chn, 13	Chair: Jose A. Gobbo
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007-0079: The Impact of Virtuality on Supply Chain Strategies

Claudia Mattos, University of São Paulo, Brazil
Fernando Laurindo, University of São Paulo, Brazil

The transparency provided by information technologies (IT) allows companies to reposition themselves in the chain and collaborate dynamically with other companies with the purpose of optimizing their position in the business. Thus, this article explores through two cases studies the phenomenon of inter-firm collaboration and aims to analyze the supply chain strategies that have been adopted by the players in the network based on the IT. The case studies have focused on a neutral third party, that is, the portal site that coordinates the network and aligns the incentives for all players belonging to the network enabling information starts to flow more quickly along the supply chain. The results obtained in this research can contribute to understanding of the concepts and principles of the role of the neutral third party in a value network and formulate the role of the neutral third party that coordinates the network .

007-0310: Performance Improvement Through Supply Chain Integration: The Moderating Effect of Business Conditions

Cristina Gimenez, Universitat Ramon Llull, Spain

Dirk Pieter van Donk, University of Groningen, Netherlands

Taco van der Vaart, University of Groningen, Netherlands

Most of the recent research ignores factors (such as uncertainty in demand, market structure and production characteristics) that moderate the impact of supply chain integration on performance. The objectives of this paper are: firstly, to measure supply chain integration along three main dimensions: practices (being concrete activities with respect to information, organisation and planning, such as delivery synchronization), patterns (being the way of interacting, such as frequency of face-to-face communication) and attitudes (being the way the supplier/buyer is looked at, such as the expectations in the relationship); and secondly, to search for moderators of the effect of supply chain integration on performance improvement in a buyer-supplier relationship. Based on data collected through a survey, we can conclude that business conditions moderate the effect of supply chain integration: performance is hardly influenced by supply chain integration if the business conditions are simple.

007-0181: Vertical Integration: An Exploratory Study in Supply Networks

Jose Gobbo, Sao Paulo State University, Brazil

With the diffusion of new business forms in the 90's, such as the lean manufacturing system, firms had a tendency in direction towards a higher flexibility in production and management. That caused the change in the vertical bureaucratic structures for the horizontal company, modifying the previous paradigm, that of competition between business units. The formation and the development of enterprise networks gained relevance and one of the main tendencies is the Supply Chain Management (SCM) studies. Recent events, in prominent corporations researched in this work, show the advancement in horizontal integration and the beginning of a new process of vertical integration, differently than had been proposed in the past. This article reviews the literature related with supply chain design, and through a qualitative and exploratory study proposes a theoretical framework that enables a more detailed vision of the possible stages of the dynamic evolution of supply chains.

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Monday, May 7, 10:30-noon **Room:** Far East

Track: Sustain Ops, 16

Chair: Willard Price

Session: Sustainability

007-0115: The Impacts of Social Responsibility on Corporate Reputation and Behavioral Intentions of Communities: An Empirical Study

Hélvio Brito, Fumec University, Brazil

Cid Gonçalves-Filho, Fumec University, Brazil

Marlusa Gosling, UFGM, Brazil

Corporate reputation is nowadays one of the few opportunities of differentiation and institutionalization of companies along with society. Its studies are normally turned towards the generation of rankings that classify them from the viewpoint of the business community, its employees and other stakeholders. Few, however, consider the community's opinion - a stakeholder that can be invested with great power and sometimes make it unviable for the installation or continuity of an operation. This study proposes a method that aims to assess social responsibility actions as well as measure its impacts on corporate reputation and the trust and behavioral intentions of communities. A survey research with 306 interviews was conducted and structural equation modeling was used to analyze data. At its end, it proposes that SCR actions have a strong impact on trust and therefore on corporate reputation, which works as an antecedent of the community's behavioral intentions.

007-0425: A Sustainable Response for Supply Chain Logistics: Biodiesel Fuel

Willard Price, University of the Pacific, United States

An available alternative fuel, Biodiesel, relies on renewable supply and results in meaningful air emission reduction. Biodiesel is a product commercially viable for both the producer and consumer while generating net environmental benefits. Such payoffs as well as diesel independence will not likely be achieved without such viability because regulatory restrictions on regular diesel are neither desired now or expected soon. Yet biodiesel production and distribution are challenged at several stages in its supply chain. This research critiques raw material choices, production systems and capacity, distribution options and final consumer decisions. For the general supply chain, a case study of Frito Lay is included to demonstrate the opportunity to improve SC logistics with an environmentally and commercially valuable fuel.

007-0444: Sustainable Supply Chain in Brazil: A Case Study

Marcelo Pedroso, University of Sao Paulo, Brazil

Aldo Bastos Jr., Fundacao Getulio Vargas / Klabin, Brazil

The paper aims to discuss the implementation of sustainability at the supply chain level. It considers the case study of Plasma Project, a successful initiative of corporate sustainability in Brazil. This project integrates the supply chain of three manufacturing companies in order to leverage the recycling of aseptic carton packages. The sustainability concepts drawn from the literature and experiences from the project are used to discuss the critical success factors and the implications for the management of corporate sustainability within the manufacturing companies. The paper's findings are exploratory. It has identified four critical success factors for implementing sustainability concepts at the supply chain level: the appropriate management of technology innovation; the economic viability within the supply chain scope; the strategic supply chain coordination; and the motivation and commitment to corporate sustainability of the companies involved.

007-0582: A Closed-loop Supply Chain Model for Managing Overall Optimization of Eco-efficiency*Wei Solvang, Narvik University College, Norway**Ziqiong Deng, Narvik University College, Norway**Bjoern Solvang, Narvik University College, Norway*

The focus and scope of environmental care has been extended over the past four decades. More and more attention has been attached to pollution prevention and minimization rather than end-of-pipe pollution control. It is believed that there is an optimized break-even point where more goods and services are created with fewer resources and less waste and pollutions. This point is termed eco-efficiency. This paper discusses, firstly, the major challenges of managing eco-efficiency in the context of a supply chain. The challenges in optimization of eco-efficiency are also addressed. The disadvantages of applying traditional supply chain models in managing overall optimization of eco-efficiency are discussed. A closed-loop supply chain model is suggested. Suggestions on future works are given at the end of this paper.

007-0621: Supply Chain Strategy and Environmental Performance*Tanya Boone, College of William and Mary, United States*

Environmental management systems have become a critical factor in the competitive landscape, with a growing number of tools, techniques and programs from which managers can choose. Yet, there is little guidance in the research literature as to the relative effectiveness of the various methods and relevant contextual variables. This paper investigates the association between supply chain coordination strategies and firm environmental performance. We examine whether the approach(es) that a firm uses to coordinate, collaborate and communicate with its supplier partners is associated with the level of environmental emissions.

007-0639: The Impact of Enterprise Solutions on Environmental Performance*Roland Geyer, University of California, Santa Barbara, United States**Vered Doctori Blass, University of California, Santa Barbara, United States**Andrea Masini, London Business School, United Kingdom**Magali Delmas, University of California, Santa Barbara, United States*

Investments in technologies and information systems to improve production and operations management may also help increase firms' environmental performance. We hypothesize that investments in ERP solutions enable firms to reduce their environmental impact per unit output by facilitating better control of their internal processes and exchange of information across supply chain activities and agents. By affecting every function of the firm, enterprise solutions are expected to have a significant impact on the efficacy and efficiency of business processes and thus on environmental performance. We examine if and to what extent the adoption of certain ERP modules affects selected environmental performance indicators of firms. The methodology is based on panel data analysis also utilized to study the impact of ERP on the financial performance of firms. The data for the research is obtained from SAP and from publicly available information as TRI and ECHO databases of the US EPA.

007-0736: RFID in Manufacturing: the Good, the Bad, and the Ugly*Can Saygin, University of Texas - San Antonio, United States**Jagannathan Sarangapani, University of Missouri - Rolla, United States*

This paper presents a systems approach to radio frequency identification (RFID) deployment in network-centric manufacturing environments, which can be defined as a "dynamic network of self-organizing, autonomous assets and entities that operate, collaborate, cooperate, and compete upon basic principles of decentralization, participation, and coordination through rich information exchange." Two perspectives are highlighted: RFID data-based decision making on the shop floor and communications infrastructure necessary to provide seamless data and information flow to support decision making. Three RFID applications, including a dock door, inventory control, and shop floor control, are presented along with the impact of RFID data on decision making. Through these applications, this study shows that the success of RFID applications depend on how well the RFID data-based decision-making model fits the application domain and how well it is integrated with the scheduling schemes implemented at the networking and communications layer.

007-0412: A Dynamic Simulation Model for the Long Term Analysis of the Indian Automotive Industry*Prem Vrat, UP Technical University, India**Pradeep Kumar, Indian Institute of Technology Roorkee, India**Balan Sundarakani, National University of Singapore, Singapore*

This paper presents a new model for long term analysis of deregulated Indian auto market. In this model we try to capture the main factors affecting long term development of the Indian auto industry. Investor's lack of perfect foresight, together with construction delay could possibly result in periods of over capacity or capacity deficits in the system in the global supply chain. By using a dynamic simulation model and analysis framework, it's possible to analyze the Indian auto market and analyze the industry over a period of time. Under different delay and risk conditions, policy experimentation is carried out considering various global economies and their degree of development. A detailed sensitivity test is carried out to examine the robustness of the model. The research recommends some strategies for a global supply chain that could improve flexibility across the chain, reduce lead time, reduce inventory and enhance supply chain efficiency

007-0320: Effect of Labor Force Reduction on Product Throughput in a Complex Manufacturing*Brian Neureuther, SUNY Plattsburgh, United States*

Complex manufacturing environments are denoted by processes that involve several hundred operations with many different types of products. In some cases, these environments include re-entrant flows where product must re-enter the production process at several specific points of entry. One performance measure that is affected is product throughput, or the amount of product produced over time. This research explores the affect of labor reduction, in a cost conscious effort, and the effect it has on product throughput in a complex manufacturing environment.

205	Monday, May 7, 10:30-noon Room: Garden Session: Issues in Operations Management Education	Track: Education, 13	Chair: Mona Ali
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007-0733: TQM in Universities?

Mona Ali, The German University in Cairo, Egypt

Is TQM an efficient technique to be implemented on Campus or not? This question has been asked ever since Deming suggested the linkage between quality management principles and education (Felder and Brent,1999. Deming had a view that quality management principles could positively affect the quality of any product or service provider organization. In his book - The new Economics - he claims that "Improvement of education,and the management of education,require application of the same principles that must be used for the improvement of any process,manufacturing or service" Deming, 1994. After working in many factories which apply main features of TQM semi efficiently, The question in mind was is it possible to apply these basic ideas of TQM to Managing universities in general and in the Middle East in particular, would it be an efficient way of management, and how can I evaluate the results?.

007-0684: Developing Course Material for a Business Process Simulation Class

Paul Schikora, Indiana State University, United States

Brian Neureuther, SUNY Plattsburgh, United States

Michael Godfrey, University of Wisconsin - Oshkosh, United States

We present ongoing efforts to develop appropriate course materials and exercises for teaching applied discrete event simulation to business students. This is a fairly narrow, technical field, and the relatively few course texts available are often written towards students in an engineering curriculum. Material in these texts is highly technical with extensive coverage of the underlying science of discrete event simulation. Our focus in the business school is on the application of current user-friendly practitioner-oriented software packages to the analysis and improvement of business process flows. We desire to strike a balance between a basic understanding of the underlying science and the valid application of the methodology to routine business process analysis using the ProcessModel software package. We present completed work on an extensive course packet and a discussion of future work to be completed.

007-0238: Comparison of Students' Perceptions of the Quality of Education at AACSB Accredited and Non-Accredited Business School

Albena Iossifova, Slippery Rock University, United States

The study focuses on comparing the differences in students' perceptions of the quality of education between the AACSB accredited and non-accredited business schools in the USA. Quality of education from the students' perspective has four dimensions: (i) academic instruction, (ii) campus life, (iii) career guidance, and (vi) employment after graduation. Analysis of the data reveals that on general the accredited schools have higher ratings for campus life, whereas the non-accredited schools have higher ratings for academic instruction and career guidance.

007-0778: Mass Customization Through Religious-based Strategy

Mostafa Jafari, Azad University, Iran (Islamic Republic of)

Some communities like ZANJAN city in Iran are religious-based integrating communities. Companies can attract societal mass through designing religious -based strategy. Its conceptual framework is RB-MCS(RELIGIOUS-BASED MASS CUSTOMIZATION STRATEGY). The social behavior changes easily through this marketing approach. This article introduces and describes this wonderful strategy. THE METHOD is PCM.(PROJECT CYCLE MANAGEMENT).

206	Monday, May 7, 10:30-noon Room: Green Room Session: Outsourcing Theories	Track: Purchasing, 5	Chair: Alan J. McKittrick
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007-0005: Contingencies on the Effect of Supplier Innovativeness on Manufacturer Performance

Arash Azadegan, Arizona State University, United States

Kevin Dooley, Arizona State University, United States

Outsourcing of manufacturing and design task is on the premise that supplier capabilities such as innovativeness enhance manufacturer performance. This is not always the case. We posit that beneficial effects of supplier innovativeness are contingent on the alignment of manufacturer and supplier business strategy, and the level of relationship coupling between the two. Furthermore, as the level of design responsibility placed on the supplier increases, strategic and relationship factors can result in differing effects. The study applies organizational learning theory (March and Levinthal, 1993) and absorptive capacity concepts (Cohen and Levinthal, 1989) to Miles and Snow's (1978) business strategy categories to distinguish conditions when supplier innovativeness has higher effects on manufacturer performance. Case analyses provide further support to the strategic distinctions.

007-0003: Outsourcing Process and Theories

Zoran Perunovic, Technical University of Denmark, Denmark

Jørgen Pedersen, Technical University of Denmark, Denmark

The studying of the outsourcing phenomenon has been grounded in many theories. Some of them are complementary, the other are contradictory. This creates confusion among the researchers of the outsourcing phenomenon. This paper has an aim to contribute to the existing body of knowledge on outsourcing process by exploring how theories have been used to study, understand and describe activities within the phases of the outsourcing process. In addition, we analyze the explanatory power of various theories that haven't been much used in studying the outsourcing. Consequently we associate those theories with certain phases of the process, where they could contribute towards understanding the embedded activities and mechanisms. The final result of the paper is a map showing the phases of the outsourcing process with the associated theories that have been used and could be used in exploring and explaining the outsourcing process.

007-0513: Collaborative and Non-collaborative Vendor Selection Processes: Three Stories from Umbria

Paolo Taticchi, University of Perugia, Italy

Mads Christoffersen, Technical University of Denmark, Denmark

Piero Lunghi, University of Perugia, Italy

Zoran Perunovic, Technical University of Denmark, Denmark

Over the last decade, outsourcing has become a widespread phenomenon. Many outsourcing process frameworks have been proposed to support this development. A typical outsourcing process consists of five phases – preparation, vendor selection, transition, managing relationship, and reconsideration. This paper has focus on the vendor selection phase. The tendency of outsourcers to engage in more collaborative and relational oriented outsourcing arrangements is discussed with comparison to the formal non-collaborative (transactional) relationships. The chosen outsourcing relationship (collaborative vs. non-collaborative) will influence the process of selecting a vendor. A general framework for the vendor selection process consisting of several stages is proposed. We have used a case study method, involving three Umbrian companies, to explore how the content and the inner decision making mechanisms of the stages differ between the con-collaborative and collaborative vendor selection processes. Implications for outsourcers, vendors, and academics are given.

007-0432: Business Process Outsourcing: Effects on Performance at the Process Level

Alan McKittrick, University of Ulster at Jordanstown, United Kingdom

Most prior research in the field of outsourcing has focused on the ex ante outsourcing evaluation. In contrast, this paper focuses on ex post outsourcing performance. The limited extant empirical research has analysed performance outcomes at the firm level rather than the process level making it difficult to argue causality. Business process outsourcing is a multi-billion dollar industry. The financial services sector makes up a significant source of comparative advantage for the UK economy and is its largest market for business process outsourcing. As a result of an in-depth case study analysis of a major UK financial services organisation, a number of propositions concerning the factors affecting outsourcing success and the effects of outsourcing on process-level performance have been developed. Both perspectives of transaction cost theory and resource-based view are used to explain the factors affecting outsourcing performance.

007-0774: Strategic Planning in Nonprofit Organizations: An Example in a Higher Teaching Unit

Mauri Rico, Sao Paulo State University, Brazil

Otávio Oliveira, Universidade Estadual Paulista, Brazil

Nowadays the organizations act in unstable environment and many have used the Strategic Planning to increase its possibilities of survival. This paper presents an application example of this instrument in a higher teaching unit, with internal and external assessment, and elaboration of some action plans for weakness improvement. Qualitative research was carried out with basis in case study. The theoretical referencial approaches issues as services, knowledge management, quality management in nonprofit organizations, in the education and in the higher education and last strategic planning. After the referencial the case study results are presented, followed for an analysis of the situation with consequent recommendation of some actions plans. The moment is propitious for the development of a strategic planning because the higher teaching unit has presented considerable development throughout the years, needing, however, of guidelines that can take it to a more efficient and conscientious development.

207	Monday, May 7, 10:30-noon Room: Oak	Track: Environ, 5	Chair: Ravi Subramanian
	Session: Preventive Measures and Compliance Issues in Environmental Management		

007-0598: The Impacts of Compliance Decisions Under Market-Based Environmental Regulation: Evidence from the US Acid Rain Program

James Kroes, Georgia Institute of Technology, United States

Ravi Subramanian, Georgia Institute of Technology, United States

The rationale behind market-based programs for pollution control is that firms should be allowed the flexibility to choose from a variety of strategic, tactical, and operational compliance levers – including abatement, input-switching, use of permits, adjustment of output levels, and retirement of older or dirtier facilities - as long as overall environmental goals are met. The US Acid Rain Program for controlling sulfur dioxide (SO₂) emissions from electric utilities remains the pioneering emissions trading program both in the US and beyond. However, the empirical linkage between compliance decisions and emissions outcomes, as well as the impacts of compliance decisions and emissions outcomes on financial performance, has received relatively less attention. We address these gaps first by examining the relationship between compliance decisions and environmental performance at the generating sites of publicly traded utility firms, and then by investigating the impacts of environmental performance and compliance decisions on firms' financial performance.

007-0770: Cleaner Production Program and Climate Change Mitigation: Organizational Networks Integrating Competences for Decreasing GHG Emissions

Fabio Guerrini, University of Sao Paulo, Brazil

Rogério Calia, FGV Business School, Brazil

This paper presents the experience of a multinational company's cleaner production program to mitigate greenhouse effect gases emissions. The research is empirically based on 205 projects that reduced emissions of greenhouse effect gases and were recognized by the corporate cleaner production program from July 2004 to December 2006. The paper compares the contributions of subsidiaries in different locations and analyses how the six sigma methodology for project management stimulates the creation of internal networks integrating different competences and different tactical knowledge to effectively implement the required changes for reducing emissions.

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Monday, May 7, 10:30-noon **Room:** Panorama **Track:** Human Res, 3
Session: Effects of Knowledge and Self-management on Organizational Performance

Chair: João Amato-Neto

007-0051: The Self Management in the Productive Process of Cooperatives

Sandra Rufino, University of São Paulo, Brazil

João Amato Neto, University of Sao Paulo, Brazil

The new ways to manage work – like democratic and collective management, knowledge and information reappropriation, use of machines and equipments as production helpers, beyond the emerging of new economical and social relationships that could be created from these changes – are the main point to understanding of Solidary Economy process, that which the enterprises could join economical maintenance and social compromising. Multiple and varied solutions are essential to self-management enterprises, because in many times the resources found in the traditional models could be uncertain. The main focus of our research are the knowledge about self-management usages and the productive process employed at the everyday work at these organizations. The investigated co-operatives examples could demonstrate the strength and power of the self-management enterprises inside the new panorama of economical growth in Brazil and the world.

007-0107: Choir Conducting: Human Resources Management and Organization of the Work

Rita de Cássia Fucci-Amato, University of the State of São Paulo, Brazil

João Amato-Neto, University of Sao Paulo, Brazil

The aim of this paper is to analyze the practice of the choir conducting, starting from the concepts of organization of the work and competences management. The main aspects discussed in this study are: the creativity, dimensions and levels of the work in a choir; competences, abilities and the formation of a choir conducting; motivation; leadership, problems solution and human resources management. The methodological approach is based on a bibliographical revision with an exploratory character, relating to the literature to the practice of the choir conducting. Thus, this study aims at giving subsidies for the work of the choir conductor and for the improvement in the comprehension and development of the direction and organization in vocal groups. It concludes that the practice of these concepts can improve the quality of the activities developed by the choirs.

007-0112: Exploration into the Conditions for Effective Transactive Memory System Emergence in Virtual Teams

Joy Oguntebi, University of Michigan, United States

The areas of knowledge management and virtual organizations receive considerable attention in business and research. Studies have explored a variety of processes for communicating and transferring knowledge in organizational group settings. One observation in group interrelations that has been identified as an emerging research topic is the transactive memory system (TMS). These systems represent formations of collective memory within small groups. Researchers have explored factors necessary for the development of this construct in face-to-face environments. A consistent finding in the TMS literature is that the development of a TMS within a team leads to improved team performance. Explorations of TMS development in virtual organizations exist but remain limited even as interest in virtual environments has increased. Our research study intends to explore and analyze the roles that influential factors play in TMS emergence and maintenance in virtual teams.

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Monday, May 7, 10:30-noon **Room:** Parisian **Track:** Emp Res, 13
Session: Supply Chain Management

Chair: Berit I. Helgheim

007-0263: Reconfiguring Supply Chain: A Case Study in Chinese Electric Bike Industry

Berit Helgheim, Molde University College, Norway

Shanshan Zhong, Molde University College, Norway

Jie Sha, Molde University College, Norway

China, as the world's most populous nation, mostly people continue to satisfy their transit on two wheels transportation tool. As a part of whole range of Light Electric Vehicles, electric bikes provide local point-to-point transportation. According to the statistic report of total trade in electric bike from China Bicycle Association (CBA, 2005), the demand in this industry will grow rapidly the next five years. Nowadays, a number of general tendencies enable and reinforce key changes in the restructuring of supply chain in electric bike industry. For example the demand for products and services is becoming increasingly volatile and uncertain in terms of volume, mix, timing and place. Also the markets have become more transparent and enhance the opportunities for companies to structure their own supply chain in an economical scale. The objective in this paper is to explore different Supply Chain Management strategies in order to meet the increasing demand.

007-0276: An Inquiry into the Success Parameters of the Pop-Rock Industry

Svein Bråthen, Molde University College, Norway

Berit Helgheim, Molde University College, Norway

The pop-rock music business is a large worldwide industry. It is huge differences with respect to how the artists run their business. Some artists are making additional concepts around their music as their core product. These activities can be viewed as value added activities for the customers. Another issue is supply chains: some artists are controlling a much larger part of the production process from making their own compositions to managing production and sale of their records, while others are pure performers who outsource the rest of the supply chain activities to other composers, producers and managers. If we control for "music quality", it is likely that there will be a difference in success and the degree of success. In order to explore the nature of this industry more formally, the concept of product variety in operations management is applied.

007-0074: New Heuristics for Resource Constrained Multi-project Scheduling Problem*Murari Lal Mittal, Malaviya National of Technology Jaipur, India**Arun Kanda, Indian Institute of Technology Delhi, India*

New priority rule based heuristics are developed for scheduling of simultaneous multiple projects sharing a common pool of resources. These heuristics are based on a two-phase prioritization process of activities for allocation of resources. At any decision point, the projects are first prioritized as per project selection rule and eligible activities in the projects are then prioritized as per activity selection rule. This is in contrast to the traditional process of activity prioritization in which all eligible activities from all projects are prioritized for resource allocation with no regard to the projects they belong to. The proposed heuristics are categorized into look-ahead and non-look-ahead type based on the project selection rules used. The performance is evaluated in two stages by solving 64 problems for the measures-minimizing mean project delay and minimizing increase over critical project duration.

007-0608: A Prescriptive Taxonomy for Risk and Resource Management Utilizing Alternative Project Life-Cycle Models*Dwight Smith-Daniels, Arizona State University, United States*

Traditional project life cycle models utilize a linear project flow with planned singular performance of project phases. In contrast, the increasing complexity and uncertainty of high-technology projects from environments such as new product development, information technology, and software development projects has led to advocacy for iterative, repetitious, and selectionist strategies for developing project deliverables for the purpose of project performance. We review the alternative models from risk and resource management perspectives, and provide a prescriptive model for life cycle selection.

007-0264: Supply Chain Management in a Project Management Setting: Supplier Selection in the Development Phase of Ormen Lange*Per Arne Fagervoll Meek, Molde University College, Norway**Gunhild Furu, Molde University College, Norway**Berit Helgheim, Molde University College, Norway*

In Norway there is a large offshore oil industry. Many previous projects have problems with over budging, keep the time schedule. In these offshore-oil projects, the main cost is supplies. However, there has been less focus on relations between suppliers and the project with respect of costs. "Ormen Lange" is the largest oil project in Norway. It is currently operated by Norsk Hydro and planned to be completed autumn 2007. The total budget for the project is 66 billion NOK, including land facilities, the modules on the seabed and the pipeline for gas export to Easington. Some of suppliers to the project are organized in a network database and the contracting system is hierarchal. The objective for this research is to do an explorative analyzes of the impact of contracting systems with respect to costs and productivity.

007-0725: Mid Cycle Capital Planning*Cigdem Gurgur, Colorado School of Mines, United States*

The classical capital rationing problem takes place at the beginning of a financial planning cycle. A project portfolio is chosen to maximize expected return on investment while adhering to the capital budget constraint. This paper examines mid-cycle capital planning, which takes place near the end of a financial planning cycle after a number of projects under run their budgets, projects with allocated budgets are cancelled for various reasons throughout the year, financial reserves free up towards the end of the year. How should the remaining funds be reallocated among short-term, supplementary projects? We develop a methodology to compare portfolio selection subject to the constraints that the net cash flow targets that are laid out at the start of the fiscal year is achieved and that the carryover of unspent funds to the next fiscal year does not exceed predetermined limits.

007-0370: The Relevance of Early Warning Systems Within the Total Quality Management*Lothar Czaja, University of Erlangen-Nuremberg, Germany**Kai-Ingo Voigt, University of Erlangen-Nuremberg, Germany*

To ensure trouble-free production and logistics processes, the principles of Total Quality Management gain importance and have to be classified to be a critical success factor. Companies deal with risks that occur, especially as an implication of serious quality problems.

Because the duration between identifying potential quality problems and the initialising of measures to eliminate the problem is getting shorter, companies deal with relevant developments at an early stage. Starting from current quality problems we cull from the daily press, this paper reflect the following questions: How important are Early Warning Systems in the fields of total quality management in an automotive network environment and what can be their contribution to solve existing and to prevent future quality problems?

007-0049: (Process) Control and Total Quality Management: A Qualitative Study of Three Manufacturing Organisations*Ebrahim Soltani, University of Kent, United Kingdom**Pei-Chun Lai, Ming Chuan University, Taiwan, Republic of China*

This paper empirically examines management's perception and understanding of the concept of control at three quality-driven manufacturing organisations operating in the UK. A review of the literature pertinent to TQM would suggest that 'control' is a means of providing information or feedback aimed at both monitoring a process and at eliminating causes of unsatisfactory performance, and that direct control is reduced through increased involvement and empowerment of the workforce. This paper is critical of these assumptions. It was shown that managers at various organisational levels found no difference between TQM and quality control, and that they viewed process control as a means of increasing control over the workforce. In sum, the paper demonstrates the danger that the promised TQM benefits could be vulnerable to management bias towards (process) control, leading to its failure in the long term.

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Monday, May 7, 10:30-noon **Room:** State
Session: Information Technology in Service Operations

Track: Service Ops, 6

Chair: Rafael Teixeira

007-0540: Handling the Complexity of Information Management

Andre Minkus, ETH Zurich, Switzerland

Andreas Nobs, ETH Zurich, Switzerland

For industrial service organizations information management (IM) has become a critical success factor. An increasing product complexity, global distributed customers and inter-organizational service networks requires the ability to efficiently manage product and service process related information. However, the need to focus on all organizational, technical and human aspects makes an implementation of IM complex and difficult. This paper presents a methodology for implementing IM in medium sized industrial service organizations. Following the principles of the axiomatic design framework a catalog of organizational, technical and human factors for supporting IM is developed. It distinguishes objectives and means at different levels of abstractions. This allows identifying the coherences between the different objectives and shows the sequence in which the means have to be implemented. Depending on their characteristics, organizations can use this catalogue to identify objectives and select.

007-0376: Production of Services – An Experience at the Educational Sector

Daniel Lacerda, Federal University of Rio de Janeiro, Brazil

Rafael Teixeira, Texas A&M University, United States

Andre Koetz, Petrobras S/A, Brazil

Luis Rodrigues, Universidade do Vale do Rio dos Sinos, Brazil

The production of services has grown in importance at the operations area since it has started to discuss applications of its traditional concepts considering the services characteristics. However, few studies have demonstrated the use of these concepts and techniques of production for educational area. Studies in this area are important due to its relevance and its specific characteristics as service's operations. This paper analyzes the modifications in service production area developed by a technical school. For such, it presents a case study about the use of production tools and techniques in service operations improvements in a real educational organization. Based on the results of this case, comparing the traditional educational model, the authors conclude that applying production concepts in educational processes lead to positive results in terms of profitability and operation's improvements.

007-0295: Identifying Key Capabilities to Leverage Resources of the Service Factory Firms: The Case of a Brazilian Telecom Firm

Rafael Teixeira, Texas A&M University, United States

Daniel Lacerda, Federal University of Rio de Janeiro, Brazil

Firms' resources are fundamental elements in developing the competitive advantage of firms. In this context, identifying capabilities inside the firm that match customers' expectations is one primary objective in order to leverage the correct resources and add value for customers. Based on characteristics of service factory firms, we run a customer satisfaction survey to assess which internet access services attributes/capabilities were more important for customers of a Brazilian telecommunication firm. The results show that customers want reliable telecommunication services. Thus, information technology as well as human resources should be developed by the firm to support the reliability of services.

007-0764: Security at the Source: Re-thinking the Processes for Secured Supply Chain

Simon Veronneau, HEC Montreal, Canada

Jacques Roy, HEC Montreal, Canada

At a time when organizations are asked to reassess their vulnerability, supply chains are under tight scrutiny. A recent quality criterion for supply chain is to be secured and not cause organizations further weaknesses. Certain high-risk organizations are now tightly screening all shipments before it enters their premises. These heightened logistical activities can prove to be very costly to a supply chain. While the necessity of such activities cannot be re-questioned for high-risk organizations, the processes to achieve secured shipments must be reviewed. Similar to quality at the source philosophy, this field research tested the benefits of security at the source. It was found that once new processes were implemented upstream in the supply chain, substantial benefits were achieved, including increased velocity and lower security costs. This paper outlines new processes for industries requiring enhanced security in their shipments due to their high-risk profile.

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Monday, May 7, 10:30-noon **Room:** Terrace
Session: Matching Demand with Supply for Products and Services: Empirical Investigations

Track: Emp Res, 15

Chair: Kamalini Ramdas

007-0286: Competing Retailers and Inventory: An Empirical Investigation of U.S. Automobile Dealerships

Marcelo Olivares, University of Pennsylvania, United States

Gerard Cachon, University of Pennsylvania, United States

In this study we empirically estimate the effect of local market conditions on inventory of U.S. automobile dealerships. We obtained data (via a web crawler) on inventory and sales of auto dealerships of a large manufacturer. Using cross-sectional variation of dealers in isolated markets, we estimated the effect of market structure (number and type of competitors), local demographics and sales on inventory levels. Our results suggest a strong positive non-linear effect of the number of rivals on service levels. Counterfactual experiments indicate that reducing the dealership network of this manufacturer (thereby reducing competition) could reduce the remaining dealers' inventory to sales ratio from 13% to 24%.

007-0262: Demand-supply Mismatch and Stock Market Reaction: Evidence from Excess Inventory Announcements

Kevin Hendricks, Wilfrid Laurier University, Canada

Vinod Singhal, Georgia Institute of Technology, United States

This paper documents that excess inventory announcements, an indication of demand-supply mismatch, are associated with statistically and economically significant negative stock market reaction. The results are based on a sample of 418 excess inventory announcements made during 1990-2002. Over a two-day period (the day of the announcement and the day before the announcement) the mean (median) stock market reaction is -5.89% (-3.80%), with more than 68% of the sample firms experiencing a negative market reaction. When excess inventory is at the announcing firm's customers, the market reaction is more negative than when the excess inventory is at the announcing firm. The stock market reaction is less negative for announcements made by larger firms. Firms with higher growth prospects have more negative stock market reactions.

007-0518: Administration of Advance Purchase Discounts

Karan Girotra, INSEAD, France

Advance Purchase Discounts have been identified as a strategy to obtain early demand information and reduce demand-supply mismatches (Tang et al, 2004). In this study, we develop an econometric technique that allows firms to efficiently utilize the obtained demand information and develop improved demand forecasts.

007-0682: An Investigation into the Causes of Airline Flight Delays

Kamalini Ramdas, University of Virginia, United States

Jonathan Williams, University of Virginia, United States

We examine why airlines differ systematically in their on time performance, using detailed data on flight arrival and departure times, and other factors affecting delays. Controlling for previously identified variables such as choice of point-to-point vs. hub-and-spoke network and airport congestion, we examine how aircraft utilization impacts delays. Based on queueing theory fundamentals, we hypothesize that more highly utilized aircraft should on average suffer greater delays. Further, we expect that the impact of utilization on delays should be mediated by the amount of variability in the route flown by the aircraft, and that the impact of utilization on delays should be mediated by the degree of capacity flexibility available on an aircraft's route. We are able to explain differences in on-time performance across airlines as a function of key operational and strategic variables, and to provide insight on how airlines can improve their on-time performance.

214	Monday, May 7, 10:30-noon Room: Vista	Track: JIT & Lean, 10	Chair: Angel Diaz
	Session: Implementation and Application of JIT and Lean Production - II		

007-0246: Leagility in Procurement: A Conceptual Framework

Sumeet Gupta, The Logistics Institute - Asia Pacific, Singapore

Mark Goh, The Logistics Institute Asia Pacific, Singapore

Robert DeSouza, The Logistics Institute - Asia Pacific, Singapore

Miti Garg, The Logistics Institute - Asia Pacific, Singapore

Lean and Agile Supply chains have widespread applications in the field of manufacturing. Several studies describing the successful implementation of the principles of lean and agile especially in the manufacturing processes of Toyota, Dell among others have been conducted. However learnings from lean and agile supply chain management in manufacturing can benefit the field of procurement. This paper elaborates on the application of the lean and agile management in procurement by developing a model for product categorization. In the next section, the literature elaborating on the principles of lean, agile and leagile SCM is described. This is followed by extension of the principles of leagility to procurement and inventory management.

007-0520: Improvement of Lean Methodology with FMEA

Aamir Shekari, Iran University of Science & Technology (Behshahr Branch), Iran (Islamic Republic of)

Soheil Falahian, Iran University of Science & Technology (Behshahr Branch), Iran (Islamic Republic of)

Considering the degree of competition between companies in the world, advantages in competition will be won by those companies who focus on performance improvement, customer satisfaction, reducing the costs. Lean production strategies can help identify and eliminate non-value added resources. FMEA technique is applied to analyze the possible failures, in order to raise the safety factor and customer satisfaction. Considering the weak and strong points of each of methods, and the synergy between them, simultaneous implementation of these two, leads to better results comparing to their separate implementation. In this paper, we focus on implementing them together in a way that not also their specific abilities will not be lost, but also raise the overall performance of the organization.

007-0715: JIT & Lean Manufacturing

Prashant Patil, Pune University, India

Here as a very important member of TPM Implementation team I am presenting, how a major Indian company (Godrej - Lawkim) transformed its manufacturing and maintenance capabilities with immense focusing and innovative approach. The paper explains how company successfully achieved Autonomous Maintenance practices. It also includes the different types Kaizens Implemented. Also takes cout of Realiability & Quality Analysis. All this explained in very analytical and logical manner with in detail examples. includes which method company is using for continuous improvement. It also includes new concept of Cost Analysis done for project right from first step of implementation till the last step, which takes care of the financial part of it.

007-0153: Lean Manufacturing Principles: Are Venezuelan Firms Applying Them?

Jose Gimenez, Instituto de Estudios Superiores de Administracion, Venezuela

Angel Diaz, Instituto de Empresa, Spain

Oswaldo Lorenzo, Instituto de Empresa, Spain

Lean manufacturing principles are being applied by many successful enterprises all around the world. This paper, based on a sample of 30 Venezuelan manufacturing firms, analyzes the lean manufacturing practices currently used by these firms. Data has been gathered thanks to the questionnaire prepared for the fourth edition of the International Manufacturing Strategy Survey, a tool that periodically surveys manufacturing firms about their manufacturing and supply chain strategies, practices and performance. This IMSS edition has focused on industrial firms manufacturing machinery, electric and electronic devices, medical and optical equipment, all kinds of vehicles and, in general, metal parts and components. We have chosen the answers related to lean aspects in order to see how far these subjects have been adopted by Venezuelan firms. Results show that, even if there is room to improvement opportunities, Venezuelan firms are adapting lean practices to an environment characterized by constraints in international merchandising exchange.