

TECHNOLOGY MANAGEMENT SECTION<http://tms.section.informs.org>

Published by TMS for its fall academic meeting

From the Chair's Desk
— **Sarfraz Mian**

With this year's fall annual meeting on the horizon, your Technology Management Section is poised for a well-prepared conference with a full agenda in Atlanta. I am pleased to say that we have significant accomplishments to report, in all areas of our professional activity, since our last annual meeting in San Jose. The revamping of our exiting program offerings, addition of two international joint meetings, enhancements in web and member communication, and some new initiatives, all of which were made possible by the efforts of our new cadre of enthusiastic officers.

In the program area, Diana Bailey, the Program Vice Chair, conducted an innovative survey to solicit member input in mid March. Based on this feedback, she has put together a quality program that covers an array of important technology management topics which are of interest to our members: technology and organizational change, technology strategy, R&D management, creating an environment for innovation, organizational agility, product innovation, strategies to manage technological knowledge-base of the firm, technology alliances, technology diversification and economic performance, and much more.

In July 2003, we participated in the EURO/INFORMS joint international conference in Istanbul, Turkey. Moren Lévesque, our Vice Chair Membership and Communication, organized an entrepreneurship cluster on behalf of TMS. Ten competitive papers were presented including business models, opportunity recognition, international venturing, commercializing emerging technologies, risk and innovative market entries, entrepreneurial strategies and new venture growth. A distinguished speaker gave a tutorial on the application of quantitative methods in entrepreneurial research. Ours was a well-attended cluster at the conference.

The initial plans for our CORS/INFORMS joint international meeting at Banff, Canada to be held in May 2004, are in place. Elicia Maine, our TMS Cluster Chair is organizing sessions around: NPD, knowledge management, organizational structure, technology diffusion, technology portfolio management, TM

education initiatives, technology policy, entrepreneurship and new ventures, along with other industry specific topics. Banff is a very attractive location to visit, and I urge our members to seriously consider attending the event. Please contact Elicia at <emaine@sfu.ca> if you are interested in submitting a paper or organizing a session.

This year we have invited Professor William E. Halal of George Washington University as our TMS Distinguished Speaker (please read a recent Newsweek report on his innovative web based technological forecasting project). Professor Halal's talk in the area of knowledge management and technological forecasting is featured on Monday at 16h30 (see details on page 2 in this newsletter). He will be available for informal

(Continued on page 14)


**ATLANTA
BUSINESS MEETING**

The Technology Management Section business meeting will be held on Monday, October 20, 2003 18h00 - 19h00. A wine and cheese reception will follow and you will get to meet with the TMS officers and other distinguished colleagues. Please do not miss this networking opportunity.



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William E. Halal
The TMS Distinguished Speaker
— Sarfraz Mian

The title of William Halal's speech is "Mastering the Knowledge Revolution: Highlights from the GW Forecast of Technology & Strategy." Professor Halal presents results of his GW Forecast Project, a sophisticated website that pools the knowledge of experts working online to forecast breakthroughs in all fields of science and technology. Forecasts of emerging technologies show advances in all fields that promise to transform life in 20 years. These remarkable developments are shown to be driven by the Knowledge Revolution because science and technology are fundamentally knowledge, and the spreading of powerful IT systems is advancing the growth of knowledge as never before. Halal concludes by forecasting fundamental changes in business, government, and other institutions to manage this explosion of change and complexity.

William Halal is Professor of Management at George Washington University, Washington, D.C. An authority on emerging technology, strategic management, knowledge management, and institutional change, he has consulted for General Motors, IBM, AT&T, MCI, Blue Cross/Blue Shield, International Data Corporation, the Department of Defense, foreign companies, and various government agencies. Professor Halal recently substituted for Peter Drucker in giving a talk to 2000

managers at the Los Angeles Coliseum.

Halal's work has appeared in journals such as *The California Management Review*, *Strategy & Business*, *Knowledge Management Review*, *The Academy of Management Executive*, *Human Relations*, *Systems & Cybernetics*, and *Technological Forecasting*, as well as popular media like *The New York Times*, *The Christian Science Monitor*, *Advertising Age*, *Executive Excellence*, and *The Futurist*. He has authored five books: *The New Capitalism* (Wiley, 1986), outlined the system of business and economics for the Information Age; *Internal Markets* (Wiley, 1993), describes how organizations replace hierarchy with internal market economies; *The New Management* (Berrett-Koehler, 1996), shows that democracy and enterprise are transforming organizations; *The Infinite Resource* (Jossey-Bass, 1998), includes chapters by 20 corporate CEOs and politicians on knowledge organizations; and *21st Century Economics* (St. Martin's Press, 1999), explores the emerging global economy.

For the past decade, Professor Halal has been developing the GW Forecast, an electronic network that gathers online the estimates of experts around the world and synthesizes this knowledge into the best possible forecast of emerging technology and strategy. The Forecast can be thought of as "A Virtual Think-Tank for Tracking the Technology Revolution." (GWForecast.gwu.edu). He also founded the Institute for Knowledge Management with Mike Stankosky, Professor of Engineering.

Professor Halal studied engineering, business, economics, and the social sciences at Purdue and Berkeley. Previously, he was an Air Force major, an aerospace engineer on the Apollo Program, and a Silicon Valley business manager. He serves on the advisory boards of Advanced Micro Devices Corporation (AMD), the World Future Society, and other organizations. His work has received prominent recognition. One paper, "Beyond the Profit-Motive," won the Mitchell Prize and an award of \$10,000, and he received a Freedom Foundation award for excellence in the study of enterprise. Macmillan's Encyclopedia of the Future ranked Halal among "The World's 100 Most Influential Futurists," which included H.G. Wells, Arthur C. Clarke, Alvin Toffler, Daniel Bell, and Leonardo Da Vinci. (For more details, see Prof. Halal's website at <http://home.gwu.edu/~halal>)

The lecture is scheduled on Monday, October 20, 2003 from 16h30 to 18h00 (please see the schedule for room location). After the lecture there will be a wine and cheese reception at 18h00 followed by the TMS business meeting. Please do not miss this networking opportunity.



TMS Doctoral Dissertation Award 2003 — Glenn Dietrich

The 2003 Informs TMS Best Doctoral Dissertation Award was announced in September this year . The following doctoral graduates have been chosen as winner and finalists.

Best Dissertation Award goes to:

Arvids A. Ziedonis, University of California at Berkeley, for his thesis "The Commercialization of University Technology: Implications for Firm Strategy and Public Policy".

The three runner-ups were:

Charles M. Weber, Sloan School of Management, for his thesis "Rapid Learning in High Velocity Environments".

Robert A. Lowe, University of California at Berkeley, for his thesis "Invention, Innovation, and Entrepreneurship: The Commercialization of University Research by Inventor-Founded Firms".

James M. Morgan, University of Michigan, for his thesis "High Performance Product Development: A Systems Approach to a Lean Product Development Process".

Congratulations to the winners !!!

In recognition of the award, the winner and finalists are invited to present a synopsis of their dissertations at the upcoming INFORMS meeting in Atlanta, Georgia. We have a full session devoted to the best dissertation awards on Monday, October 20th, at 10h00. INFORMS will cover \$500 of the winner's travel expenses and \$300 for each runner-up. There will be plaques for the winners.

TMS OFFICERS	
Chair :	Sarfraz Mian (mian@oswego.edu)
Vice Chair Membership & Communication:	Moren Lévesque (mxl101@cwru.edu)
Vice Chair Programs:	Diane Bailey (dbailey@leland.stanford.edu)
Information Officer:	Jennifer Karlin (jennifer.karlin@sdsmt.edu)
Past Chair:	Glenn Dietrich (gdietrich@utsa.edu)

History of the Technology Management Section — Moren Lévesque

The history of the Technology Management Section of INFORMS goes back to 1979 when Dr. Dundar Kocaoglu and about 30 colleagues formed the TIMS College on Engineering Management or COLEM. COLEM was approved by the TIMS Council in May 1979, where before TIMS and ORSA merged the TIMS Colleges were the equivalent of INFORMS Sections. Dr. Kocaoglu was the first president of COLEM, followed by Drs. John Manley, Jim Solberg, Ravi Ravindran, Burton Dean and others.

There were other TIMS Colleges with similar activities, notably the College on Research and Development or COLRAD which was founded in the late fifties by Dr. Al Rubenstein. Dr. Peter Norden served as COLRAD chairman, and so did Dr. Burton Dean. In the mid-eighties another related college emerged, the College on Innovation and Entrepreneurship with Dr. Burton Dean as its founding chairman. COLEM, COLRAD and the College on Innovation and Entrepreneurship were merged into the College on Technology and Engineering Management or COLTEM in 1989. COLTEM continued until the TIMS/ORSA merger. After the merger in 1995, INFORMS converted the TIMS Colleges, ORSA Divisions and Special Interest Groups into INFORMS Sections. COLTEM then became the Technology Management Section or TMS.

Dr. Jeff Liker took over as chair of the TMS to be more formally developed. The infrastructure, including the succession system for leadership that had been developed in the earlier COLTEM, had fallen into disarray. He worked hard at merging it with the Productivity Section, whose long-time president was Dr. Mike Radnor, and rebuilding some of the basic features like timely newsletters, a web page, an active dissertation award, and distinguished speakers. After the two Sections merged, a new set of by-laws were created and the baton was passed to a new generation of active leaders. TMS increased its membership to over 300 members.

The Newsletter's editor would like to thank Drs. Burton Dean, Dundar Kocaoglu, and Jeffrey Liker for their important contribution to this historical note.



INFORMS -Technology Management Section Atlanta, GA '03 Sponsored/Invited Program (Oct 19 - 22, Sun-Wed)

—Diane Bailey

This year's TMS sponsored cluster for the INFORMS Annual Meeting is comprised of more than thirty intriguing and interesting research talks in the area of technology management. Our eight paper sessions are complemented by talks by our Distinguished Speaker, Dr. William Halal of George Washington University, and our Dissertation Award winners. In addition, this year we have a new feature: a panel discussion jointly hosted by TMS and the New Product Development group entitled, "Interface between NPD and Technology Management." We hope you'll join us for this great line-up of talks and discussion!

The program begins on *Sunday, October 19th* with three paper sessions that center around technology. The opening session takes as its focus the interactions that arise from technological and organizational changes. Topics include how Toyota creates an environment for innovation, the relationship between product architecture and firm boundaries, and the impact of ERP adoption on organizational agility. Last year's Dissertation Award co-winner, Annique Un, will also present in this session, looking at unintended consequences of product innovation. The day concludes with two sessions on technology and strategy. The first session focuses on managing the firm's knowledge base. Papers here consider such issues as the development of corporate technological knowledge and the relation between technology diversification and economic performance. The second session includes papers on B2B marketplaces and relationships, contract design in the freight forwarding industry, and investments in knowledge for IT-worker systems.

Monday, October 20th starts off bright and early with a paper session on managing the R&D process. Topics in this session include game-theoretic and real options analysis in strategic decision-making and an analysis of design iterations and transaction costs in distributed software development. Special events mark the rest of the day. The Dissertation Award winner speaks in the morning, followed by the panel discussion with NPD after lunch. In the afternoon, we hear from Dr. William Halal as this year's Distinguished Speaker. His talk is entitled, "Mastering the Knowledge Revolution: Highlights from the GW Forecast of Technology & Strategy." We'll hold the TMs business meeting directly after Dr. Halal's talk. Please join us for news, updates, and refreshments!

Tuesday, October 21st rounds out our schedule with four paper sessions. The first session considers how knowledge flows across the university-industry interface. Papers in this session address questions of the commercialization of university inventions, the role of strong property rights in

and licensing behavior of science and engineering faculty. The next session considers innovations in market entry and diffusion, with topics that include issues of new-product adoption over time and switching behavior in technology procurement. The day's third session presents practical and theoretical insights on new venture formation. Papers consider ideas such as how a "knightian" notion of uncertainty might help explain the emergence of entrepreneurial firms and a stopping model for the decision of when to switch from exploration to exploitation of a new venture opportunity. The day, and our sponsored cluster, ends with a session that examines knowledge, technology and organization in new product development. Topics in this final session include how accelerating product development with peer-to-peer technologies may engender unanticipated consequences and how knowledge management may help reduce the risk associated with new product development.

We look forward to great talks, lively discussions and time to chat with our many TMS members at this year's meeting!

Sunday, October 19th

SB15 10h00 – 11h30 Interactions: Technological and Organizational Change

Chair: **Sebastian Fixson**, University of Michigan, 1205 Beal Avenue, IOE 2793, Ann Arbor MI, USA, fixson@umich.edu.

- P1. *The Toyota Way: Creating an Environment for Innovation.* **Jeffrey Liker**, University of Michigan, 1205 Beal Avenue, Ann Arbor MI 48109, USA, liker@umich.edu.
Abstract: Toyota in 2003 was the most profitable company in Japan and more profitable than the Big-3 U.S. companies combined. Year after year profitability and quality awards are a result of internal social and technical systems that make up "the Toyota way." This philosophy and management approach supports innovation and continuous improvement.
- P2. *The Impact of ERP Adoption on Organizational Agility: An Empirical Investigation.* **Andrea Masini**, London Business School, Regents Park, London, United Kingdom, amasini@london.edu.
Abstract: This paper examines the impact of ERP adoption on the degree of formalization of organizational processes and on the cognitive mechanisms through which the firm responds to changes in its external environment. Theoretical and managerial insights are obtained via the analysis of a sample of American and European SAP clients.
- P3. *Unintended Consequences of Product Innovation: Organizational Change.* **Annique Un**, Cornell University, Johnson Graduate School of Management, 370 Sage Hall, Ithaca NY 14850, USA, cau3@cornell.edu.

Abstract: This paper analyzes the unintended consequences of product innovation. It explains how when the firm innovates existing products to meet the changes in the demands of the market place, it is forced to alter its work processes because of the interdependencies in generating the product innovation.

P4. Product Architecture Changes and Firm Boundary Shifts: Causes and Consequences. **Sebastian Fixson**, University of Michigan, 1205 Beal Avenue, IOE 2793, Ann Arbor MI 48109, USA, fixson@umich.edu.

Abstract: Several conceptual models have been proposed to link product architecture and industry structure. To explore this relationship between product design decisions and firm boundary choices in more detail, this paper uses detailed case analyses to map individual event sequences. The direction of change and drivers from outside of the two domains are examined.

SC15 13h30 – 15h00 Technology & Strategy: Managing the Firm Knowledge Base

Chair: **Francisco Veloso**, Carnegie Mellon University, Department of Eng. and Public Policy, 5000 Forbes Av., Pittsburgh PA 15232, USA, fveloso@cmu.edu.

P1. R&D, Organization Structure, and the Development of Corporate Technological Knowledge. **Nicholas Argyres**, Boston University, 595 Commonwealth Avenue, Boston MA 02215, USA, nargyres@bu.edu; **Brian Silverman**, University of Toronto, 105 St. George Street, Toronto ON M5S 3E6, Canada, silverman@rotman.utoronto.ca.

Abstract: We draw on transaction cost theory and theories of innovation to explore the link between a firm's choice of a centralized or decentralized R&D structure and the type of innovation it produces. We find that firms with centralized R&D generate innovations that have a larger and broader impact on later technological development than decentralized R&D. We find mixed evidence that centralized R&D leads to broader search, and evidence that R&D budgets can substitute for authority relations.

P2. Evolution of External R&D: Exploring the Role of Equity Investment in Building Technology Alliances. **Gary Dushnitsky**, Stern School of Business, New York University, 44 West 4th St. Suite 750, New York NY 10012, USA, gdushnit@stern.nyu.edu; **Michael Lenox**, Duke University, PO Box 90210, Durham NC 27708, USA, mlenox@duke.edu.

Abstract: Building on the organizational learning and the economics of information literatures, we argue that external R&D efficiency depends on the sequence by which linkages evolve. We examine to what extent incumbent firms who take an equity stake in an entrepreneurial venture are more likely to establish an alliance with that venture, concluding that corporate venture capital may be instrumental in identifying and allying with innovative partners and an important part of a firm's innovation strategy.

P3. Giving up Competitive Advantage? The Role of Learning in the Expiration of Real Options. **Atul Nerkar**, Columbia University, 721 Uris Hall, 3022 Broadway, New York NY 10027, USA, aan19@columbia.edu.

Abstract: Do firms give up competitive advantage that emanates from the ownership of real options in the technology sector? Using a path dependent approach, I suggest that firms give up of competitive advantage when the uncertainty underlying the real option is reduced via learning. Empirical evidence based on patent data is presented.

P4. Technology Diversification and Economic Performance: A Within Industry Perspective. **Francisco Veloso**, Carnegie Mellon University, Department of Eng. and Public Policy, 5000 Forbes Av., Pittsburgh PA 15232, USA, fveloso@cmu.edu; **Patrick Steinemann**, Merrill Lynch, Merrill Lynch Financial Centre, London, United Kingdom, patrick_steinemann@ml.com.

Abstract: This paper examines the relation between diversification and performance. While most diversification studies look across industries and consider market diversification measures, we focus on a panel of firms in a single sector, automotive suppliers, and address technology diversification. Using a new measure of technological coherence, we show that firms with stronger coherence are able to better exploit corporate synergies and therefore achieve superior economic performance.

SD15 16h30 – 18h00 Technology and Strategy II

Chair: **Aleda Roth**, Kenan Flagler Business School, University of North Carolina at Chapel Hill, McColl Building, CB 3490, Chapel Hill NC 27599, USA, aleda_roth@unc.edu.

P1. Seller-Buyer Relationships and Environmental and Contextual Factors in the B2B Arena. **Eve Rosenzweig**, Emory University, 1300 Clifton Road, Atlanta GA 30322, USA, Eve_Rosenzweig@bus.emory.edu.

Abstract: Internet-based business-to-business (B2B) marketplaces enable the development and exchange of goods and services among businesses. Consistent with contingency theory, we develop a model that links three distinct types of seller-buyer relationships in the B2B arena with various market, supply chain and product characteristics. The model is empirically tested using data collected from a carefully designed web-based survey.

P2. Strategic Indicators of B2B eMarketplace Financial Performance. **Timothy Laseter**, University of Virginia, 100 Darden Boulevard, Charlottesville VA 22903, USA, LaseterT@Darden.virginia.edu.

Abstract: The population of B2B eMarketplaces—like the speculative bubble which triggered them—progressed through a rapid cycle of growth and decline with over half failing in a few short years. This paper employs a conceptual model drawing upon Industrial Organization Economics and the Resource-Based View of the Firm to explain financial success. To test the model, we surveyed 273 surviving B2B eMarketplaces and achieved a 22% percent response rate which provided some clear indicators of performance.

P3. Contract Design in the Freight Forwarding Industry. **Stefan Spinler**, The Wharton School, USA, sspinler@wharton.upenn.edu.

Abstract: In this study, we examine the determinants of contract design in the freight forwarding industry. In particular, we show that flexibility contracts lead to higher capacity utilization and improved return on assets, both through analytical and simulation based results. Strategic implications resulting from contingency contracts in the context of integrated vs. non-integrated supply-chain set-ups in freight transportation are discussed.

P4. Adaptive Supply Chain Networks From Theory To Application. **Murat Kristal**, UNC-Chapel Hill, Kenan-Flagler Business School, Chapel Hill NC, USA, kristal@unc.edu; **Aleda Roth**, Kenan Flagler Business School, University of North Carolina at Chapel Hill, McColl Building, CB 3490,

Chapel Hill NC 27599, USA, aleda_roth@unc.edu.
Abstract: Based on complexity theory, a complex adaptive systems (CAS) refers to a system that emerges over time into a coherent form and adapts itself without any singular entity purposely managing it (Hollan d, 1995). We perceive supply chain networks as CASs, which are loosely coupled group of organizations that work together to enhance network competitiveness (Choi et al, 2001). In this paper we study the antecedents of adaptive supply chain networks, and show their impact on supply chain performance.

P5. *Dynamic Investments in Knowledge for IT-Worker Systems.*

Cheryl Gaimon, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, cheryl.gaimon@mgt.gatech.edu;
Karen Napoleon, University of Georgia, Terry College of Business Administration, Athens GA 30602, USA, knapol@terry.uga.edu.

Abstract: We introduce a model for the long-term planning of an IT-worker system. The firm determines the timing of a series of IT upgrades in an environment where technological change occurs such that the level of knowledge embedded in the IT offered by vendors increases over time. We examine how the firm's level of worker knowledge (skill, training, and forgetting) impacts profit and the IT investment decision.

Boston University, 595 Commonwealth Avenue, Boston MA, USA, joglekar@bu.edu.

Abstract: We present a Design Structure Matrix (DSM) and associated transaction cost data to study the relationship between task dependencies and the amount of coordination effort, i.e., the amount of hours spent managing the development tasks. We deploy these data to observe modularity at two distinct sets of interfaces across a software development project: internal and external. Observed modularity is used to develop tests for the relation between uncertainty and accrual of coordination costs.

P4. *Insights on Predicting the Productivity of Project Managers in Service Operations.* **Tonya Boone**, College of William & Mary, School of Business, Williamsburg VA 23185, USA, tonya.boone@business.wm.edu; **Ram Ganeshan**, College of William & Mary, School of Business, Williamsburg VA 23185, USA, ram.ganeshan@business.wm.edu.

Abstract: Making efficient resource-allocation decisions, especially with respect to professional knowledge workers, has long been a critical issue with service organizations. Using fifteen years of data collected on projects with varying complexity completed by managers with a wide range of experience, this talk attempts to provide insights on how the productivity of project managers (and/or the organizations they are in) can be accurately measured.

Monday, October 20th

MA15 8h00 – 9h30 Managing the R&D Process

Chair: **Melissa Appleyard**, Portland State University, School of Business Administration, P.O. Box 751, Portland OR 97207, USA, appleyard@virginia.edu.

P1. *The Influence of Risk Perspectives on Project Teams.*

Lynne Cooper, Jet Propulsion Laboratory, 4800 Oak Grove Drive, MS 303-310, Pasadena CA 91109, USA, lynne.p.cooper@jpl.nasa.gov.

Abstract: Risk is an intrinsic part of the ambitious work pursued by project teams. There are, however, multiple ways of defining risk. This research proposes the concept of "risk perspectives" – an orientation toward risk that influences how a person conceives of, communicates about, and makes decisions concerning risk. It identifies three perspectives with the potential to influence project teams: financial, societal, and technical, and presents propositions for how they may influence project teams.

P2. *Integrating Game-Theoretic and Real Options Analysis in Strategic Decision-Making.* **Nile Hatch**, BYU, Marriott School, 790 TNRB, Provo UT 84602, USA, nile@byu.edu; **Douglas Johnson**, Purdue University, Krannert Graduate School of Management, West Lafayette IN 47907, USA, johnsond@mgmt.purdue.edu.

Abstract: Game theory and real option analysis represent two complementary, yet distinct, approaches to understanding the strategic behavior of firms in R&D investments. This paper develops an analytical approach that integrates game theory and real options and then applies our approach to the decision facing Airbus and Boeing in investing in the emerging superjumbo jet segment of the aircraft industry. This application illustrates how managers can practically implement this approach to R&D investments.

P3. *Design Iterations and Transaction Cost Accrual: Evidence from Distributed Software Development.* **Paulo Gomes**, Universidade Nova de Lisboa, Rua Marquês da Fronteira, 20, 1099, Lisbon, Portugal, pgomes@fe.unl.pt; **Nitin Joglekar**,

MB15 10h00 – 11h30 TMS Dissertation Award

Chair: **Glenn Dietrich**, The University of Texas-San Antonio, Information Systems, 6900 N. Loop 1604 West, San Antonio TX 78249, USA, gdietch@utsa.edu

Best Dissertation Award to **Arvids A. Ziedonis**, University of California at Berkeley.

Three Runner-ups: **Chales M. Weber**, Sloan School of Management; **Robert A. Lowe**, University of California at Berkeley; **James M. Morgan**, University of Michigan.

MC14 13h30 – 15h00 Joint Panel with Product Development: Interface between NPD and Technology Management

Chair: **Cheryl Gaimon**, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, cheryl.gaimon@mgt.gatech.edu.

Cheryl Gaimon, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, cheryl.gaimon@mgt.gatech.edu; **Vish Krishnan**, University of Texas – Austin, Austin TX 78712-5921, USA, krishnan@mail.utexas.edu; **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu; **Thomas Roemer**, MIT, 50 Memorial Drive, Cambridge MA, USA, troemer@mit.edu; **Kingshuk K. Sinha**, University of Minnesota, USA, ksinha@csom.umn.edu; **Mihkel Tombak**, University of Toronto, 105 George St., Toronto ON, Canada, mtombak@business.queensu.ca.

MD15 16h30 – 18h00 Technology Management Section Distinguished Speaker

Chair: **Sarfraz Mian**, State University of New York-Oswego, School of Business, 310 Rich Hall, Oswego NY 13126, USA, mian@oswego.edu.

"Mastering the Knowledge Revolution: Highlights from the GW Forecast of Technology & Strategy" **William Halal**, The George

Washington University, Halal@gwu.edu. Professor Halal presents results of his GW Forecast Project, a sophisticated website that pools the knowledge of experts working online to forecast breakthroughs in all fields of science and technology. Forecasts of emerging technologies show advances in all fields that promise to transform life in 20 years. These remarkable developments are shown to be driven by the Knowledge Revolution because science and technology are fundamentally knowledge, and the spreading of powerful IT systems is advancing the growth of knowledge as never before. Halal concludes by forecasting fundamental changes in business, government, and other institutions to manage this explosion of change and complexity.

M 18h00 – 19h00 TMS Business Meeting

Chair: **Sarfraz Mian**, State University of New York-Oswego, School of Business, 310 Rich Hall, Oswego NY 13126, USA, mian@oswego.edu.

Tuesday, October 21st

TA15 8h00 – 9h30 University-Industry Interfaces: How Knowledge Crosses the Moat Surrounding the Ivory Tower

Chair: **Robert Lowe**, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh PA 15213, USA, roblowe@andrew.cmu.edu.

P1. *Start-ups, Established Firms, and the Commercialization of University Inventions.* **Robert Lowe**, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh PA 15213, USA, roblowe@andrew.cmu.edu; **Arvids Ziedonis**, University of Michigan, 701 Tappan Street, Ann Arbor MI 48109, USA, azied@bus.umich.edu.

Abstract: We examine the role of the entrepreneurial firm in commercializing university technology. We find that start-ups are neither more nor less “successful” than established firms, but play a distinct role in the commercialization process: intermediate development organizations. We find that commercialized inventions licensed by inventor-founded start-ups are virtually always commercialized only after the start-up has developed the technology and been acquired by an established firm.

P2. *Do Strong Property Rights Inspire Academic Entrepreneurship?* **Brent Goldfarb**, University of Maryland, 3314 Van Munching Hall, College Park MD 20742, USA, bgoldfarb@rhsmith.umd.edu.

Abstract: We develop a model that describes how strong intellectual property rights encourage inventors to participate in the commercialization of their technologies when they do not have control rights over the intellectual property. This case describes inventions emanating from US universities. We use the model using a dataset that follows academic inventors and their relationships with firms. We find that strong IPR's encourage inventor involvement in general, and academic entrepreneurship in particular.

P3. *Patterns of Research and Licensing Activity of Science and Engineering Faculty.* **Marie Thursby**, Georgia Institute of Technology, 755 Ferst Drive, Room 431, Atlanta GA 30332, USA, marie.thursby@mgt.gatech.edu; **Jerry Thursby**, Emory University, Atlanta GA 30322, USA, jthursb@emory.edu. Abstract: We examine a database of publication, disclosure, and personal profiles of 3,241 faculty from 6 US universities. We

examine the evolution of faculty research and licensing behavior over time and the extent to which it is related to characteristics such as age and academic quality of their department. We find that the much-publicized increase in licensing activity appears to be concentrated among a minority of faculty and does not appear to signal a change in the direction of faculty research.

TB15 10h00 – 11h30 Innovations: Market Entry and Diffusion

Chair: **Christian Schade**, Humboldt University, Spandauer Str. 1, Berlin 10178, Germany, schade@wiwi.hu-berlin.de.

P1. *Using Spatial Statistics for the Analysis of New-Product Adoption over Time.* **Christian Schade**, Humboldt University, Spandauer Str. 1, Berlin 10178, Germany, schade@wiwi.hu-berlin.de; **Yasemin Boztug**, Humboldt University, Spandauerstr. 1, Berlin 10178, Germany, boztug@wiwi.hu-berlin.de.

Abstract: The paper concerns itself with a new way to analyze the new-product adoption over time: spatial statistics. The major advantage of this approach is that observations may be treated as spatially dependent, i. e. a low-distance adoption is more likely to impact on an individual's adoption decision than a large-distance adoption. Implications of this new kind of analysis and requirements for further research are discussed.

P2. *Dependence and Switching Behavior in Technology Procurement.* **Ralf Linke**, Humboldt University, Alexanderplatz. 6, Berlin 10178, Germany, linke@wiwi.hu-berlin.de.

Abstract: A firm may face barriers to adopt a new technology. In case of a specific technology the firm will be locked in due to a transaction and production costs advantage with the current technology which cannot be transferred to the innovation. A strong body of empirical evidence suggests that perceived system dependence may also influence switching behavior. Implications for the innovator are discussed.

P3. *Analyzing E-Learning Adoption via Recursive Partitioning.* **Philipp Koellinger**, DIW Berlin, Koenigin-Luise-Straße 5, Berlin 14195, Germany, pkoellinger@diw.de; **Christian Schade**, Humboldt University, Spandauer Str. 1, Berlin 10178, Germany, schade@wiwi.hu-berlin.de.

Abstract: The paper analyzes factors that influence the adoption of e-learning and gives an example of how to forecast technology adoption based on a post-hoc predictive segmentation using a classification and regression tree (CART). We find strong evidence for the existence of technological interdependencies and organizational learning effects. Furthermore, we find different paths to e-learning adoption. The results of the analysis suggest a growing “digital divide” among firms.

P4. *Innovation Diffusion with Heterogeneous Preferences.* **Julia Grishchenko**, Humboldt University, Spandauer Str. 1, Berlin 10178, Germany, gristschenko@wiwi.hu-berlin.de; **Christian Schade**, Humboldt University, Spandauer Str. 1, Berlin 10178, Germany, schade@wiwi.hu-berlin.de.

Abstract: The paper proposes a model analyzing the diffusion of an incremental innovation. We model the innovation diffusion as a function of the probability that the new rather than the old product will be purchased. The purchase probability is derived based on two phenomena: consumers' awareness and product utility perception. Therefore, the innovation diffusion is determined by the information spread regarding the new product and changes in the utility perception of the new and old products.

TC15 13h30 – 15h00 Practical and Theoretical Insights on New Venture Formation

Chair: **Maria Minniti**, Economics Division, Babson College, Babson Park, MA 02457, USA, minniti@babson.edu

P1. *Quantitative Process Model for a Technology Transfer Firm.* **Michael Dowell**, 5iTech LLC, 1768 E. 25th Street, Cleveland OH 44114, USA, mbdowell@5itech.com; **L.A. Polott**, 5iTech LLC, 1768 E. 25th Street, Cleveland OH 44114, USA, lapolott@5itech.com.

Abstract: Flow diagrams for a firm that validates foreign technologies are presented. Technology is channeled to (a) industrial partners supporting its flow, (b) license to third parties, or (c) formation of U.S. firms, or is discarded. Issues such as outcome mix and funds flow can thus be modeled in a familiar and quantitative way.

P2. *In Search of a Useful Theory of Entrepreneurship: Knightian Uncertainty and New Firm Formation.* **Atul Nerkar**, Columbia University, 721 Uris Hall, 3022 Broadway, New York NY 10027, USA, aan19@columbia.edu.

Abstract: This paper explores explanations for the emergence of entrepreneurial firms based on a 'knightian' notion of uncertainty. Such firms emerge at the nexus of environment, existing firms, individuals and opportunities. Based on this nexus, theoretical propositions that predict the likelihood of emergence of new firms are developed.

P3. *Different Ways to Model Preferences: An Application to Entrepreneurship Experiments.* **Andreas Schroeder**, Humboldt University, Spandauerstr. 1, Berlin 10178, Germany, aschroed@wiwi.hu-berlin.de; **Christian Schade**, Humboldt University, Spandauer Str. 1, Berlin 10178, Germany, schade@wiwi.hu-berlin.de.

Abstract: Experimental research in entrepreneurship often requires a formal benchmark actual behavior may be compared with. A formal benchmark model requires integrating a preference calculus into an optimization approach that is consistent with rationality and at the same time simple enough to keep the model tractable. These requirements are met with mean-variance preferences under certain conditions. These conditions are analyzed via a check of consistency with the expected utility world.

P4. *An Optimal Stopping Model for the Exploration and Exploitation of a New Venture Opportunity.* **Moren Lévesque**, Case Western Reserve University, 10900 Euclid Avenue, Cleveland OH 44106, USA, mxl101@cwru.edu; **Young Rok Choi**, School of Business, Singapore Management University, 469 Bukit Timah Road, Singapore 259756, yrchoi@smu.edu.sg; **Dean A. Shepherd**, Leeds School of Business, University of Colorado at Boulder, Boulder, CO 80309-0419, USA, Dean.Shepherd@colorado.edu.

Abstract: The decision of when to change focus from exploring the viability of a business opportunity to exploiting it impacts a new venture's profitability and survival. We propose the notion of an uncertainty threshold as the basis for a number of decision rules for deciding when to shift focus from exploration to exploitation.

TD15 16h30 – 18h00 Knowledge, Technology and Organization in New Product Development

Chair: **Diane Bailey**, Stanford University, Terman 428, MS&E Dept., Stanford CA 94305-4026, USA, debailey@leland.stanford.edu.

P1. *Organizing New Product Development Projects in Strategic Alliances.* **Donald Gerwin**, Carleton University, Business School, Ottawa ON K1S 5B6, Canada, dgerwin@ccs.carleton.ca; **Stephen Ferris**, Carleton University, Department of Economics, Ottawa ON K1S 5B6, Canada, sferris@ccs.carleton.ca.

Abstract: We use research on strategic alliances and on new product development (NPD) to study how alliances organize NPD projects. We identify at least four viable project organization options. Under varying conditions, we compare the costs and benefits of the options with respect to the underlying transaction costs, potential for learning, and contribution to developing a social relations network. We then determine the points at which costs and benefits indicate a switch from one option to another.

P2. *Accelerating New Product Development with Peer-to-Peer Technologies: Some Unanticipated Consequences.* **Julie Rennecker**, Weatherhead School of Management, Case Western Reserve University, 10900 Euclid Avenue, PBL 522, Cleveland OH 44106, USA, jar27@weatherhead.cwru.edu.

Abstract: This paper contrasts claims used to sell a peer-to-peer systems integration tool with observations of automotive NPD engineers' pre-implementation collaborative practices, illustrating the technical and organizational risks of substituting technology for "inefficient" person-mediated processes without compensating for their secondary benefits. The paper furthers our understanding of the contextualization of information as a foundation for designing and implementing NPD tools.

P3. *Overcoming Barriers to Knowledge Sharing: At the Frontier of Operations Strategy.* **Enno Siemsen**, Kenan Flagler Business School, University of North Carolina at Chapel Hill, McColl Building, CB 3490, Chapel Hill NC 27599, USA, Enno_Siemsen@kenan-flagler.unc.edu; **Sridhar Balasubramanian**, Kenan-Flagler Business School, University of North Carolina at Chapel Hill, McColl Building, CB 3490, Chapel Hill NC, USA, Sridhar_Balasubramanian@kenan-flagler.unc.edu; **Aleda Roth**, Kenan Flagler Business School, University of North Carolina at Chapel Hill, McColl Building, CB 3490, Chapel Hill NC 27599, USA, aleda_roth@unc.edu.

Abstract: Creating knowledge is a fundamental process to generate competitive advantage. Employees are major contributors to the generation of knowledge. Besides being an asset for the company, this knowledge is also an asset for each individual employee. Employees gain value with expertise. However, employees do not always share what they know with fellow employees. We present a conceptual framework that addresses this phenomenon, and we develop scales for an empirical test of this framework.

P4. *Research Issues for Reducing NPD Risk through Knowledge Management.* **Lynne Cooper**, Jet Propulsion Laboratory, 4800 Oak Grove Drive, MS 303-310, Pasadena CA 91109, USA, lynne.p.cooper@jpl.nasa.gov.

Abstract: Knowledge management systems (KMS) offer significant potential benefits for reducing risk in new product development (NPD). The promises of improved access to relevant knowledge and increased effectiveness for managing project team information, however, have not been fully realized. Instead, systems claiming these benefits may actually introduce new risks. This work suggests a research agenda for balancing risks and benefits in the use of knowledge-based tools.



INFORMS – New Product Development, Atlanta, GA '03

Sponsored/Invited Program

(Oct 19 - 22, Sun-Wed)

— Stylianos Kavadias and Nitin Joglekar

The New Product Development (NPD) cluster will feature over thirty research papers and three panel discussions beginning on Sunday and ending on Wednesday morning. Issues examined in the research papers include coordination and technology supply chains, managing new product variety, managing portfolios, market and performance considerations, product development and time-to-market.

Two panel sessions on Sunday will examine new product development pedagogy and emerging research themes respectively. The third panel (on Monday) is jointly organized by the NPD and TMS clusters to address themes at the intersection of NPD and technology management research and practice.

Sunday, October 19th

SA14 08h00 - 09h30 Pedagogy: NPD in Business School Settings

Chair: **Christian Terwiesch**, Wharton School of Business, 1319 Steinber-Dietrich Hall, Philadelphia PA, USA, terwiesch@wharton.upenn.edu.

- P1. *Using the Xpult to Teach Process Capability and Experimental Design.* **Karl Ulrich**, Wharton School, Huntsman Hall, Philadelphia PA, USA, ulrich@wharton.upenn.edu; **Christian Terwiesch**, Wharton School of Business, 1319 Steinber-Dietrich Hall, Philadelphia PA, USA, terwiesch@wharton.upenn.edu.

Abstract: We have developed a small low-cost catapult that provides a hands-on exercise for learning about process capability and experimental design. In this talk, we demonstrate the device - the Xpult- and show how it can be used in courses on operations management, process improvement, product design, or quality.

- P2. *Product Development as the Integrating Theme in Business Core Classes.* **Nitin Joglekar**, Boston University, 595 Commonwealth Avenue, Boston MA, USA, joglekar@bu.edu; **Frederic Brunel**, Marketing Department/ School of Management, Boston University, USA, brunel@bu.edu; **Jonathan Hibbard**, Marketing Department/School of Management, Boston University, USA, jhibbard@bu.edu.

Abstract: Our undergraduate core consists of traditional marketing, operations, information systems, and finance courses integrated into a unique sequence through the new product development project. Statistics from 350 team projects are used to illustrate the strengths of this type of pedagogy. Teaching innovations needed to institute the integrated curricula are highlighted.

- P3. *Student Projects in Product Development.* **Christian Terwiesch**, Wharton School of Business, 1319 Steinber-Dietrich Hall, Philadelphia PA, USA, terwiesch@wharton.upenn.edu; **Karl Ulrich**, Wharton School, Huntsman Hall, Philadelphia PA, USA, ulrich@wharton.upenn.edu.

Abstract: Many product development classes require or encourage their students to 'get their hands dirty' by developing an actual product over the course of the quarter / semester. The purpose of this session is to discuss the logistics of student projects for courses we taught to undergraduate students, MBA students, and executive MBA students. Participants of this session are encouraged to share their experiences and best practices.

SB14 10h00 - 11h30 Panel: NPD Emerging Research Themes

Chair: **Vish Krishnan**, University of Texas at Austin, TX 78712, Austin TX, USA, vish.krishnan@bus.utexas.edu.

Vish Krishnan, University of Texas at Austin, TX 78712-5921, Austin TX, USA, vish.krishnan@bus.utexas.edu; **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu; **William Lovejoy**, University of Michigan, USA, wlovejoy@umich.edu; **Karl Ulrich**, Wharton School, Huntsman Hall, Philadelphia PA, USA, ulrich@wharton.upenn.edu.

SC14 13h30 - 15h00 Managing New Product Variety

Chair: **Kamalini Ramdas**, University of Virginia, 100 Darden Boulevard, Charlottesville VA, USA, ramdask@darden.virginia.edu.

- P1. *How does Component Standardization Impact Product Quality? An Empirical Study in the Auto Industry.* **Taylor Randall**, University of Utah, David Eccles School of Business, Salt Lake City UT, USA, acttr@business.utah.edu; **Kamalini Ramdas**, University of Virginia, 100 Darden Boulevard, Charlottesville VA, USA, ramdask@darden.virginia.edu.

Abstract: Component standardization is widely practiced as a means to offer high variety at low cost. We examine the impact of standardization on product quality, using data on automotive braking systems. We seek to identify what constitutes appropriate use of standardization, and to highlight the risks of inappropriate use of this design strategy.

- P2. *The Dynamics of Product Variety.* **Karl Ulrich**, Wharton School, Huntsman Hall, Philadelphia PA, USA, ulrich@wharton.upenn.edu; **Karthik Balasubramanian**, Wharton Business School, Philadelphia PA, USA, balasubramanian@wharton.upenn.edu; **Taylor Randall**, University of Utah, David Eccles School of Business, Salt Lake City UT, USA, acttr@business.utah.edu.

Abstract: How should we think about changes in the level of product variety over the lifecycle of a category? We provide theoretical and empirical evidence for the role of product variety in explaining industry lifecycle dynamics. The empirical work examines the laserprinter category over the period 1980-2000.

- P3. *Modular Design and Sequential Product Introduction.* **Vish Krishnan**, University of Texas at Austin, TX 78712-5921, Austin TX, USA, vish.krishnan@bus.utexas.edu; **Karthik Ramachandran**, University of Texas, 1 University Station,

Austin TX, USA, karthikr@mail.utexas.edu.

Abstract: Sequential Introduction of rapidly improving products can cause consumers to regret their earlier purchases. We find that a modular design strategy that localizes stable components in a standard module can alleviate consumer regret. We identify dominant pricing strategies over the range of competitive prices of the open source module factors.

- P4. *The Impact of Product Life-Cycle Management (PLM) Software on New Product Design and Development.* **Indranil Bardhan**, The University of Texas at Dallas, School of Management, 2601 North Floyd Road, Richardson TX 75083, USA, bardhan@utdallas.edu; **Rajiv Banker**, The University of Texas at Dallas, School of Management, Richardson TX 75083, USA, rbanker@utdallas.edu.

Abstract: PLM software has enabled companies to collaborate during product design and development. We investigate the impact of collaboration software on product development outcomes such as quality, cycle time, cost, and user satisfaction. Based on a study of 71 companies, we find that collaboration software has significant impact on time to market, quality and development costs.

SD14 16h30 - 18h00 Market and Performance Considerations in NPD

Chair: **Christian Terwiesch**, Wharton School of Business, 1319 Steinber-Dietrich Hall, Philadelphia PA, USA, terwiesch@wharton.upenn.edu.

- P1. *User Design of Customized Product.* **Karl Ulrich**, Wharton School, Huntsman Hall, Philadelphia PA, USA, ulrich@wharton.upenn.edu; **Taylor Randall**, University of Utah, David Eccles School of Business, Salt Lake City UT, USA, acttr@business.utah.edu; **Christian Terwiesch**, Wharton School of Business, 1319 Steinber-Dietrich Hall, Philadelphia PA, USA, terwiesch@wharton.upenn.edu.
Abstract: "User Design" has been proposed by many as a way to meet user needs more directly. However, user design presents cognitive and information processing challenges. Focusing on notebook computers at Dell, we demonstrate a new interface for user design and outline a planned experiment to test its effectiveness.
- P2. *Product Development Performance in the Global Automotive Industry.* **Stefan Thomke**, Harvard Business School, USA, sthomke@hbs.edu.
Abstract: In many fields, the economics of prototyping are being radically affected by new technologies. Indeed, these technologies seem to be affecting everything, from the development process itself, including its performance and structure. I will present empirical evidence for some of these changes from an empirical study on global automotive development.
- P3. *Competitive New Product Diffusion and the Economics of Launch Time Decisions.* **Sergei Savin**, Columbia Business School, 3022 Broadway, 404 Uris Hall, New York Ny 10027, USA, svs30@columbia.edu; **Christian Terwiesch**, Wharton School of Business, 1319 Steinber-Dietrich Hall, Philadelphia PA, USA, terwiesch@wharton.upenn.edu.
Abstract: We present a model describing the demand dynamics of two new products competing for a limited target market. The demand trajectories of the two products are driven by a market saturation effect and an imitation effect reflecting the product experience of previous adopters. In this general setting, we provide analytical results for the sales trajectories and lifecycle sales of the competing products. We use these results to study

the impact of launch time delay on overall lifecycle sales.

- P4. *Component Specifications, Product Performance, and Causal Knowledge in High-Performance Design.* **Roger Bohn**, University of California at Santa Barbara, USA, rbohn@ucsd.edu.

Abstract: Higher component specifications allow higher product performance, but the link is not 1:1 and designs avoid expensive components when feasible. The link is through detailed quantitative knowledge about component and subsystem behavior, often embodied in product simulators. Such knowledge complements higher specifications. Sharing specific knowledge with suppliers becomes critical.

Monday, October 20th

MA14 08h00 - 09h30 Coordinating NPD and Technology Supply Chains

Chair: **Edward Anderson**, University of Texas at Austin, 1 University Station, Austin TX, USA, edward.anderson@bus.utexas.edu.

- P1. *Opening Proprietary Code.* **Geoffrey Parker**, Tulane University/Freeman School of Business, New Orleans LA 70118, USA, geoffrey.parker@tulane.edu; **Marshall Van Alstyne**, School of Information/ University of Michigan, USA, mvanalst@umich.edu.
Abstract: We articulate a balance of incentives and openness to promote the creation of new information products. We show that environmental parameters such as the size of the market, the value of the code base, and network effects can affect the optimal choice of time to release and degree of openness.
- P2. *Impact of Alternative Selection Policies on Product Development Project Value.* **David Ford**, Texas A&M University, Civil Engineering Dept., College Stations TX 77843-3136, USA, DavidFord@tamu.edu; **Durward Sobek II**, Montana State University, USA, dsobek@ie.montana.edu.
Abstract: Effectively and efficiently policies for converging on a final product design are investigated with a dynamic model of system development at Toyota. Generic alternative descriptions are developed and used to describe alternative spaces, initial alternative consideration sets, and design convergence speeds and strategies. Results suggest how product development managers may improve alternative selection and management
- P3. *Design Integration: Who Should Go Back and Redo Their Work?* **Jovan Grahovac**, Tulane University/ Freeman School of Business, New Orleans LA 70118, USA, Jovan.Grahovac@tulane.edu; **Thomas Roemer**, MIT, 50 Memorial Drive, Cambridge MA, USA, troemer@mit.edu.
Abstract: We view new product development as an iterative process in which the overall task is partitioned and subsequent individual efforts of team members are integrated. We analyze various decision rules that can be used in deciding which individual tasks, if any, should be redefined and retried in order to perform another design iteration.
- P4. *Preliminary Results from an Empirical Analysis of Outsourced Product Design Across Firm Boundaries.* **Edward Anderson**, University of Texas at Austin, 1 University Station, Austin TX, USA, edward.anderson@bus.utexas.edu; **Alison Davis-Blake**, University of Texas - Austin, USA, alison.davis-blake@bus.utexas.edu; **Geoffrey Parker**, Tulane University/Freeman School of Business, New Orleans LA 70118, USA, geoffrey.parker@tulane.edu.
Abstract: We present preliminary hypotheses and evidence from

a survey studying how firms outsource portions of their core product development process in environments characterized by rapid technological and market change. In particular, we discuss the role of supply chain integrators whose job is to maintain product coherence across firm boundaries.

MB14 10h00 - 11h30 Complexity and Ambiguity in Project Management

Chair: **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu.

P1. *Incentives and Monitoring in Projects with Ambiguity.* **Svenja Sommer**, INSEAD, Boulevard de Constance, Fontainebleau, France, svenja.sommer@insead.edu; **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu.

Abstract: Incentive setting and progress monitoring are well understood in routine projects, but not in projects with ambiguity. We study in a model and empirically how incentive setting and monitoring need to be adjusted in projects that exhibit ambiguity.

P2. *Hierarchies and Problem Solving Oscillations in Complex Projects.* **Jurgen Mihm**, WHU, Burgplatz 2, Vallendar 56179, Germany, jumihm@whu.edu; **Bernardo Huberman**, Hewlett Packard Labs, USA, huberman@exch.hpl.hp.com; **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu.

Abstract: Complex projects are characterized by the inability to solve the overarching problem in one piece. Rather, problem solving is distributed across components, which are then integrated. This often leads to oscillations, or cycling through the solution space with slow convergence to a system solution. We show that hierarchies can help to dampen such oscillations (apart from their well known role of control).

P3. *The Role of Ambiguity in (Incomplete) Contracts.* **Sudheer Gupta**, University of Michigan, 701 Tappan Street, Ann Arbor MI 48109, USA, sudheer@umich.edu.

Abstract: Ambiguity – the inability to probabilistically know what you don't know for sure – is a common occurrence in business situations. We analyze the role of ambiguity in contractual relations with a formal game-theoretic framework. Incomplete contracts can endogenously emerge as rational responses to ambiguity. We discuss applications to supply chain contracting and project management.

P4. *Process, Practice and Politics: Relationship Between Documentation, Deployment and Work.* **Nelson Repping**, MIT Sloan, 50 Memorial Drive, Cambridge MA 02142, USA, nelsonr@mit.edu.

Abstract: We present an empirical study of a product development process initiative at Xerox Corporation focused on the use of standard processes. The more novel the project, the more rigid was the enforcement of the standard process. Our analysis provides insight into the challenges when using standard processes to manage innovation in both traditional and new markets and technologies.

MC14 13h30 - 15h00 Joint Panel with Technology Management: Interface between NPD and Technology Management

Chair: **Cheryl Gaimon**, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, cheryl.gaimon@mgt.gatech.edu.

Cheryl Gaimon, Georgia Institute of Technology, 755 Ferst Drive,

Atlanta GA, USA, cheryl.gaimon@mgt.gatech.edu; **Vish Krishnan**, University of Texas at Austin, TX 78712-5921, Austin TX, USA, vish.krishnan@bus.utexas.edu; **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu; **Thomas Roemer**, MIT, 50 Memorial Drive, Cambridge MA, USA, troemer@mit.edu; **Kingshuk Sinha**, USA, ksinha@csom.umn.edu; **Mihkel Tombak**, University of Toronto, 105 St. George St., Toronto ON, Canada, mtombak@business.queensu.ca.

MD14 16h30 - 18h00 Empirical Perspective on NPD and Technology Management

Chair: **Manuel Sosa**, INSEAD, Boulevard de Constance, Fontainebleau, France, manuel.sosa@insead.edu.

P1. *Management Competence.* **Andreas Enders**, WHU, Otto-Besheim Graduate School of Business, Koblenz DE, Germany, aenders@whu.edu; **Arnd Huchzermeier**, WHU, Otto-Besheim Graduate School of Business, Koblenz D, Germany, ah@whu.edu; **Luk van Wassenhove**, INSEAD, Boulevard de Constance, Fontainebleau, France, luk.van.wassenhove@insead.fr.

Abstract: Based on an study in the German electronics industry with dyadic data from 168 companies, we have tested a multi-dimensional model to control for the effects of resource deployment and reconfiguration on plant performance. We deliver empirical evidence for the resource-based-view of the firm and the theory of dynamic capabilities.

P2. *Knowledge Articulation, Genesis of IT Capabilities and NPD Effectiveness: An Empirical Investigation.* **Andrea Masini**, London Business School, Regents Park, London UK, United Kingdom, amasini@london.edu.

Abstract: This paper examines the efficacy of various knowledge generation strategies through which firms develop IT capabilities. We propose a model to identify configurations of IT adopters that undertake different cognitive efforts in different operational environments. The configurations are assessed particularly with respect to the effectiveness of their NPD activities.

P3. *Contracting, Directed Parts and Complexity in Automotive Outsourcing Decisions.* **Sharon Novak**, Kellogg School of Management, USA, s-novak@kellogg.nwu.edu; **Peter Kliibanoff**, Kellogg School of Business, Northwestern University, Evanston IL, USA, peterk@kellogg.nwu.edu.

Abstract: We examine the outsourcing of interior systems for luxury automobiles using contracts obtained from both buyers and suppliers to construct a theoretical framework and to empirically evaluate the interaction of product complexity, contract structure and buyer involvement in supplier product development in determining program pricing and performance. We find that directed parts and complexity serve as strongly negative substitutes in the determination of the equilibrium bid price.

P4. *Dynamic Alignment of Project and Organizational Structure in Complex Product Development.* **Manuel Sosa**, INSEAD, Boulevard de Constance, Fontainebleau, France, manuel.sosa@insead.edu.

Abstract: This longitudinal study examines the alignment of project and organizational structures during the concept development phase of a complex system of an aircraft. We present preliminary results of the variation over time of technical project interfaces and actual technical communication. We hypothesize causes for the observed dynamic behavior.

Tuesday, October 21st

TA14 08h00 - 09h30 Intersection of NPD and Supply Chains

Chair: **Nitin Joglekar**, Boston University, 595 Commonwealth Avenue, Boston MA, USA, joglekar@bu.edu

P1. *Product Line Design with Component Commonality and Design Investments.* **Hans Heese**, Kenan-Flagler School of Business, University of North Carolina, Chapel Hill NC, USA, seb@unc.edu; **Jayashankar Swaminathan**, Kenan-Flagler School of Business, University of North Carolina, Chapel Hill NC, USA, msj@unc.edu.

Abstract: Component commonality can mitigate the effects of product proliferation on product and supply chain complexity. However, increased component commonality can limit a firm's potential to extract price premiums through product differentiation. In this work, we explore the relationships between optimal commonality, pricing and design investment decisions for a monopolist.

P2. *Investment and Information Sharing in Collaborative New Product Development and Introduction.* **Sreekumar Bhaskaran**, McCombs School of Business, University of Texas at Austin, Austin TX, USA, sreekumar.bhaskaran@phs.bus.utexas.edu; **Vish Krishnan**, University of Texas at Austin, TX 78712-5921, Austin TX, USA, vish.krishnan@bus.utexas.edu; **Karthik Ramachandran**, University of Texas, 1 University Station, Austin TX, USA, karthikr@mail.utexas.edu; **Wenge Zhu**, University of Texas at Austin, 1630 W 6th St Apt E, Austin TX 78703, USA, zwenge@mail.utexas.edu.

Abstract: We conceptualize and formulate the collaborative product development problem and propose two mechanisms that involve the sharing of development cost and development effort, which we term investment and innovation sharing, respectively. These mechanisms can have varying effects on the investment and profits of firms, which we characterize in this paper.

P3. *Technology Introduction and Implications for Adoption.* **Sanjiv Erat**, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, sanjiv.erat@mgt.gatech.edu; **Stylianos Kavadias**, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, stylianos.kavadias@mgt.gatech.edu.

Abstract: The article develops a model for a technology supplier who dynamically introduces new technologies (processes or components) to multiple OEMs, that compete on quality in their end-product market. We analyze the resulting game theoretic structure and identify optimal technology pricing policies. In addition, we characterize the resulting market structures

P4. *Collaborative Development of Products and Supply Chains.* **Nitin Joglekar**, Boston University, 595 Commonwealth Avenue, Boston MA, USA, joglekar@bu.edu.

Abstract: Visibility and synchronization are critical governance decisions while managing the collaborative product and supply chain development. Using evidence from the medical devices industry, we model the joint impact of these two decisions on the product development and delivery performance in beginning of life (BOL) and end of life (EOL) situations.

TB14 10h00 - 11h30 Cooperation and Coordination in NPD

Chair: **Thomas Roemer**, MIT, 50 Memorial Drive, Cambridge MA, USA, troemer@mit.edu.

P1. *Collaborative Prototyping and the Pricing of Customized Products.* **Christian Terwiesch**, Wharton School of Business, 1319 Steinber-Dietrich Hall, Philadelphia PA, USA, terwiesch@wharton.upenn.edu; **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu.

Abstract: A major challenge in the creation of custom-designed products lies in the elicitation of customer needs. This process, to which we refer as collaborative prototyping, allows both parties to anticipate the outcome of the design process. We show that, depending on the design problem and the market characteristics, the customizing producer should offer prototypes with a profit, at cost, or even for free.

P2. *Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization.* **Jonathan Cummings**, MIT, 50 Memorial Drive, Cambridge MA, USA, cummings@mit.edu. Abstract: Building on social network theory, this paper argues that variation in features of group structure, termed structural diversity, can increase the value of external knowledge sharing. Using corporate database records, group member surveys, and senior executive's ratings of performance, a field study of 182 work groups in a global organization reveals that external knowledge sharing is more strongly associated with performance when groups have greater structural diversity.

P3. *The Role of Knowledge Redundancy in Collaborative Product Development.* **Kingshuk Sinha**, USA, ksinha@csom.umn.edu; **Changyue Luo**, Carlson School of Management, University of Minnesota, Twin cities MN, USA, cluo@csom.umn.edu; **Debashish Mallick**, Carlson School of Management, University of Minnesota, Twin Cities MN 55455, USA, dmallick@csom.umn.edu. Abstract: Despite the growing consensus on the importance of inter-firm collaboration in product development, over 75% of the firms are not satisfied with their CPD performance. We will present results of a multiple-case study, where we investigate how knowledge redundancy, a firm's internal capability of understanding and collaborating with its partners, impacts CPD performance.

P4. *Contracting, Architectural Knowledge and Warranty Costs: Evidence from the Automotive Industry.* **Sharon Novak**, Kellogg School of Management, USA, s-novak@kellogg.nwu.edu; **Sridhar Tayur**, GSIA, Carnegie Mellon University, Pittsburgh PA, USA, stayur@grobner.gsia.cmu.edu. Abstract: There has been a rise in the automotive industry of "full service" supplier contracts where suppliers adopt contractual responsibility for development of complete subsystems, such as the seat. This research demonstrates that the common practice of including buyer-specified components, or "direct parts," in such contracts can have unintended negative consequences for supplier effort incentives. This paper provides the first theoretical model and empirical test of the relationship.

TC14 13h30 - 15h00 Management of Uncertainty in NPD
Chair: **Stylianos Kavadias**, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, stylianos.kavadias@mgt.gatech.edu.

P1. *Dynamic Management of NPD Portfolios.* **Pirooz Vakili**, Boston University, Manufacturing Eng. Department, Boston MA, USA, vakili@bu.edu; **Leonardo Santiago**, Boston University, Manufacturing Eng. Department, Boston MA, USA, leonardo@bu.edu. Abstract: A model of an NPD portfolio with a multi-dimensional

state space and several funding/resource allocation levels for each project is considered. The issues of project selection, incremental resource allocation, and risk management in an integrated setting will be discussed. Results related to the optimal management of the portfolio will be presented.

P2. The Effect of Improving Data Quality upon Managing Product Development. **Nitin Joglekar**, Boston University, 595 Commonwealth Avenue, Boston MA, USA, joglekar@bu.edu; **Edward Anderson**, University of Texas at Austin, 1 University Station, Austin TX, USA, edward.anderson@bus.utexas.edu.

Abstract: We develop a control theoretic model to capture management decisions within distributed product development projects and allow for corruption in the progress status data either by mis-estimation or information systems errors. Our analysis yields a framework that illustrates the balance between data quality improvement costs/delays and ongoing product development costs.

P3. Managing Dynamically Project Portfolios. **Stylianos Kavadias**, Georgia Institute of Technology, 755 Ferst Drive, Atlanta GA, USA, stylianos.kavadias@mgt.gatech.edu; **Christoph Loch**, INSEAD, Boulevard de Constance, Fontainebleau, France, christoph.loch@insead.edu.

Abstract: We analyze how portfolio decisions and resource allocation are optimally done over time, when new product ideas get generated dynamically, and resources may or may not be available. We derive dynamic policies and discuss the implications.

P4. Efficiently Identifying Synergies in Project Portfolios. **Jeffrey Keisler**, University of Massachusetts Boston, M/5-230, 100 Morrissey Boulevard, Boston MA 02125, USA, Jeff.Keisler@umb.edu.

Abstract: Early stage R&D portfolios contain numerous assets low-EV assets whose effects, applications, interactions, and markets are unknown. Complete detailed decision analysis has prohibitive costs. Instead, several frugal analytic strategies are compared using simulated portfolios, e.g., combining detailed local evaluations of individual project characteristics with a coarse representation of the entire portfolio.

P5. Product Portfolio and Resource Management in Delay Sensitive Markets. **Ram Akella**, Baskin School of Engineering 131, University of California, Silicon Valley Center/Santa Cruz, Santa Cruz CA 95064, USA, akella@acsu.buffalo.edu; **Kristin Fridgeirsdottir**, London Business School, Regent's Park, London NW1 4SA, United Kingdom, kristin@london.edu.

Abstract: We construct optimal product portfolio and resource management models for a profit-maximizing facility that develops products where the profit generated by each product family decreases with increasing delay. The objective function has a particular non-concave structure that implies in our far-processing settings it is optimal to focus on one product family, while diversification results when there are priorities among the products. Next we simultaneously determine the optimal portfolio and the optimal resource levels.

358 Stuzin Hall, Gainesville FL, USA, janice.carrillo@cba.ufl.edu; **Richard Franza**, Kennesaw State University, Coles College of Business, 1000 Chastain Road, #0404, Kennesaw GA 30144-5591, USA, rfranza@coles2.kennesaw.edu.

Abstract: We present a model which offers guidance regarding several key new-product development (NPD) decisions. An appropriate investment strategy in both design and production capabilities is determined to speed new products to market. The model develops the optimal time-to-market and ramp-up-time necessary to meet peak demand for the new product.

P2. New Product Strategy and Industry Clockspeed. **Gilvan Souza**, University of Maryland, Smith School of Business, College Park MD 20742, USA, gsouza@rsmith.umd.edu; **Barry Bayus**, Kenan-Flager Business School, University of North-Carolina, Chapel Hill NC, USA, Barry_Bayus@unc.edu; **Harvey Wagner**, Kenan-Flager Business School, University of North Carolina, Chapel Hill NC, USA, harvey_wagner@unc.edu.

Abstract: We study the role of external industry factors (i.e., clockspeed), internal firm factors (i.e., product development, production, and inventory costs), and competitive factors in determining a firm's optimal new product introduction timing and product quality decisions. We explicitly model market demand uncertainty, and competition via an infinite-horizon Markov decision process. We find that more frequent new product introductions are optimal under faster clockspeed conditions.

P3. The Interaction of Quality, Warranty, and Price. **Dilip Chhajed**, University of Illinois at Urbana-Champaign, 350 Wohlers Hall, 1206 S. Sixth Street, Urbana IL 61820, USA, chhajed@uiuc.edu; **Kunpeng Lee**, University of Illinois, 1407 West Gregory Drive, Urbana IL, USA, kli@uiuc.edu; **Suman Mallik**, University of Illinois at Urbana-Champaign, 493 Wohlers Hall, 1206 South Sixth Street, Champaign IL 61820, USA, mallik@uiuc.edu.

Abstract: Warranty is important in the relationship amongst products, manufactures, and customers. Purchase decisions are often based on warranty when the true quality is unknown. Using a stylized model we seek answers to questions such as: Should a company with higher quality offer longer warranty? How a firm's prior reputation and price affect these decisions?

P4. Coordinated Product and Process Development for Multiple Product Generations. **Leslie Morgan**, University of Utah, 1645 E Campus Center Drive, Salt Lake City UT, USA, gtlm@business.utah.edu; **Janice Carrillo**, University of Florida, 358 Stuzin Hall, Gainesville FL, USA, janice.carrillo@cba.ufl.edu; **William Moore**, University of Utah, 1645 E Campus Center Drive, Salt Lake City UT, USA, mktbm@business.utah.edu; **Ruskin Morgan**, University of Utah, 1645 E Campus Center Drive, Salt Lake City UT, USA, mktrm@business.utah.edu.

Abstract: We develop an analytical model of coordinated product and process development when there are multiple generations of a product. Critical strategic decisions include not only the quality and timing of successive product generations, but also the synchronized introduction of new production technology.

TD14 16h30 - 18h00 Product Development and Time-To-Market

Chair: **Janice Carrillo**, University of Florida, 358 Stuzin Hall, Gainesville FL, USA, janice.carrillo@cba.ufl.edu.

P1. The Crucial Linkage Between Time-to-Market and Production Ramp-Up. **Janice Carrillo**, University of Florida,

Wednesday, October 22nd

WA14 08h00 - 09h30 Information Systems and Risk Management of Technology in New Product Development

Chair: **Ram Akella**, Baskin School of Engineering 131, University of California, Silicon Valley Center/Santa Cruz, Santa Cruz CA

P1. *Models for Efficient Triggered Learning in NPD.* **John Voit**, Delphi Corporation, USA, john.r.voit@delphi.com; **Ram Akella**, Baskin School of Engineering 131, University of California, Silicon Valley Center/Santa Cruz, Santa Cruz CA 95064, USA, akella@acsu.buffalo.edu; **Rajiv Kishore**, SUNY Buffalo, USA, rkiskore@buffalo.edu; **R. Ramesh**, SUNY Buffalo, USA, rramesha@acsu.buffalo.edu.

Abstract: We develop queuing models to provide managerial insights on the conditions under which knowledge management systems are competitive. These cost-benefit models enable us to understand the value of allocating resources between staff and line capacities to efficiently incorporate learning into New Product Development. We also discuss the related ontology development that increases the learning process efficiency in an automotive setting.

P2. *Value of Management Flexibility in R&D Projects Revisited.* **Leonardo Santiago**, Boston University, Manufacturing Eng. Department, Boston MA, USA, leonardo@bu.edu; **Pirooz Vakili**, Boston University, Manufacturing Eng. Department, Boston MA, USA, vakili@bu.edu.

Abstract: We analyze the impact of increased uncertainty / variability on the value of R&D projects and flexibility in managing them. We show that for development or market requirement uncertainty, general statements about the impact of increased uncertainty can not be made. However, when market payoff variability increases, the project value generally increases but there is a significant difference between improvement and abandonment options.

P3. *Analysis of Overlapping Activities of New Product Development (NPD).* **Jin Young Park**, Korea Advanced Institute of Science and Technology, USA, zknowledge@naver.com; **Hong Bae Jun**, Korea Advanced Institute of Science and Technology, USA, phobeto@naver.com; **Hyo Won Suh**, Korea Advanced Institute of Science and Technology, USA, hwsuh@mail.kaist.ac.kr.

Abstract: One of the most useful methods of process reengineering for NPD is the overlapping of activities. However, the overlapping does not always bring the benefits as expected. Some negative factors such as communication overhead, uncertain information, inappropriate communication timing generate time delays or cost increases. Thus, in this paper, we analyze the overlapping characteristics and evaluate the factors with a mathematical model.

P4. *Applying Decision Production Systems to Improve Environmentally Responsible Product Development.* **Jeffrey Herrmann**, University of Maryland, Department of Mechanical Engineering, College Park MD 20742, USA, jwh2@umd.edu; **Peter A. Sandborn**, University of Maryland, USA, sandborn@umd.edu; **Linda C. Schmidt**, University of Maryland, USA, lschmidt@umd.edu.

Abstract: The decision production systems methodology models the decision-making and information flow in a product development organization, analyzes the model, and identifies feasible improvements to the new product development process. This novel methodology has been applied to improve decision-making related to environmental impacts at a printed circuit board manufacturer.

(Continued from page 1)

conversations during our business meeting at 18h00. Please join us to make this event a success.

In the area of member communication, Jennifer Karlin, our Information Officer has done a wonderful job in updating and enriching the contents of our web page. The long held task of putting our newsletters on the web, which provides current and previous copies of the newsletter to our readers in electronic form, was realized this year (see <<http://tms.section.informs.org>>). To further enhance member communication, this year we started a separate list-serve for TMS, which is moderated by Jennifer.

In developing professional alliances, TMS continued to act as a "cooperating society" with PICMET (Portland International Conference on Management of Engineering and Technology). To further enhance our regional professional image, TMS developed cooperative arrangement with RIDIT (Red de Investigacion y Docencia sobre la Innovacion Tecnologica), a major Latin American technology and innovation network during my visit to Mexico in May 2003. This will allow regional contacts through information dissemination and will facilitate attending each other's key professional events.

During the past year, several of our TMS officers including myself have been involved in revamping our bylaws based on INFORMS standard requirements and input from our past Section officers. Based on our consensus a revised copy has been approved by INFORMS and will be circulated for your formal approval before or at the time of our business meeting in Atlanta.

Last but not the least, in the area of dissertation awards, we have witnessed a new enthusiasm resulting in an unprecedented number of high quality submissions (22, a more than two folds increase from previous years) that speaks of our popularity as a professional forum in the field. Thanks to the efforts of Glenn Dietrich, our Past Chair, we have completed our reviews and announced the winners — congratulations to the winners (see details page 3 in this newsletter). The awardees will present summaries of their work and will receive plaques during the Atlanta meeting.

We are all excited about the meeting and I bet you don't want to miss this event either. I look forward to seeing you ALL in Atlanta.