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PICMET '12

PICMET

Dear PICMET Guests:

It is a great pleasure for us to welcome you to PICMET '12.

Development and management of new technologies has been going on throughout history. Discovery of the wheel was a major breakthrough in the Stone Age. Agricultural production and distribution technologies became a game changer in the 18th and 19th centuries. Electricity and transportation technologies brought society to the Industrial Age driven by manufacturing efficiency in the 19th and early 20th centuries. Since then, technologies have been emerging at a dizzying pace. When computer technology emerged in mid-20th century, the world entered the technology era driven by knowledge. Soon after that, information and communication brought radical changes to the way we lived. Now, the bio and nanotechnologies are revolutionizing the society and changing every aspect of our lives. Both manufacturing and service sectors in every industry are being affected by these emerging technologies.

PICMET defines the primary role of Technology Management as the management of the technologies to assure that they work for the betterment of humankind. Identifying and developing emerging technologies; formulating technology policies; establishing technology strategies; evaluating and selecting alternative technologies; and implementing, commercializing and improving new technologies are the critical tasks in this age of rapid technological changes. These are all in the domain of Technology Management.

It is the responsibility of the Technology Management community to guide technology effectively to provide the world with the framework to respond to the changes taking place around us and to move continuously toward better futures through innovation and technology development.

This is a big challenge for the leaders and future leaders in the Technology Management field. Recognizing this challenge, the PICMET '12 Conference explores the role of technology management for emerging technologies.

More than 800 papers were submitted to PICMET '12. After they were reviewed by at least one referee from the 129-member Program Committee, 364 were included in the conference. The referees are from universities, industrial organizations and government agencies from around the world. The authors represent about 300 organizations in 37 countries.

The PICMET '12 Conference has two outputs:

This ***Conference Bulletin*** includes an up to 200-word abstract of each paper to enable the participants to select the sessions to attend and the presentations to follow. The Bulletin is intended as a reference book for an overview of the field, in general, and the conference, in particular.

The ***Proceedings*** is a flash drive containing full-length presentations included in the conference. Its purpose is to give full access to the entire conference for many years after the conference is over. The *Proceedings* is divided into 47 sections, listed below, each containing several papers on the topic of the section.

- **Science and Technology Policy**
- **Technology Management Framework**
- **Strategic Management of Technology**
- **Emerging Technologies**
- **Disruptive Technologies**
- **Collaborations in Technology Management**
- **Competitiveness**
- **Convergence of Technologies**
- **Decision Making**
- **Commercialization of Technology**
- **Entrepreneurship/Intrapreneurship**
- **Intellectual Property**
- **Patent Analysis**
- **E-Business**
- **Cultural Issues**
- **Environmental Issues**
- **Sustainability**
- **Technology Forecasting**
- **Technology Planning**
- **Technology Assessment and Evaluation**
- **Technology Adoption**
- **Technology Diffusion**
- **Technology Marketing**
- **Technology Transfer**

PICMET ’12

- **Technology Management Education**
- **Innovation Management**
- **Information Management**
- **Knowledge Management**
- **Project/Program Management**
- **New Product Development**
- **Nanotechnology**
- **Information Technology**
- **Semiconductor Industry**
- **Telecommunication Industry**
- **Transportation Industry**
- **Technology Management in the Energy Sector**
- **Technology Management in the Health Sector**
- **Technology Management in Services**
- **Technology Management in Auto Industry**
- **Manufacturing Management**
- **Productivity Management**
- **Quality Management**
- **R&D Management**
- **Software Process Management**
- **Resource Management**
- **Management of Technical Workforce**
- **Management of Tech-Based Organizations**

A large number of colleagues around the world contributed to the success of PICMET ’12.

The PICMET Board of Directors set the strategic direction; the Advisory Council provided guidance for the implementation of the strategies for the conference.

Ann White coordinated the overall planning for PICMET ’12; Liono Setiowijoso designed, maintained and managed the information systems, and formatted the papers for the *Proceedings* and the *Bulletin*; Kenny Phan managed the registration process; Songphon Munkongsujarit and Inthrayuth Mahaphol coordinated the on-site activities; and Jeff Birndorf of endesign developed graphic arts for the conference.

Vince Reindl, Mike Storch and Kai Oldenburg of Omnipress worked with PICMET from the beginning to the end of the conference planning effort. Their professionalism and superb expertise assured the high quality production of the PICMET *Proceedings* on schedule.

The Country Representatives, under the leadership of Kiyoshi Niwa of the University of Tokyo and Dilek Cetindamar of Sabanci University, provided linkages between PICMET and the regions they represented. The Program Committee, under the leadership of Tim Anderson and Tugrul Daim, reviewed the papers and provided valuable assistance to assure the highest quality of presentations.

The 129 members of the Program Committee reviewed the papers in a double-blind refereeing process.

Gary Perman provided the liaison between PICMET and IEEE. Antonie Jetter managed the finances. Charles Weber provided leadership in the selection of award recipients.

We acknowledge the support of all of these colleagues and hundreds of others who contributed to PICMET’s success, and express our gratitude to all.

We also offer special thanks to Dean Renjeng Su of Portland State University’s Maseeh College of Engineering and Computer Science for his support.

We believe the PICMET ’12 *Bulletin* and this *Proceedings* contain some of the best knowledge available on Technology Management for addressing the challenges and opportunities in a world becoming smarter in the development and utilization of energy technologies. We hope they will contribute to the success of technology managers and emerging technology managers throughout the world.

Dundar F. Kocaoglu
President and CEO, PICMET

PICMET ’12

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DEDICATION

PICMET ’12 is dedicated to all researchers, educators and practitioners of Technology Management who are contributing to the establishment and growth of this field throughout the world.

PICMET '12

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IEEE Oregon Technology Management Chapter

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PICMET has an International Advisory Council, which provides advice and counsel on critical issues and strategic directions. The members are listed below.

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Dr. Nuket Yetis, TUBITAK – Turkey

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PROGRAM COMMITTEE

The Program Committee consisted of 129 researchers, educators, practitioners and students of Technology Management from around the world. The members of the Program Committee evaluated the abstracts, reviewed the papers, and made recommendations on the appropriateness of each presentation for inclusion in the conference.

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PICMET LEADERSHIP IN TECHNOLOGY MANAGEMENT (LTM) AWARD RECIPIENTS

The PICMET Leadership in Technology Management (LTM) Award recognizes and honors individuals who have provided leadership in managing technology by establishing a vision, providing a strategic direction, and facilitating the implementation strategies for that vision.

The Award was established in 1991. The recipients between 1991 and 2011 with their affiliations and positions at the time of the award are listed below.

1991
Dr. Andrew S. Grove, CEO of Intel, USA

1997
Norman Augustine, Chairman of Lockheed Martin, USA

1999
Jack Welch, CEO of General Electric, USA
Dr. Richard M. Cyert, President of Carnegie Mellon University, USA

2001
Dr. Modesto A. Maidique, President of Florida International University, USA
Ms. Carleton S. Fiorina, Chairman and CEO of Hewlett-Packard Co., USA
Ms. Donna Shirley, Manager of the Mars Exploration Program, USA

2003
Mr. Jong-Yong Yun, Vice Chairman and CEO of Samsung Electronics, Inc., Korea
Dr. Joseph Bordogna, Deputy Director of the National Science Foundation (NSF), USA
Dr. Chun-Yen Chang, President of National Chiao Tung University, Taiwan

2004
Dr. Kwan Rim, Chairman of Samsung Advanced Institute of Technology (SAIT), Korea
Dr. Gunnar Hambraeus, member of the Swedish Royal Academy of Science and former President and Chairman, Royal Swedish Academy of Engineering Sciences, Sweden

2005
Dr. Morris Chang, Founding Chairman, Taiwan Semiconductor Manufacturing Company Ltd. (TSMC), Taiwan
Dr. Pairash Thajchayapong, Permanent Secretary, Ministry of Science and Technology, Thailand
Dr. Eric von Hippel, Professor and Head of the Technological Innovation and Entrepreneurship Group, Sloan School of Management, Massachusetts Institute of Technology, USA
Prof. Dr.-Ing. Dr. Sc. h.c. Bacharuddin Jusuf Habibie, former President, Indonesia, and founder and chairman, The Habibie Center, Indonesia

2006
Dr. Youngrak Choi, Chairman, Korea Research Council of Public Science & Technology (KORP), Korea
Dr. Tsuneo Nakahara, Adviser to CEO (past Vice Chairman) of Sumitomo Electric Industries, Ltd., Japan
Dr. Mehmet Nimet Ozdas, Dept. of Mechanical and Control Engineering, Istanbul Technical University, Turkey
Dr. Edward B. Roberts, David Sarnoff Professor of the Management of Technology and Chair, Massachusetts Institute of Technology (MIT) Entrepreneurship Center, USA

2007
Dr. Harold A. Linstone, Editor-in-chief, Technological Forecasting and Social Change, University Professor Emeritus, Systems Science, Portland State University, USA
Dr. Yoshio Nishi, Director of Research of the Stanford Center for Integrated Systems, Director of the Stanford Nanofabrication Facility, and Research Professor in the Department of Electrical Engineering at Stanford University, USA

2008
William P. Venter, Chairman, Allied Electronics Corporation Limited, South Africa
Gideon de Wet, Professor Emeritus, University of Pretoria, South Africa

2009
Dr. Klaus Brockhoff, Professor, Otto Beisheim School of Management, Germany
Anne M. Mulcahy, Chairman and Former CEO, Xerox Corporation, USA
Prof. Muhammad Yunus, Managing Director, Grameen Bank, Bangladesh

2010
HRH Princess Maha Chakri Sirindhorn, Thailand

2011
David M. Steele, Dean, College of Business and Lucas Graduate School of Business, San Jose State University, USA

PICMET '12

PICMET MEDAL OF EXCELLENCE AWARD RECIPIENTS

PICMET's "Medal of Excellence" recognizes extraordinary achievements of individuals in any discipline for their outstanding contributions to science, engineering and technology management.

The award was instituted in 2004. The recipients between 2004 and 2011 with their affiliations and positions at the time of the award are listed below.

2004
Dr. Daeje Chin, Minister of Information and Communications, Seoul, Korea
Dr. Kiyoshi Niwa, Professor in the Department of General Systems Studies at the University of Tokyo, Japan
Rosalie A. Zobel, Director of Components and Systems in the Information Society and Media Directorate-General of the European Commission

2005
Bob Colwell, President, R & E Colwell and Associates; and former Fellow, Intel Corporation

2006
Dr. Frederick Betz, Former Program Officer, NSF
Dr. Fariborz Maseeh, Founder and President, The Massiah Foundation
Dr. T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami

2007
Mihail C. Roco, National Science Foundation (NSF), National Nanotechnology Initiative (NNI), and International Risk Governance Council (IRGC), USA

2009
Dr. Albert H. Rubenstein, Founder and President, International Applied Science and Technology Associates (IASTA); Professor Emeritus, Industrial Engineering and Management Sciences, Northwestern University

2010
Kiran Mazumdar-Shaw, Chairman and Managing Director, Biocon Limited, India
Prof. Dr. Nuket Yetis, President, Scientific and Technological Research Council of Turkey (TÜBITAK)

2011
Alejandro Cruz, Minister of Science and Technology, Costa Rica

SHARE THE PICMET EXPERIENCE

THE PICMET EXPERIENCE

Joining the world's leading technology management experts from academic institutions, industrial corporations and government agencies for discussions on cutting-edge topics.

PICMET ’12

PICMET FELLOWS

On its 20th Anniversary, PICMET created a Fellow category as a new award to recognize outstanding contributions to the development and growth of the Engineering and Technology Management discipline. The first recipients of this new award are those who provided leadership in the establishment of PICMET and those who completed their six-year terms in serving the PICMET Advisory Council. The Fellows in subsequent years will be selected from nominees from around the world.

The 2011 Fellows are listed in alphabetical order below.

Mr. Charles Allcock, PGE, USA
Dr. Daniel Berg, Rensselaer Polytechnic Institute (RPI), USA
Dr. Frederick Betz, Portland State University, USA
Dr. Joseph Bordogna, University of Pennsylvania, USA
Dr. Youngrak Choi, Korea University, Korea
Dr. Robert Colwell, DARPA, USA
Dr. Joseph Cox, Distinguished Public Service Professor and Chancellor Emeritus, OUS, USA
Ms. Charmagne Ehrenhaus, Portland Community College, USA
Mr. Les Fahey, Fahey Ventures, USA
Dr. Gunnar Hambraeus, Royal Swedish Academy of Engineering Sciences, Sweden
Dr. Dundar Kocaoglu, Portland State University, USA
Mr. Thomas Lipscomb, The Center for the Digital Future, USA
Dr. Tom Long, Tektronix Vice President, Retired, USA
Mr. John McDougall, Alberta Research Council, Canada
Dr. Graham Mitchell, University of Pennsylvania, USA
Dr. Kiyoshi Niwa, The University of Tokyo, Japan
Dr. Kwan Rim, Samsung Corporation, Korea
Dr. Frederick Rossini, George Mason University, USA
Mr. Terry Rost, The Franchise Group, USA
Dr. Nam Suh, KAIST, Korea
Dr. Nejat Veziroglu, University of Miami, USA
Dr. Eric von Hippel, MIT, USA
Dr. Seiichi Watanabe, Terumo Corporation, Japan
Dr. Rosalie Zobel, European Commission, Belgium

STUDENT PAPER AWARD

PICMET NAMES ITS OUTSTANDING STUDENT PAPER AWARD

An endowment has been created to name the PICMET Outstanding Student Paper Award after **Brad W. Hosler**, who was a dedicated engineer and technology leader with 25 years of service at Intel, as well as a proud and loving family man. Brad Hosler lived by his motto: "Work hard, play hard."

AWARD CRITERIA

The Brad W. Hosler PICMET Outstanding Student Paper Award is bestowed upon a paper based on the student's research toward a graduate degree in the area of Engineering and Technology Management. Eligibility is restricted to currently enrolled students and those who have received their master's or doctorate degrees after July 31, 2010. The paper is nominated by the advising professor and selected by the Awards Committee. The award consists of $1,000, complimentary conference registration and a plaque for the student, as well as a plaque and complimentary registration for the nominating professor. The winner may not be nominated again for the same award in subsequent years.

ABOUT BRAD W. HOSLER

Brad Hosler passed away on August 31, 2007, at his home in Portland, Oregon, after several years of battling cancer. He received his undergraduate degree from Bucknell University and completed his graduate studies at Carnegie Mellon University. Brad joined Intel in 1980 to work on the architecture and implementation of the I/O subsystem and had key roles in the Plug & Play BIOS definition and its implementation on Intel's first PCI chipset, Saturn. He formed the Compliance Workgroup to establish the PC industry's first multi-vendor I/O compliance program. The innovative methods and practices that he architected and implemented have become the benchmark for the computer industry. Brad was among the pioneers recognized for his industry contributions at the 10-year anniversary of the PCI-SIG, which has a worldwide membership of about 900 companies.

Brad's signature accomplishments are associated with the Universal Serial Bus (USB) family of technologies. He received two Intel Achievement Awards, one in 2003 and another in 2006, for his outstanding work. The success of the USB interface and market of platforms and peripherals that sell in multiple billion units today is a measure of his impact.

Brad was promoted to Principal Engineer in 2006 and was vested with the informal authority of Chief Technical Officer for the USB Implementers Forum.

PICMET is proud to recognize Brad Hosler's accomplishments, as an engineer and a technology leader, by naming the Outstanding Student Paper Award after him.

STUDENT PAPER AWARD

BRAD W. HOSLER OUTSTANDING STUDENT PAPER AWARD

The number of students doing significant research in the area of Engineering and Technology Management was demonstrated by the number of nominations received. The selection of the award winner was difficult because of the excellent quality of all the submissions, but one paper stood out for its contributions to the field of Engineering and Technology Management.

AUTHOR

Vitavin Ittipanuvat

ADVISOR & CO-AUTHOR

Professor Yuya Kajikawa

UNIVERSITY

The University of Tokyo, Japan

PAPER TITLE

"Finding Linkage between Technology and Social Issues: A Literature Based Discovery Approach"

ABSTRACT

With social issues such as an aging society and sustainability becoming of greater concern than ever as we are heading towards the future society, decision makers in both the government and private sector need to identify and focus their efforts on promoting key technologies which have significant contributions to these increasingly complex social problems. However, such connections are not easy to trace, thus making this subject very difficult to be completely understood. Meanwhile, literature based discovery (LBD) has been widely accepted as an effective approach to discover hidden connections from information within bibliographical databases but is still used mainly in medical databases. This paper investigates the possibility of a broader application of LBD to reveal the linkage between technology and social issues from science and social science citation databases. Robotics and gerontology were selected as an example dataset, and some lexical statistics were used to suggest important connecting terms. The result shows various contributions of robotics to healthcare and the well-being of elderly people such as surgery, hearing implants, and rehabilitation. This methodology could offer an alternative approach in creating an overview picture of how one technology contributes to a particular social issue and assists in forming policies to promote key technologies towards the future society.

LTM AWARDS

The PICMET Leadership in Technology Management (LTM) Award recognizes and honors individuals who have provided leadership in managing technology by establishing a vision, providing a strategic direction, and facilitating the implementation strategies for that vision.

PICMET '12 AWARDEES

Dr. Daniel Berg
Distinguished Research Professor of Engineering, the University of Miami, USA

Dr. Daniel Berg is a Distinguished Research Professor of Engineering at the University of Miami. Previously, he was Dean and Provost at Carnegie Mellon University (CMU) as well as Provost and President at Rensselaer Polytechnic Institute (RPI) and Institute Professor of Science and Technology.

He received his B.S. in Chemistry and Physics from the City College of New York and his M.S. and Ph.D. in Physical Chemistry from Yale. He was employed by Westinghouse Electric in a variety of technical/managerial positions including Technical Director.

Dr. Berg serves as the American Editor of the *International Journal of Services Technology and Management*. He is the author of four books, five book chapters and over 80 refereed journal articles.

He is a member of the National Academy of Engineering, a Life Fellow of the Institute of Electrical and Electronic Engineers (IEEE), a Fellow of INFORMS, and a Fellow of the American Association for the Advancement of Science.

Dr. Berg's many awards and honors include the IEEE Engineering Management Section Educator of the Year Award; the IAMOT Award for Distinguished Achievement in Management of Technology; the IEEE Educational Activities Board Meritorious Achievement Award in Continuing Education; the National Academy of Engineering Service Award; the Townsend Harris Medal, City College of New York; the Wilbur Cross Medal, Yale University; and the Belden Prize for Mathematics.

Dr. Nam P. Suh
President, Korea Advanced Institute of Science and Technology (KAIST), Korea

Dr. Nam Pyo Suh has been the President of the Korea Advanced Institute of Science and Technology (KAIST) since July 13, 2006.

Dr. Suh was a member of the Presidential Committee on Science and Technology of Korea (2009-2010) and the chairman of the Commission for New Economic Growth of the Ministry of Economy and Knowledge (2008-2009). He was also the President of the Accreditation Board of Engineering Education of Korea (ABEEK).

Previously, he had been at MIT (1970-2008), where he was Director of the Park Center for Complex Systems (formerly the Manufacturing Institute) and the Head of the Department of Mechanical Engineering (1991-2001). He was also the Founding Director of the MIT Laboratory for Manufacturing and Productivity (1977-1984), the Founder and Director of the MIT-Industry Polymer Processing Program (1973-1984). He is now the Ralph E. & Eloise F. Cross Professor, Emeritus.

In October 1984, Professor Suh took a leave of absence from MIT to accept a Presidential Appointment at the National Science Foundation, where he was in charge of engineering. He returned to MIT in January 1988. For his contributions, he received the Distinguished Service Award of the National Science Foundation.

Dr. Suh has received many awards and honors. He received seven honorary doctoral degrees: Doctor of Humane Letters from the University of Massachusetts-Lowell in 1988, Doctor of Engineering from Worcester Polytechnic Institute in 1986, Honorary Doctor (Tekn. Hedersdoktor) from the Royal Institute of Technology (KTH), Stockholm, Sweden, in 2000, Doctor of Engineering Honoris Causa, University of Queensland in 2007, Doctor Scientiarum *Honoris Causa* from the Technion, Israel Institute of Technology in 2007, Doctor of Science and Technology from Carnegie-Mellon University in 2008, and Honoris Causa from Babe -Bolyai University, Cluj-Napoca, Romania, in 2009. Also, in 2011 the Technical University of Denmark awarded him the Gold Medal, its highest honor.

He is the recipient of the 2009 ASME Medal, the highest honor bestowed by the American Society of Mechanical Engineers. In 2006, he received the General Pierre Nicolau Award, the highest honor given by the International Academy for Production Engineering (CIRP). Also from

LTM Awards

ASME, he received the Gustus L. Larson Memorial Award, the Blackall Award, the Best Tribology Paper Award, and the William T. Ennor Manufacturing Technology Award. *Time* selected his invention of the On-Line Electric Vehicle (OLEV) as one of "The 50 Best Inventions of 2010." Mobile Harbor was ranked second in the "10 best start-up ideas of 2011" by StartupSmart, an Australia-based consultancy firm. Also in 2010, the MIT Geospatial Data Center created the "Professor Nam Suh Award for Innovation in Design of Software Systems."

In 2011, the Society for Design and Process Science (SDPS) selected him for the 2011 transformative Achievement Medal and the Korea Economic Institute awarded him the Korean-American Achievement Award. In 2008, he was given the second Pony Chung Award of the Pony Chung Foundation and the Inchon Education Award of the Inchon Memorial Foundation. He received the F.W. Taylor Research Award of SME; an SPE Best Paper Award; Federal (NSF) Engineer of the Year Award from NSPE; and the American Society for Engineering Education Centennial Medallion. He was also awarded the National Science Foundation's Distinguished Service Award. In 1994, he was awarded the KBS Korean Compatriot Award for Scholarly Achievements. He is also the winner of the 1997 Ho-Am Prize for Engineering. In 2000, he was the recipient of the Mensforth International Gold Medal of the Institution of Electrical Engineers of the United Kingdom. In 2001, he received the Hills Millennium Award from the Institution of Engineering Designers of the United Kingdom. In 2006, the Academy of Transdisciplinary Learning and Advanced Studies (Society for Design and Process Science) awarded him the Academy Gold Medal of Honor. In 2007, he received the Lifetime Achievement Award of SPE. He was awarded the 2008 Proud Korean award for educational contributions by the Korea Association of Journalists and the Distinguished Alumni Award by Carnegie Mellon University.

He is the author of over 300 papers and seven books, holds more than 70 patents, and edited several books. Among the books he has authored are *Elements of the Mechanical Behavior of Solids* (with A.P.L. Turner published by McGraw-Hill, 1975), *Tribophysics* (Prentice-Hall, 1986; translated into Chinese), *The Principles of Design* (Oxford University Press, 1990; translated into Japanese and Korean), *The Delamination Theory of Wear* (Elsevier, 1974), *Axiomatic Design: Advances and Applications* (Oxford University Press, 2001, also translated into Japanese and Chinese), *Complexity: Theory and Applications* (Oxford University Press, 2004), and *Axiomatic Design and Fabrication of Composite Structures* (with D. G. Lee, Oxford University Press, 2004).

His contributions to the field of tribology include the delamination theory of wear, the solution wear theory, a theory on the genesis of friction, coated cutting tools, the use of undulated surfaces to lower friction and wear, and new woven electrical connectors. The Institute of Scientific Information (ISI) chose his paper on delamination theory of wear as the citation classic. His invention of electric connectors that have low friction and low contact resistance (originally manufactured by Tribotek, Inc., now acquired by Methode Electronics, Inc.) received the Product of the Year award of Power Electronics Technology magazine in 2005. In the field of design, he has developed Axiomatic Design theory, which is taught worldwide. It is required for certification of Master Black Belts by the American Society of Quality. He also advanced a theory of complexity and the concept of Functional Periodicity. In the field of polymer processing, he invented many industrially important processes and devices, including microcellular plastics (commercially known as MuCell, trademark of Trexel, Inc.), the USM foam molding process, the Axiometer for moisture measurement in polymers, the Electrostatic Charge Decay NDE technique (commercialized by QEA, Inc.), and the foam/straight plastic lamination/forming process (sold in billions by Sweetheart Plastics, Inc.). In metal processing, he is the inventor of a new metal processing technique called the Mixalloy Process. At KAIST, he invented the on-line electric vehicle (OLEV) and the Mobile Harbor (MH). OLEV is being commercialized by two firms.

Professor Suh was a Series Editor for the Advanced Manufacturing Series and an Editor of the MIT/Pappalardo Series in Mechanical Engineering of Oxford University Press. He was also the Founding Co-Editor-in-Chief of the International Journal *Robotics and Computer-Integrated Manufacturing* from 1981 to 1996, and also serves on editorial boards of many journals.

He is a member of the Board of Directors of Axiomatic Design Software, Inc., and Parker Vision, Inc. He is a member of the Board of Trustees of King Abdullah University of Science and Technology (KAUST) and a member of the International Advisory Board of the King Fahd University of Petroleum and Minerals (KFUPM) of Saudi Arabia, and the Khalifar University of Science, Technology and Research (KUSTAR) of UAE. He has been a consultant for many industrial firms. He was a member of the board of directors of Silicon Valley Group, Inc., Therma Wave,

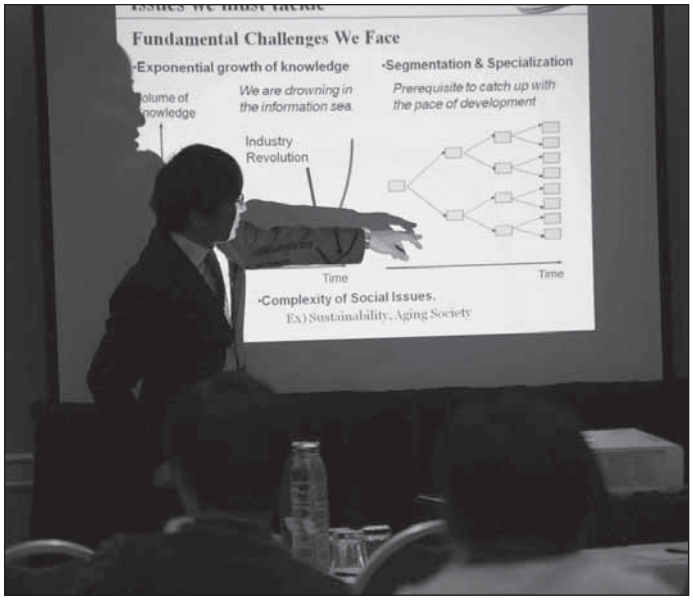
LTM Awards

Inc., the founder and member of the board of directors of Trexel, Inc., Integrated Device Technologies, and Triboteck, Inc.

He is a Fellow of the University of Tokyo. He is an Honorary Professor at Yanbian University of Science and Technology, China; Honorary Professor of the University of Hong Kong; and Advisory Professor of Shanghai Jiaotong University, China. He was an Eminent Visiting Professor at the Korea Advanced Institute of Science and Technology, Korea. He has been on visiting committees of Georgia Institute of Technology, Stanford University, the University of Michigan, and the University of California - Berkeley. He was a member of the DoD Panel on "Global War on Terrorism" and served on a research award committee of ASEE. He was a consultant of the Lawrence Livermore National Laboratory and Korea Electric Power Research Institute. He was a member of the Visiting Committee for the National Institute of Standards and Technology (a statutory committee). In addition, he was a member of the Development and Advisory Council of the Texas A&M University Department of Mechanical Engineering and a member of the Science Board of MacroChem Corporation. He served on advisory committees of the Lawrence Livermore National Laboratory, the Idaho National Engineering Laboratory, and Alcan Aluminum Corporation. He was a member of several NRC and NAE committees. He was also the chairman of the ASME Productivity Committee. He was a member of the Scientific Committee of the ENDREA Program of Sweden. He also evaluated a Kplus Center in Austria.

He has consulted extensively for governments, the World Bank, the United Nations, universities, and many industrial firms throughout the world on various technical matters, the development of economic policies, and the creation of new products and processes. He was the architect of the Five-Year (1980-85) Economic Development Plan of the Republic of Korea.

Professor Suh was educated at Buckingham, Browne and Nichols School (1955), MIT (S.B., 1959, and S.M., 1961) and Carnegie-Mellon University (Ph.D., 1964).



SHARE THE PICMET EXPERIENCE

General Information

CONFERENCE FOCUS

As computer technology reaches maturity, information technology continues to grow, and bio and nano technologies start to develop rapidly, emerging technologies are increasingly becoming the defining characteristics of the 21st century.

There is no shortage of efforts for developing new technologies throughout the world. As the technologies develop, it becomes the responsibility of the Technology Management community to guide those technologies effectively for the betterment of humankind. This is a big responsibility for the leaders and emerging leaders in the Technology Management field, but it is critical that they accept the responsibility and meet the challenges head on. That is the focus of the PICMET '12 Conference. The role of Technology Management for Emerging Technologies is highlighted throughout the conference.

WHO SHOULD ATTEND

Following the PICMET tradition, this high-impact symposium will set the stage for innovation management for decades to come. The world's leading experts from academic institutions, industrial corporations and government agencies will participate in the discussions. PICMET '12 is essential for:

- Presidents and CEOs of technology-based corporations
- Vice presidents of engineering, R&D and technology in industrial organizations
- R&D managers
- Engineering, manufacturing, operations, quality and marketing managers in the technology-based organization
- Project and product managers
- Information systems managers in industrial and service organizations
- Technology management researchers
- Educators in engineering management, technology management, manufacturing management, technology marketing, software management, information systems management, project management, and technology-focused MBA programs
- Engineering and technology management program heads
- Students in engineering management, management of technology and related programs
- Government officials responsible for technology policy
- Government officials responsible for science and technology programs
- Engineers and scientists moving from technical specialty to management positions while maintaining their identity in technical fields

PROGRAM

The PICMET '12 program consists of

- Ph.D. Colloquium, "Getting Your PhD….and Beyond," Sunday, July 29, 13:00 - 17:00, Orca Room (South Tower, 3rd floor)
- Plenary sessions by global leaders from industrial corporations, academic institutions and government agencies in the Pavilion-Ballroom
- Two special meetings:
  1. Country Representatives Meeting, Wednesday, August 1, 12:00-14:00, Constellation Suite (35th floor, South Tower)
  2. PICMET '13 & '14 Planning Session, Thursday, August 2, 16:00-17:30, Pavilion-Ballroom C
- Research papers by cutting-edge researchers
- Applications papers by researchers and practitioners working on industry applications
- Panel discussions with interactions between panelists and the audience
- Tutorials on select topics by authorities in the field

PUBLICATIONS

There will be two publications at PICMET '12:

- The "Bulletin" containing the symposium schedule and abstracts of each presentation
- The "Proceedings" containing all of the papers on USB drive

The publications will be available to PICMET '12 attendees at the registration desk.

REGISTRATION POLICY

All PICMET attendees, including speakers and session chairs, must register and pay the registration fee to have access to sessions and other events. The registration fee allows admittance to all technical session and social events.*

Name badges must be worn to all PICMET sessions, functions and events. If you attend workshops, site visits, or other events not covered by the registration fee, you will be required to pay an additional fee.

**The one-day registration fee does not include the evening social events. The student registration fee does not include Sunday, Monday and Tuesday evening events. The PhD Colloquium and site visits are not included in the registration fee. Tickets for these events may be purchased at the registration desk.*

GENERAL INFORMATION

SESSION AND PAPER DESIGNATIONS

The sessions are identified by a four-digit code as follows:

First digit shows the day	M: Monday T: Tuesday W: Wednesday H: Thursday
Second digit shows the time	A: 08:30-10:00 B: 10:30-12:00 C: 12:00-14:00 D: 14:00-15:30 E: 16:00-17:30
Third and fourth digits show the room	01: Pavilion-Ballroom A 02: Pavilion-Ballroom B 03: Pavilion-Ballroom C 04: Pavilion-Ballroom D 05: Orca 06: Finback 07: Beluga 08: Parksville 09: Port Hardy 10: Port McNeill 11: Port Alberni 12: Azure

Presentations in each session are given consecutive numbers following the session number. For example, paper TD-05.2 is the second paper on Tuesday at 14:00 – 15:30 in Orca.

PRESENTATION GUIDELINES

SESSION GUIDELINES

The sessions are 90 minutes long and include two, three, or four papers. Depending on the number of papers in the session, the time should be divided equally for each presentation, allowing about five minutes after each one for questions.

SESSION CHAIR GUIDELINES

If you are chairing a session, please follow the guidelines below:

- Contact the speaker before your session starts.
- Check the equipment in the room. If something does not work or if anything else is needed, contact the PICMET volunteer responsible for your room.
- Introduce each speaker.
- Coordinate the time allocated to each speaker so that each has about equal time, allowing about five minutes for questions from the audience.
- Fill out the Session Summary Form and leave it on the table in the room. The form will be given to the session chair by the PICMET volunteer at the beginning of the session.

SPEAKER GUIDELINES

If you are presenting a paper, please follow the guidelines below:

- Introduce yourself to your session chair, and provide him/her with a brief background statement that he/she can use in introducing you to the audience.
- Divide the 90 minutes by the number of papers in your session so that every speaker in the session has approximately the same length of time.
- Allow about five minutes for questions from the audience after your presentation.

AUDIO/VISUAL EQUIPMENT

Each session is equipped with an LCD projector and screen. The Chartroom near the North Tower elevators on the Ballroom level (3rd floor) is designated as the Authors Room. If you need information about anything concerning the conference, volunteers in the registration area will try to help you.

WIRELESS ACCESS

Wi-Fi for Internet connections will be provided in the Pavilion Ballroom Foyer.

PICMET VOLUNTEERS

PICMET Volunteers wearing white polo shirts with the PICMET logo will assist the participants throughout the conference. If you need help in locating the room where your session will be held or if there are equipment problems, for example, you can contact the PICMET Volunteers. If you need information about anything concerning the conference, a volunteer in the registration area will try to help you.

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TRANSPORTATION INFORMATION

YVR AIRPORT
One of the world's most accessible airports, Vancouver International Airport (YVR) has worked over the past 20 years to ensure all passengers with disabilities have a positive experience traveling to and from Vancouver.

Outside the terminals, ramps and special curbside parking are available at both the Arrivals and Departures areas. Relief areas for guide dogs and service animals are also provided on the Arrivals level outside the main terminal.

Throughout the airport, facilities include fully-accessible restrooms, phone booths and TTY phones, plain language signage, low-mounted flight information monitors, visual paging monitors and public address systems, check-in counters adapted for wheelchairs, and contrasting, textured flooring to guide visually impaired travelers.

Individual airlines have trained staff who can assist in escorting passengers through security checkpoints and to the gates. It is recommended that disabled travelers state their particular needs when booking, and again at the ticket counter. Additionally, YVR Airport Customer Care personnel can be reached at 604-207-7077.

TAXIS
More than 500 trained and licensed taxis currently serve the airport. Wheelchair-accessible taxis and vans are available, and no reservations are required. Curbside staff is available to provide assistance.

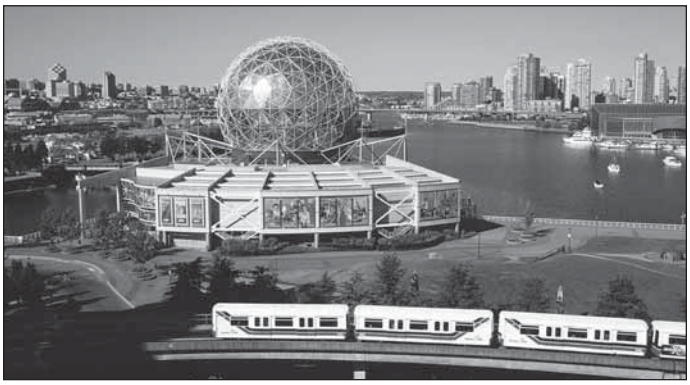

Photo Courtesy of Tourism Vancouver

RENTAL CARS
Most airport rental car companies can provide accessible vehicles, but a minimum 48 hours advance booking is required. Check with your rental car company for further information.

PUBLIC TRANSPORTATION
The Canada Line SkyTrain connects YVR Airport to Richmond and downtown Vancouver quickly and easily. The Canada Line is fully accessible by elevator from both the Arrivals and Departures level.

COURTESY SHUTTLES
Hotel courtesy shuttle buses provide transportation service to local hotels. Many hotel shuttles can accommodate wheelchairs and mobility aids, but it's advisable to contact hotels directly to confirm availability and book a pick-up.

Photo Courtesy of Tourism Vancouver

VANCOUVER GUIDE

The following is from Tourism Vancouver (http://www.tourismvancouver.com/)

"You're gorgeous, baby, you're sophisticated, you live well… Vancouver is Manhattan with mountains. It's a liquid city, a tomorrow city, equal parts India, China, England, France and the Pacific Northwest. It's the cool North American sibling." – *The New York Times*

Vancouver is located on the mainland of North America, in the southwest corner of British Columbia, which is the westernmost of Canada's ten provinces. Greater Vancouver is made up of 21 municipalities that occupy 2,930 square kilometres on and around the Fraser River delta. The City of Vancouver is one of them. The downtown business and shopping core of the City of Vancouver is on a smaller peninsula, with Burrard Inlet on the north, English Bay on the west and False Creek on the south.

To learn more about activities, attractions, dining, entertainment, maps, transportation and travel, please visit the Tourism Vancouver web site at http://www.tourismvancouver.com/.

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FAST FACTS ABOUT VANCOUVER

BANKING
Regular banking hours in Canada are 9:30 a.m. to 4:30 p.m., Monday to Friday, with extended hours including weekends at some locations. Visitors who wish to cash cheques or require other banking services are advised to check times of operation with the institutions. Main branches of Canadian chartered banks, particularly in major centres, are equipped to exchange foreign currency as well. Several major European and foreign banks have offices in Vancouver and will handle some foreign currencies directly.


Photo Courtesy of Tourism Vancouver

Most banks have automatic teller machines, which can be accessed 24 hours a day, using bank or credit cards on major international banking networks such as Cirrus, Plus and Interac.

CLIMATE
Vancouver enjoys warm, comfortable summers that are rarely scorching. June to August daytime temperatures linger just above 20º Celsius (70º Fahrenheit). Evenings, especially in the surrounding mountains, can be cool, so it is best to pack a light jacket and sweater.

CREDIT CARDS
Most major credit cards are accepted, but visitors are always advised to check with the vendor before a purchase is made. Cash machines with 24-hour access are available in many convenient locations throughout Greater Vancouver.

CURRENCY
We recommend all visitors use Canadian currency when traveling within Canada. Visitors can exchange currency at Canadian chartered banks, trust companies, credit unions, or at offices of foreign exchange brokers, but it is advised to have local currency on hand prior to arriving. Some hotels, merchants, restaurants and suppliers accept US or other foreign currency at a pre-determined rate, which may differ from the daily rate posted by financial institutions.

Canadian one dollar coin (“loonie”) ($) = 100 cents
Canadian two dollar coin (“toonie”) ($) = 200 cents
Notes are in denominations of $1000, $100, $50, $20, $10, $5
Coins are in denominations of $2, $1, $0.50, $0.25, $0.10, $0.05, $0.01

ELECTRICITY
Outlets and voltage (110 volts) are the same as in the United States. Small appliances such as hair dryers, irons, razors, etc. can be used in Canada. For those from other countries, adapters are required for electrical appliances. The frequency of electrical current in Canada is 60 Hz.

FOOD & BEVERAGES
An extensive variety of cuisine is available representing the multicultural flavour of Vancouver. Fine dining, casual or family friendly restaurants are easily accessible throughout Greater Vancouver.

Alcoholic beverages in bottles are sold in special ‘Liquor’ stores. However, alcoholic beverages including beer and wine may be purchased in “Licensed Premises” establishments, such as restaurants, hotel lounges, pubs, and nightclubs. Minors are not admitted into bars. In British Columbia, minors are defined as anyone under 19 years of age.

GRATUITIES
This will usually include gratuities for housekeeping (cleaning your hotel room), bell service and food service. Visitors should be advised that the standard tip in most restaurants is 15 percent.

LANGUAGES
Federal government departments provide service in English and French, but most of the population speaks English as either a first or second language.

The City of Vancouver is quite cosmopolitan and is a mix of many multicultural groups. Because the city is multicultural, it is also multilingual on an unofficial level. Its people speak many different languages and many follow the traditions of their native lands, sometimes moderating them with Canadian culture.

After English and Chinese, the most common mother tongue languages spoken are Punjabi, German, Italian, French, Tagalog (Filipino) and Spanish. More than half of Vancouver’s school-age children have been raised speaking a language other than English.

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NEWSPAPERS
Residents of Vancouver stay informed through a variety of daily and weekly newspapers that service a wide range of cultural interests. The two major daily newspapers are the *Vancouver Sun* and *The Province*. There are also two major daily Chinese newspapers: *Sing Tao and Ming Pao*, offering local and regional news.

Business in Vancouver offers weekly local business information, while the *Globe and Mail* and *National Post* provide national and international news on a daily basis. *The Georgia Straight* is a news-and-entertainment weekly that also provides an excellent city calendar of events.

POPULATION
Based on 2006 Canadian Census reports, the population of the City of Vancouver in 2010 is estimated at 601,203.

Greater Vancouver's estimated total population for 2010 is 2.4 million, 52.3% of British Columbia's population of 4.6 million.

SMOKING LAWS
Each municipality in Metro Vancouver has different rules for smoking in public places such as public buildings, restaurants and pubs.

Within the City of Vancouver, smoking is not permitted by law in all indoor public spaces, including public transit, shopping malls, restaurants, pubs, nightclubs and casinos. Smoking is not permitted within six metres of an entryway, openable window or air intake of a building. Signage will be posted to indicate the applicable smoking restrictions. Please smoke in designated areas only.

TAXATION
Effective July 1, 2010, most purchases in British Columbia will be subject to a 12% Harmonized Sales Tax (HST). For more information, visit this HST FAQ: http://hst.blog.gov.bc.ca/.

Photo Courtesy of Tourism Vancouver

TIME ZONE
Vancouver is in the Pacific Time Zone. Daylight savings time is in effect from the second Sunday in March until the first Sunday in November. You can see Vancouver's time in relation to most cities on the globe by visiting www.TimeAndDate.com, which also can provide a Canadian calendar.

TRAVELLER'S CHEQUES
Traveller's cheques in Canadian dollars are the safest and most convenient way to carry money. They are widely accepted and can be cashed at banks or foreign exchange brokers. Identification may be required when cashing travelers cheques.

WORKDAYS
Greater Vancouver, like all major cities, runs 24 hours a day, seven days a week. The main workdays are Monday to Friday, from roughly 8am to 6pm - but hours vary for each organization or business. Retailers are usually open seven days a week, and most stores are open from 9:30 am to 6 pm each day-except Thursday and Friday, when they are open until 9 pm. A number of large retail stores, nearly every hotel and motel, and several restaurants remain open around the clock.

EXPLORE EVERY AVENUE

If a city is judged by its diversity and culture, we're proud to say that Vancouver neighbourhoods take top honors. No less than a dozen different enclaves invite visitors and locals to stroll colourful sidewalks, savour spectacular settings and soak in a wide range of urban vibes with roots in many different cultures and ways of life. And the bonus for visitors is that so many of the neighbourhoods in Vancouver are located so close to each other, making it possible to see many sides of this complex and diverse city during your visit.

It would take weeks, if not months, to see all there is to see in each neighbourhood, so you can focus on just a few in great detail or hit the highlights of them all. To help you narrow down the choices, we've provided this guide to Vancouver neighborhoods.

CHINATOWN
Chinatown has been humming busily for more than a century with vivid colours, exotic cuisine and a vibrant culture. Rich in history and architecture, this area east of downtown boasts North America's third-largest Chinatown after New York and San Francisco. Highlights of a Chinatown visit include the Dr. Sun Yat-Sen Classical Chinese Garden, the Sam Kee Building (world's narrowest commercial building) and the Chinese Cultural Centre. Festivals, parades and the summertime Night Market also spice up the flavour of this neighbourhood.

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COMMERCIAL DRIVE
A confluence of countercultures makes Commercial Drive, or "The Drive," the place to go for an urban experience of the young and hip Vancouver crowd. Formerly known as "Little Italy," this diverse neighbourhood is home to students, writers, artists and other bohemians. Lots of different restaurants offering every kind of cuisine imaginable make this a great place to grab an authentic ethnic meal.

DAVIE VILLAGE
Rainbow flags and sunburst banners adorn the lampposts in this lively neighbourhood in the heart of downtown's dense West End. Known internationally for its thriving community of gay and lesbian residents, Davie Village is also home to legendary bookstores and thumping nightclubs welcoming everyone. Residents and visitors hang out in the neighbourhood's coffee shops and cafes every day of the week.


Photo Courtesy of Tourism Vancouver

GASTOWN
As the birthplace of Vancouver, Gastown was initially a settlement that sprung up around a tavern founded in 1867 by sailor and gold prospector John "Gassy Jack" Deighton. This historic district's cobblestone streets are lined with Victorian buildings that today house everything from souvenir shops and First Nations galleries to stylish clothing boutiques. With informational plaques placed strategically along the street to tell the history behind various buildings and landmarks, Gastown is an excellent area for a walking tour.

GRANVILLE ISLAND
In the early 1900s, Granville Island was home to factories, plants and sawmills. At one time, its official name was actually Industrial Island. Things are a little different today. Granville Island is both a locals' favorite and a huge draw for visitors. It is centred around the Granville Island Public Market, a bevy of merchants selling seafood, fresh produce, cheese and breads. The island's offerings are much more diverse than just one of North America's best markets, with theatre, culture, restaurants and unique attractions drawing millions of people each year.


Photo Courtesy of Tourism Vancouver

Photo Courtesy of Tourism Vancouver

Public Market
The biggest attraction on Granville Island is the Public Market. Housed indoors, there are endless rows of stalls that feature fresh produce, gourmet foods, baked goods, seafood and numerous other commercial vendors. Locals come here to get started on whatever lunch or dinner menus they are working on, and visitors come to get lost in a dizzying array of fresh smells and lively vendors. For those who love a little guidance, Edible Canada offers daily, two-hour tours beginning at 9am that cover the market from the inside out and hit on plenty of other island attractions.

A Foodie's Paradise
Granville Island might be small, but it boasts a diverse collection of more than 70 options for grabbing a bite. It is difficult to walk more than a few steps without being tempted by something fresh and delicious. There are plentiful food stands in the Public Market to grab a snack while shopping, as well as romantic waterside cafés and restaurants, tasty ethnic options and even some fantastic doughnuts. The biggest mistake you can make is visiting the island without an appetite.

Local Beer and Sake
For those looking for a uniquely Granville Island adult beverage, there are two local breweries to check out including the waterfront Dockside Restaurant and Brewing Co., where you can grab a Marina Light Lager and watch the boats pass by. There is even a local, artisan sake maker on the island.

Theatre and Entertainment
Vancouver's performing arts scene is centred on Granville Island. With several professional and amateur theatre and comedy companies, there is a live entertainment option on any given night. The island is home to the 450-seat Granville Island Stage and Arts Club Theatre Company, Western Canada's largest theatre company, which pro-

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duces a variety of performances including musicals, new works and contemporary comedies. The Greater Vancouver Professional Theatre Alliance, a 100-member theatre advocacy group; Vancouver TheatreSports League, an award-winning improv comedy troupe; and several other groups make the Granville theatre scene vibrant.

The community space just outside the Public Market is a hotbed of street performers. There is ample seating nearby, making this an interesting spot to nibble on some Granville Island food while watching an impromptu musical act.

Crafts & Shopping
There is something about Vancouver that draws creative types. The city is teeming with imaginative souls creating original arts and crafts at a prolific rate. Granville Island, in particular, is a real-life Etsy marketplace, where you can touch and feel unique, handmade goods. You will find handfuls of artists' studios and co-ops on Granville Island, offering a variety of wares ranging from jewelry to souvenirs, clothing and more.

Family Fun
Parents can bring their kids along knowing the youngsters will immediately gravitate to the nearby Kid's Market. This area is one of the best family-friendly attractions in Vancouver, bar none. It features stores and exhibits tailored just for them. One of the doors is a bit smaller to make kids feel just as welcome as adults — or, maybe the market only has a bigger door to make the experience comfortable for parents.


Photo Courtesy of Tourism Vancouver

Maritime Adventure
The island is a great launching point for a number of maritime adventures. Outfitters such as Ecomarine Ocean Kayak Centre offer sea kayaking tours and rentals. There are fishing charters, whale-watching tours, boat tours and sailing adventures available through various other companies as well.

Heritage
Granville Island history dates back the late 19th century, when the island was little more than two sandbars that First Nations people used to help corral fish. Throughout the course of two decades of fierce negotiations lasting into the early 1900s, the region's settlers were able to win approval for a plan to reclaim the island by dredging nearly a million cubic yards of fill from False Creek to create the spreading pancake under the Granville Street Bridge. The island started as an industrial hotbed with shipyards and various other industrial businesses bustling. It wasn't until the post-war industrial decline that lasted well into the 1960s and 70s that the plans for a pedestrian and tourist friendly island were hatched with its most recent transformation began. At that point, the declining 37-acre industrial wasteland in Vancouver's False Creek was just starting to become the amazing urban redevelopment seen today.

Getting There
One of the easiest ways to get to Granville Island is via ferry. Ferries leave every few minutes from the Aquatic Center near the base of Burrard Street. Those who drive can take the Granville Island Bridge.

Hours of Operation
Granville Island Public Market: Open seven days a week, 9 am–7 pm. Most other retail stores: open seven days a week, 10 am–7 pm.

GRANVILLE STREET
Located in the heart of Vancouver, Granville Street is where you will find Vancouver's main downtown entertainment district. Countless restaurants, bars and nightclubs make this a popular late-night hangout, particularly on the weekends. The Pacific Centre shopping mall provides unique stores for those in search of the latest fashions, while the area between Robson and Drake Streets offers a diverse collection of boutique shops where you can find the latest footwear, club gear, music or comic books.

KERRISDALE
The Kerrisdale shopping area is known to many as the "village." It's only 20 minutes from Vancouver's downtown and offers more than 200 diverse shops and services along quiet tree-lined streets. The business district is concentrated on West 41st Avenue between Maple and Larch streets, stretching in a north-south direction along West and East Boulevards. Surrounding this area are older, gracious homes, newer additions to the neighbourhood, and both

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high- and low-rise apartment buildings. Architecturally, the neighbourhood boasts many styles and structures listed in the Vancouver Heritage inventory.

KITSILANO
In the 1960s, Kitsilano was Vancouver's hippy hangout, drawing comparisons to San Francisco's Haight-Ashbury. Today, Kitsilano still has plenty of culture, but its apartments and houses are now occupied by young urban professionals who enjoy the relaxed atmosphere. Most of the action is centered on West Fourth Avenue and West Broadway, with bookstores, ethnic restaurants, cafes and specialty retailers offering plenty of places to explore.


Photo Courtesy of Tourism Vancouver

PUNJABI MARKET
As the cultural focal point of Vancouver's Indo-Canadian population, Punjabi Market is home to a unique collection of jewelry stores and fabric shops. Located around Main and East 49th, these five blocks make up one of the largest and most prosperous areas of the city's commercial sections. Inexpensive silks, groceries and 22-karat gold jewelry also draw visitors.

ROBSON STREET
If you want a day chock-full of shopping, strolling, dining and people watching, head to Robson Street. It's a sure bet for shoppers of all kinds with everything from big-name stores to funky independent boutiques. The main action is concentrated in the blocks from Burrard Street to Jervis Street, where stores line every inch of space along the sidewalk. And with no short supply of coffee shops, ethnic restaurants, sports bars and grills, fine dining and other eateries, you're never far from a great place to stop and refuel.

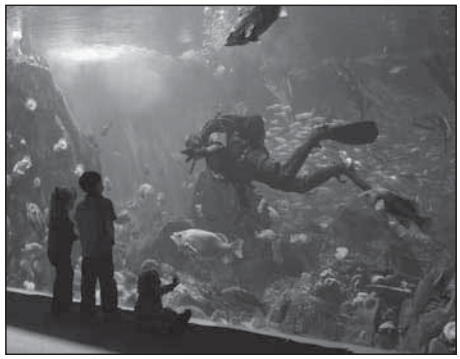


Photo Courtesy of Tourism Vancouver

SOUTH GRANVILLE
Park the car and head out on foot for a tour of South Granville's shops, art galleries and theatres. Located just south of downtown on the main road to the airport, this is a thriving shopping and entertainment district where an eclectic mix of coffee shops, antique stores, boutique clothing stores and interior design shops give visitors a chance to soak in the atmosphere while looking for the perfect souvenir from their Vancouver visit.

SOUTH MAIN (SoMa)
An up-and-coming neighbourhood located on - you guessed it - South Main Street, this area is full of art galleries, vintage clothing and furniture stores, boutique clothing shops and plenty of restaurants. Combining Yaletown's upscale offerings with Commercial Drive's eclectic businesses, SoMa (as the locals call it) is packed with artist lofts and places to purchase and peruse local art. Most of the activity can be found on Main Street between Broadway and 33rd Avenue, but like all neighbourhoods, visitors will find lots of goodies off the beaten path as well.

STEVESTON
Like so many of Greater Vancouver's best neighbourhoods, the theme of transformation is a big part of this former fishing village's bold history. Once one of the largest fishing ports in the world, the canneries and shipyards have become museums and historic sites where visitors can explore the depth of fishing's influence on the area. Even with all this change, visitors will still find fishing boats in the marinas where fresh seafood can be purchased. Steveston is located just south of Richmond near the South Arm of the Fraser River.

WEST END
A gateway to Stanley Park, the West End neighbourhood is organized around Denman Street between Robson and Davie streets and bordered to the south by English Bay. Primarily a residential area, this is one of the most densely populated areas in all of Canada, with 40,000 people living in high-rise condominiums and apartments. Coffee shops, fine-dining restaurants and plenty of shopping will keep you entertained in this area, with several beautiful parks and beaches perfect for taking a leisurely stroll after an evening meal.

YALETOWN
This False Creek waterfront community has experienced some serious revitalization since its rebirth as host of Expo '86. Formerly a warehouse district where textile shops and train yards provided little in the way of beauty or entertainment, Yaletown has been transformed into one of Vancouver's hippest areas, filled with sidewalk cafes, trendy restaurants, a thriving nightlife scene and intimate boutique hotels.

SOCIAL EVENTS

To facilitate the informal interaction of the participants, several social events have been scheduled during PICMET '12.

RECEPTION/BUFFET

DATE: SUNDAY, JULY 29
TIME: 19:00—22:00
LOCATION: PAVILION BALLROOM
DRESS: INFORMAL

Meet other conference attendees, renew old acquaintances, and begin new friendships and collaborations at this opening reception/buffet in the Sheraton Pavilion Ballroom. Included in the registration fee.*

DINNER AT FOUNTAIN SQUARE

DATE: MONDAY, JULY 30
TIME: 19:00—22:00
LOCATION: FOUNTAIN SQUARE (SHERATON NORTH TOWER OUTDOOR AREA)
DRESS: INFORMAL

Enjoy a sumptuous buffet while you mingle and network with colleagues. The Eagle Song Dancers will present Native American songs and dances. Included in the registration fee.*

Spakwus Slolem, translated "Eagle Song Dancers," is comprised of members of the Squamish Nation. Geographically located in what is called the Lower Mainland of British Columbia, the Squamish Nation's traditional territory is the Howe Sound, in the Vancouver to Whistler area. The Squamish have lived and utilized this area for over 10,000 years, its history tracing back to the Great Flood and the Ice Age.

The Squamish are a Coastal people, people of the cedar longhouses, of the great sea-going canoes and of the racing war canoes; they are People of the Salmon.

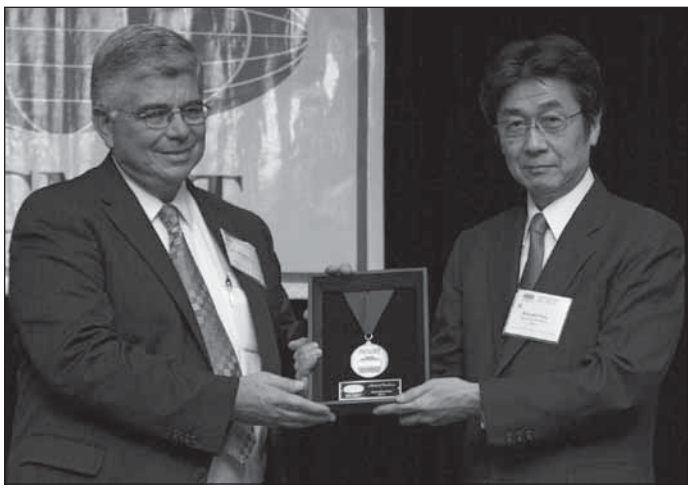
Spakwus Slolem presentations bring out "Chiax," the protocol and laws of the Squamish canoe culture and longhouses. Some of the Squamish Elders today still have memories of early years, travelling across the waters in great canoes to visit family in distant lands and exercising Chiax. Spakwus Slolem presents a glimpse into this culture through singing, drumming and dance.

AWARDS BANQUET

DATE: TUESDAY, JULY 31
CASH BAR: 18:30—19:00 IN THE PAVILION BALLROOM FOYER
BANQUET: 19:00—22:00
LOCATION: PAVILION BALLROOM
DRESS: BUSINESS ATTIRE

This is the premier social event of the conference. The PICMET '12 Leadership in Technology Management and Outstanding Student Paper awards will be presented at the banquet. Included in the registration fee.*

The one-day registration fee does not include the evening social events. The student fee does not include the Sunday, Monday and Tuesday evening events. Tickets for these events may be purchased at the registration desk.



SITE VISITS

Site visits to the following companies are offered during PICMET '12. Seating is limited, so sign up early ($50 for each site visit).

The times below include travel time. A PICMET volunteer will be in the hotel lobby to guide you to the bus.

WESTPORT INNOVATIONS
The global leader in natural gas engines

TUESDAY, JULY 31, 09:15-12:15

Westport Innovations Inc. is a leading global supplier of proprietary solutions that allow engines to operate on clean-burning fuels such as compressed natural gas (CNG), liquefied natural gas (LNG), hydrogen, and renewable natural gas (RNG) fuels such as landfill gas, which help reduce greenhouse gas emissions (GHG). Westport technology offers advanced LNG fuelling systems with direct injection natural gas engine technology for heavy-duty vehicles such as highway trucks and off-road applications such as mining and rail. Cummins Westport, our joint venture with Cummins Inc., designs, engineers and markets spark-ignited natural gas engines for North American transportation applications such as trucks and buses. The Westport LD division is one of the global leaders for natural gas and LPG fuel in passenger cars, light-duty trucks and industrial applications such as forklifts.

The natural gas vehicle (NGV) industry is a large and rapidly growing market. According to NGV America, there are more than 14.8 million natural gas vehicles in use worldwide, including approximately 120,000 operating on U.S. roads. The International Association of Natural Gas Vehicles projects that there will be more than 50 million natural gas vehicles worldwide within the next 10 years, representing approximately nine percent of the world transportation fleet. One of the primary drivers accelerating NGV adoption is the increasing price stability advantage that natural gas has over petroleum. We believe that rising demand for oil will result in price increases and/or fuel shortages, which will continue to create favorable market conditions for adoption of cheaper alternative fuels such as natural gas. As the relative price of diesel compared to natural gas increases, the payback period shortens, and the incentive to switch becomes more attractive

The visit to Westport includes a 30 minute presentation of the company's business and history, markets, visions, and a tour of its R&D facility.

TANTALUS SYSTEMS CORP.

TUESDAY, JULY 31, 12:30-15:30

Tantalus provides Smart Grid communications technology that enables electric, gas and water utilities to optimize the use resources by automating monitoring and control processes, improving operational efficiency, and delivering the information utilities and consumers need to manage energy intelligently and cost-effectively.

TUNet® – the Tantalus Utility Network – is deployed at utilities throughout North America determined to drive down operational costs, increase reliability and deliver top-tier customer service. TUNet provides the rapid and reliable two-way data communications utilities need today for Advanced Metering (AMI), Demand Response (DR), and Distribution Automation (DA), along with the flexibility and adaptability to scale step-by-step as the Smart Grid evolves.

Tantalus is a private company founded in 1989. Tantalus' technology development and headquarters are located in Vancouver, British Columbia, and its sales offices are located in Raleigh, North Carolina.

The visit to Tantalus includes a presentation of the company's history, markets, visions, and a tour of the R&D facility.

TECHNICAL PROGRAM

PROGRAM OVERVIEW

The PICMET '12 technical program consists of 124 sessions including 4 plenaries, 3 tutorials, 4 panel discussions, 1 special session and 112 paper sessions.

The plenaries are scheduled from 08:30 to 10:00 every morning, Monday, July 30 through Thursday, August 2, in the Pavilion Ballroom (South Tower Hotel, 3rd floor). They are described in the "Plenaries" section of this Bulletin.

The Tutorials are offered by experts in specific areas of technology management. They are scheduled among the regular paper sessions.

THE PAPERS

Research papers and applications-oriented papers are explicitly identified in this conference. Separate evaluation criteria were used, and different referees were selected for each category to make sure that appropriate papers were included in the conference for the "Research" and "Application" categories. We emphasized research methodology, the use of the research literature, the theory behind the paper, the sample size, and the impact on the research community for the "Research Papers." The important evaluation criteria for "Industry Applications" were the usefulness of the application, the importance of the case being discussed, the generalizability of the concepts presented, and the impact of the paper on the users of technology management. The "Research Papers" included in PICMET '12 are listed with an [R] in front of their titles on the following pages; and the "Industry Applications" papers are shown with an [A] in front of their titles. Roughly 79 percent are in the [R] category, and the rest are in the [A] category.

The Research Papers and Industry Applications are mixed in the sessions. This was done intentionally to assure effective exchange of ideas among those presenting research papers and those presenting applications-oriented papers.

THE SCHEDULE

The plenary is the only session in the 08:30-10:00 time slot. After that, there are up to 12 break-out sessions throughout the day, Monday through Thursday.

In order to make the sessions easy to see, we have prepared the schedule listings in two different formats for you.

First, you will find a pictorial display of the sessions for each day. The four pages (one for each day) should help you visualize what session is scheduled in what time slot and in which room each day.

In the second set of schedules, the sessions are listed in chronological in order to give you a breakdown of the sessions by time of day.

Finally, you will find a "Personal Schedule" following the schedule listings. It is a chart for you to make your own schedule. Only the common events are marked up on the personal schedule. You can fill it out as a daily calendar for the sessions you would like to follow, events to attend, and people to meet with.

We hope these will help you to take full advantage of the richness of the technical program at PICMET '12.

Daily Schedule

MONDAY, JULY 30, 2012

	01 Pavilion Ballroom A	02 Pavilion Ballroom B	03 Pavilion Ballroom C	04 Pavilion Ballroom D	05 Orca	06 Finback	07 Beluga	08 Parksville	09 Port Hardy	10 Port McNeill	11 Port Alberni	12 Azure
MA 08:30-10:00	Plenary - 1											
MB 10:30-12:00	Innovation Mgmt - 1	Technology Management in the Energy Sector - 1	Sustainability - 1	Decision Making - 1	Knowledge Mgmt - 1	Emerging Technologies - 1	Tech. Mgmt in the Health Sector - 1	Tech. Transfer - 1	Project/Program Mgmt - 1	PANEL: 2020 Foresight: PICMET in the Year 2020	Mgmt of Technical Workforce	Patent Analysis - 1
MC 12:00-14:00	Lunch Break											
MD 14:00-15:30	Innovation Mgmt - 2		Environmental Issues - 1	R&D Mgmt - 1	Tech. Assessment and Evaluation - 1	NanoTech. - 1	Productivity Mgmt	TUTORIAL: High Tech. Creation, Transfer and Diffusion: Evidence from Scandinavian Companies	Science and Tech. Policy - 1	Detecting and Characterizing Technical Emergence: New Methods for Measuring Scientific and Technical Change	Cultural Issues	Patent Analysis - 2
ME 16:00-17:30		TM in the Energy Sector - 2	Environmental Issues - 2	R&D Mgmt - 2		Emerging Technologies - 2	Entrepreneurship / Intrapreneurship	Tech. Mgmt in Services - 1	Science and Tech. Policy - 2	Tech. Forecasting - 1	Quality Mgmt - 1	Intellectual Property - 1

DAILY SCHEDULE

TUESDAY, JULY 31, 2012

	01 Pavilion Ballroom A	02 Pavilion Ballroom B	03 Pavilion Ballroom C	04 Pavilion Ballroom D	05 Orca	06 Finback	07 Beluga	08 Parksville	09 Port Hardy	10 Port McNeill	11 Port Alberni	12 Azure
TA 08:30-10:00	Plenary - 2											
TB 10:30-12:00	Innovation Mgmt - 3	Resource Mgmt	Software Process Mgmt	R&D Mgmt - 3	Knowledge Mgmt - 2	Emerging Technologies - 3	Tech. Marketing - 1	TM in Services - 2	PANEL: Research Funding Sources for Engineering and Technology Management Research	Tech. Forecasting - 2	Collaborations in TM - 1	Patent Analysis - 3
TC 12:00-14:00	Lunch Break											
TD 14:00-15:30	Innovation Mgmt - 4	TM in the Energy Sector - 3	TUTORIAL: A Hands-On Introduction to Tech. Forecasting using Data Envelopment Analysis	R&D Mgmt - 4	Tech. Assessment and Evaluation - 2	Emerging Technologies - 4	Tech. Marketing - 2	TM in Services - 3	New Product Development - 1	Telecommunication Industry	Collaborations in TM - 2	Intellectual Property - 2
TE 16:00-17:30	Tech. Planning - 1	TM in the Energy Sector - 4	Sustainability - 2	Decision Making - 2	Information Mgmt - 1	Tech. Transfer - 2	TM in the Health Sector - 2	TM in Services - 4	New Product Development - 2	Manufacturing Mgmt - 1	Collaborations in TM - 3	Patent Analysis - 4

DAILY SCHEDULE

WEDNESDAY, AUGUST 1, 2012

	01 Pavilion Ballroom A	02 Pavilion Ballroom B	03 Pavilion Ballroom C	04 Pavilion Ballroom D	05 Orca	06 Finback	07 Beluga	08 Parksville	09 Port Hardy	10 Port McNeill	11 Port Alberni	12 Azure
WA 08:30-10:00	Plenary - 3											
WB 10:30-12:00	Innovation Mgmt - 5	TM in the Energy Sector - 5	Strategic Mgmt of Tech. - 1		Information Mgmt - 2	TM Framework	Tech. Adoption - 1	Competitiveness	E-Business	Manufacturing Mgmt - 2	Tech. Diffusion - 1	Convergence of Technologies
WC 12:00-14:00	Lunch Break											
WD 14:00-15:30	Innovation Mgmt - 6	Transportation Industry - 1	Strategic Mgmt of Tech. - 2	Decision Making - 3	Knowledge Mgmt - 3	NanoTech. - 2	Tech. Adoption - 2	Tech. Transfer - 3	Mgmt of Tech. Based Organization	TM Education - 1	Information Tech. - 1	Semiconductor Industry
WE 16:00-17:30	TM in Automotive Industry	TM in the Energy Sector - 6	Strategic Mgmt of Tech. - 3	Decision Making - 4	Information Mgmt - 3	Project/ Program Mgmt - 2	Tech. Adoption - 3	Tech. Transfer - 4	New Product Development - 3	TM Education - 2	Information Tech. - 2	

DAILY SCHEDULE

THURSDAY, AUGUST 2, 2012

	01 Pavilion Ballroom A	02 Pavilion Ballroom B	03 Pavilion Ballroom C	04 Pavilion Ballroom D	05 Orca	06 Finback	07 Beluga	08 Parksville	09 Port Hardy
HA 08:30-10:00	Plenary - 4								
HB 10:30-12:00	Intellectual Property - 3	Quality Mgmt - 2	Strategic Mgmt of Tech. - 4	TUTORIAL: Making Excellent R&D/ Tech. Portfolio Decisions	Knowledge Mgmt - 4	Project/Program Mgmt - 3		Commercialization of Tech. - 1	PANEL: Meet the Editors
HC 12:00-14:00	Lunch Break								
HD 14:00-15:30	Innovation Mgmt - 7	TM in the Energy Sector - 7	Strategic Mgmt of Tech. - 5	Science and Tech. Policy - 3	Knowledge Mgmt - 5		Tech. Diffusion - 2	Commercialization of Tech. - 2	
HE 16:00-17:30			SPECIAL SESSION: PICMET 2013 and 2014 Planning Session						

SCHEDULE OF SESSIONS

SCHEDULE OF SESSIONS BY DATE

MONDAY, JULY 30, 2012

Session	Number	Day	Time	Room	Session Title
MA	00	Monday	08:30 - 10:00	Pavilion Ballroom	PLENARY: “Plenary - 1”
MB	01	Monday	10:30 - 12:00	Pavilion Ballroom A	“Innovation Management - 1”
MB	02	Monday	10:30 - 12:00	Pavilion Ballroom B	“Technology Management in the Energy Sector - 1”
MB	03	Monday	10:30 - 12:00	Pavilion Ballroom C	“Sustainability - 1”
MB	04	Monday	10:30 - 12:00	Pavilion Ballroom D	“Decision Making - 1”
MB	05	Monday	10:30 - 12:00	Orca	“Knowledge Management - 1”
MB	06	Monday	10:30 - 12:00	Finback	“Emerging Technologies - 1”
MB	07	Monday	10:30 - 12:00	Beluga	“Technology Management in the Health Sector - 1”
MB	08	Monday	10:30 - 12:00	Parksville	“Technology Transfer - 1”
MB	09	Monday	10:30 - 12:00	Port Hardy	“Project/Program Management - 1”
MB	10	Monday	10:30 - 12:00	Port McNeill	PANEL: “2020 Foresight: PICMET in the Year 2020”
MB	11	Monday	10:30 - 12:00	Port Alberni	“Management of Technical Workforce”
MB	12	Monday	10:30 - 12:00	Azure	“Patent Analysis - 1”
MD	01	Monday	14:00 - 15:30	Pavilion Ballroom A	“Innovation Management - 2”
MD	03	Monday	14:00 - 15:30	Pavilion Ballroom C	“Environmental Issues - 1”
MD	04	Monday	14:00 - 15:30	Pavilion Ballroom D	“R&D Management - 1”
MD	05	Monday	14:00 - 15:30	Orca	“Technology Assessment and Evaluation - 1”
MD	06	Monday	14:00 - 15:30	Finback	“Nanotechnology - 1”
MD	07	Monday	14:00 - 15:30	Beluga	“Productivity Management”
MD	08	Monday	14:00 - 15:30	Parksville	TUTORIAL: “High Technology Creation, Transfer and Diffusion: Evidences from Scandinavian Companies”
MD	09	Monday	14:00 - 15:30	Port Hardy	“Science and Technology Policy - 1”
MD	10	Monday	14:00 - 15:30	Port McNeill	“Detecting and Characterizing Technical Emergence: New Methods for Measuring Scientific and Technical Change”
MD	11	Monday	14:00 - 15:30	Port Alberni	“Cultural Issues”
MD	12	Monday	14:00 - 15:30	Azure	“Patent Analysis - 2”
ME	02	Monday	16:00 - 17:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 2”
ME	03	Monday	16:00 - 17:30	Pavilion Ballroom C	“Environmental Issues - 2”
ME	04	Monday	16:00 - 17:30	Pavilion Ballroom D	“R&D Management - 2”
ME	06	Monday	16:00 - 17:30	Finback	“Emerging Technologies - 2”
ME	07	Monday	16:00 - 17:30	Beluga	“Entrepreneurship / Intrapreneurship”
ME	08	Monday	16:00 - 17:30	Parksville	“Technology Management in Services - 1”
ME	09	Monday	16:00 - 17:30	Port Hardy	“Science and Technology Policy - 2”

SCHEDULE OF SESSIONS

ME	10	Monday	16:00 - 17:30	Port McNeill	"Technology Forecasting - 1"
ME	11	Monday	16:00 - 17:30	Port Alberni	"Quality Management - 1"
ME	12	Monday	16:00 - 17:30	Azure	"Intellectual Property - 1"

TUESDAY, JULY 31, 2012

TA	00	Tuesday	08:30 - 10:00	Pavilion Ballroom	PLENARY: "Plenary - 2"
TB	01	Tuesday	10:30 - 12:00	Pavilion Ballroom A	"Innovation Management - 3"
TB	02	Tuesday	10:30 - 12:00	Pavilion Ballroom B	"Resource Management"
TB	03	Tuesday	10:30 - 12:00	Pavilion Ballroom C	"Software Process Management"
TB	04	Tuesday	10:30 - 12:00	Pavilion Ballroom D	"R&D Management - 3"
TB	05	Tuesday	10:30 - 12:00	Orca	"Knowledge Management - 2"
TB	06	Tuesday	10:30 - 12:00	Finback	"Emerging Technologies - 3"
TB	07	Tuesday	10:30 - 12:00	Beluga	"Technology Marketing - 1"
TB	08	Tuesday	10:30 - 12:00	Parksville	"Technology Management in Services - 2"
TB	09	Tuesday	10:30 - 12:00	Port Hardy	"PANEL Research Funding Sources for Engineering and Technology Management Research"
TB	10	Tuesday	10:30 - 12:00	Port McNeill	"Technology Forecasting - 2"
TB	11	Tuesday	10:30 - 12:00	Port Alberni	"Collaborations in Technology Management - 1"
TB	12	Tuesday	10:30 - 12:00	Azure	"Patent Analysis - 3"
TD	01	Tuesday	14:00 - 15:30	Pavilion Ballroom A	"Innovation Management - 4"
TD	02	Tuesday	14:00 - 15:30	Pavilion Ballroom B	"Technology Management in the Energy Sector - 3"
TD	03	Tuesday	14:00 - 15:30	Pavilion Ballroom C	TUTORIAL: "A Hands-On Introduction to Technology Forecasting using Data Envelopment Analysis"
TD	04	Tuesday	14:00 - 15:30	Pavilion Ballroom D	"R&D Management - 4"
TD	05	Tuesday	14:00 - 15:30	Orca	"Technology Assessment and Evaluation - 2"
TD	06	Tuesday	14:00 - 15:30	Finback	"Emerging Technologies - 4"
TD	07	Tuesday	14:00 - 15:30	Beluga	"Technology Marketing - 2"
TD	08	Tuesday	14:00 - 15:30	Parksville	"Technology Management in Services - 3"
TD	09	Tuesday	14:00 - 15:30	Port Hardy	"New Product Development - 1"
TD	10	Tuesday	14:00 - 15:30	Port McNeill	"Telecommunication Industry"
TD	11	Tuesday	14:00 - 15:30	Port Alberni	"Collaborations in Technology Management - 2"
TD	12	Tuesday	14:00 - 15:30	Azure	"Intellectual Property - 2"
TE	01	Tuesday	16:00 - 17:30	Pavilion Ballroom A	"Technology Planning - 1"
TE	02	Tuesday	16:00 - 17:30	Pavilion Ballroom B	"Technology Management in the Energy Sector - 4"
TE	03	Tuesday	16:00 - 17:30	Pavilion Ballroom C	"Sustainability - 2"
TE	04	Tuesday	16:00 - 17:30	Pavilion Ballroom D	"Decision Making - 2"
TE	05	Tuesday	16:00 - 17:30	Orca	"Information Management - 1"
TE	06	Tuesday	16:00 - 17:30	Finback	"Technology Transfer - 2"

Schedule of Sessions

TE	07	Tuesday	16:00 - 17:30	Beluga	“Technology Management in the Health Sector - 2”
TE	08	Tuesday	16:00 - 17:30	Parksville	“Technology Management in Services - 4”
TE	09	Tuesday	16:00 - 17:30	Port Hardy	“New Product Development - 2”
TE	10	Tuesday	16:00 - 17:30	Port McNeill	“Manufacturing Management - 1”
TE	11	Tuesday	16:00 - 17:30	Port Alberni	“Collaborations in Technology Management - 3”
TE	12	Tuesday	16:00 - 17:30	Azure	“Patent Analysis - 4”

WEDNESDAY, AUGUST 1, 2012

WA	00	Wednesday	08:30 - 10:00	Pavilion Ballroom	PLENARY: “Plenary - 3”
WB	01	Wednesday	10:30 - 12:00	Pavilion Ballroom A	“Innovation Management - 5”
WB	02	Wednesday	10:30 - 12:00	Pavilion Ballroom B	“Technology Management in the Energy Sector - 5”
WB	03	Wednesday	10:30 - 12:00	Pavilion Ballroom C	“Strategic Management of Technology - 1”
WB	05	Wednesday	10:30 - 12:00	Orca	“Information Management - 2”
WB	06	Wednesday	10:30 - 12:00	Finback	“Technology Management Framework”
WB	07	Wednesday	10:30 - 12:00	Beluga	“Technology Adoption - 1”
WB	08	Wednesday	10:30 - 12:00	Parksville	“Competitiveness”
WB	09	Wednesday	10:30 - 12:00	Port Hardy	“E-Business”
WB	10	Wednesday	10:30 - 12:00	Port McNeill	“Manufacturing Management - 2”
WB	11	Wednesday	10:30 - 12:00	Port Alberni	“Technology Diffusion - 1”
WB	12	Wednesday	10:30 - 12:00	Azure	“Convergence of Technologies”
WD	01	Wednesday	14:00 - 15:30	Pavilion Ballroom A	“Innovation Management - 6”
WD	02	Wednesday	14:00 - 15:30	Pavilion Ballroom B	“Transportation Industry - 1”
WD	03	Wednesday	14:00 - 15:30	Pavilion Ballroom C	“Strategic Management of Technology - 2”
WD	04	Wednesday	14:00 - 15:30	Pavilion Ballroom D	“Decision Making - 3”
WD	05	Wednesday	14:00 - 15:30	Orca	“Knowledge Management - 3”
WD	06	Wednesday	14:00 - 15:30	Finback	“Nanotechnology - 2”
WD	07	Wednesday	14:00 - 15:30	Beluga	“Technology Adoption - 2”
WD	08	Wednesday	14:00 - 15:30	Parksville	“Technology Transfer - 3”
WD	09	Wednesday	14:00 - 15:30	Port Hardy	“Management of Technology Based Organization”
WD	10	Wednesday	14:00 - 15:30	Port McNeill	“Technology Management Education - 1”
WD	11	Wednesday	14:00 - 15:30	Port Alberni	“Information Technology - 1”
WD	12	Wednesday	14:00 - 15:30	Azure	“Semiconductor Industry”
WE	01	Wednesday	16:00 - 17:30	Pavilion Ballroom A	“Technology Management in Automotive Industry”
WE	02	Wednesday	16:00 - 17:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 6”
WE	03	Wednesday	16:00 - 17:30	Pavilion Ballroom C	“Strategic Management of Technology - 3”
WE	04	Wednesday	16:00 - 17:30	Pavilion Ballroom D	“Decision Making - 4”
WE	05	Wednesday	16:00 - 17:30	Orca	“Information Management - 3”
WE	06	Wednesday	16:00 - 17:30	Finback	“Project/Program Management - 2”
WE	07	Wednesday	16:00 - 17:30	Beluga	“Technology Adoption - 3”

SCHEDULE OF SESSIONS

WE	08	Wednesday	16:00 - 17:30	Parksville	“Technology Transfer - 4”
WE	09	Wednesday	16:00 - 17:30	Port Hardy	“New Product Development - 3”
WE	10	Wednesday	16:00 - 17:30	Port McNeill	“Technology Management Education - 2”
WE	11	Wednesday	16:00 - 17:30	Port Alberni	“Information Technology - 2”

THURSDAY, AUGUST 2, 2011

HA	00	Thursday	08:30 - 10:00	Pavilion Ballroom	PLENARY: “Plenary - 4”
HB	01	Thursday	10:30 - 12:00	Pavilion Ballroom A	“Intellectual Property - 3”
HB	02	Thursday	10:30 - 12:00	Pavilion Ballroom B	“Quality Management - 2”
HB	03	Thursday	10:30 - 12:00	Pavilion Ballroom C	“Strategic Management of Technology - 4”
HB	04	Thursday	10:30 - 12:00	Pavilion Ballroom D	TUTORIAL: “Making Excellent R&D/Technology Portfolio Decisions”
HB	05	Thursday	10:30 - 12:00	Orca	“Knowledge Management - 4”
HB	06	Thursday	10:30 - 12:00	Finback	“Project/Program Management - 3”
HB	08	Thursday	10:30 - 12:00	Parksville	“Commercialization of Technology - 1”
HB	09	Thursday	10:30 - 12:00	Port Hardy	PANEL: “Meet the Editors”
HD	01	Thursday	14:00 - 15:30	Pavilion Ballroom A	“Innovation Management - 7”
HD	02	Thursday	14:00 - 15:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 7”
HD	03	Thursday	14:00 - 15:30	Pavilion Ballroom C	“Strategic Management of Technology - 5”
HD	04	Thursday	14:00 - 15:30	Pavilion Ballroom D	“Science and Technology Policy - 3”
HD	05	Thursday	14:00 - 15:30	Orca	“Knowledge Management - 5”
HD	07	Thursday	14:00 - 15:30	Beluga	“Technology Diffusion - 2”
HD	08	Thursday	14:00 - 15:30	Parksville	“Commercialization of Technology - 2”
HE	03	Thursday	16:00 - 17:30	Pavilion Ballroom C	“PICMET 2013 and 2014 Planning Session”

SCHEDULE OF SESSIONS BY ROOM

Session	Number	Day	Time	Room	Session Title
MA	00	Monday	08:30 - 10:00	Pavilion Ballroom	PLENARY: “Plenary - 1”
TA	00	Tuesday	08:30 - 10:00	Pavilion Ballroom	PLENARY: “Plenary - 2”
WA	00	Wednesday	08:30 - 10:00	Pavilion Ballroom	PLENARY: “Plenary - 3”
HA	00	Thursday	08:30 - 10:00	Pavilion Ballroom	PLENARY: “Plenary - 4”
MB	01	Monday	10:30 - 12:00	Pavilion Ballroom A	“Innovation Management - 1”
MD	01	Monday	14:00 - 15:30	Pavilion Ballroom A	“Innovation Management - 2”
TB	01	Tuesday	10:30 - 12:00	Pavilion Ballroom A	“Innovation Management - 3”
TD	01	Tuesday	14:00 - 15:30	Pavilion Ballroom A	“Innovation Management - 4”
TE	01	Tuesday	16:00 - 17:30	Pavilion Ballroom A	“Technology Planning - 1”
WB	01	Wednesday	10:30 - 12:00	Pavilion Ballroom A	“Innovation Management - 5”
WD	01	Wednesday	14:00 - 15:30	Pavilion Ballroom A	“Innovation Management - 6”

Schedule of Sessions

WE	01	Wednesday	16:00 - 17:30	Pavilion Ballroom A	“Technology Management in Automotive Industry”
HB	01	Thursday	10:30 - 12:00	Pavilion Ballroom A	“Intellectual Property - 3”
HD	01	Thursday	14:00 - 15:30	Pavilion Ballroom A	“Innovation Management - 7”
MB	02	Monday	10:30 - 12:00	Pavilion Ballroom B	“Technology Management in the Energy Sector - 1”
ME	02	Monday	16:00 - 17:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 2”
TB	02	Tuesday	10:30 - 12:00	Pavilion Ballroom B	“Resource Management”
TD	02	Tuesday	14:00 - 15:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 3”
TE	02	Tuesday	16:00 - 17:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 4”
WB	02	Wednesday	10:30 - 12:00	Pavilion Ballroom B	“Technology Management in the Energy Sector - 5”
WD	02	Wednesday	14:00 - 15:30	Pavilion Ballroom B	“Transportation Industry - 1”
WE	02	Wednesday	16:00 - 17:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 6”
HB	02	Thursday	10:30 - 12:00	Pavilion Ballroom B	“Quality Management - 2”
HD	02	Thursday	14:00 - 15:30	Pavilion Ballroom B	“Technology Management in the Energy Sector - 7”
MB	03	Monday	10:30 - 12:00	Pavilion Ballroom C	“Sustainability - 1”
MD	03	Monday	14:00 - 15:30	Pavilion Ballroom C	“Environmental Issues - 1”
ME	03	Monday	16:00 - 17:30	Pavilion Ballroom C	“Environmental Issues - 2”
TB	03	Tuesday	10:30 - 12:00	Pavilion Ballroom C	“Software Process Management”
TD	03	Tuesday	14:00 - 15:30	Pavilion Ballroom C	TUTORIAL: “A Hands-On Introduction to Technology Forecasting using Data Envelopment Analysis”
TE	03	Tuesday	16:00 - 17:30	Pavilion Ballroom C	“Sustainability - 2”
WB	03	Wednesday	10:30 - 12:00	Pavilion Ballroom C	“Strategic Management of Technology - 1”
WD	03	Wednesday	14:00 - 15:30	Pavilion Ballroom C	“Strategic Management of Technology - 2”
WE	03	Wednesday	16:00 - 17:30	Pavilion Ballroom C	“Strategic Management of Technology - 3”
HB	03	Thursday	10:30 - 12:00	Pavilion Ballroom C	“Strategic Management of Technology - 4”
HD	03	Thursday	14:00 - 15:30	Pavilion Ballroom C	“Strategic Management of Technology - 5”
HE	03	Thursday	16:00 - 17:30	Pavilion Ballroom C	“PICMET 2013 and 2014 Planning Session”
MB	04	Monday	10:30 - 12:00	Pavilion Ballroom D	“Decision Making - 1”
MD	04	Monday	14:00 - 15:30	Pavilion Ballroom D	“R&D Management - 1”
ME	04	Monday	16:00 - 17:30	Pavilion Ballroom D	“R&D Management - 2”
TB	04	Tuesday	10:30 - 12:00	Pavilion Ballroom D	“R&D Management - 3”
TD	04	Tuesday	14:00 - 15:30	Pavilion Ballroom D	“R&D Management - 4”
TE	04	Tuesday	16:00 - 17:30	Pavilion Ballroom D	“Decision Making - 2”
WD	04	Wednesday	14:00 - 15:30	Pavilion Ballroom D	“Decision Making - 3”
WE	04	Wednesday	16:00 - 17:30	Pavilion Ballroom D	“Decision Making - 4”
HB	04	Thursday	10:30 - 12:00	Pavilion Ballroom D	TUTORIAL: “Making Excellent R&D/Technology Portfolio Decisions”
HD	04	Thursday	14:00 - 15:30	Pavilion Ballroom D	“Science and Technology Policy - 3”
MB	05	Monday	10:30 - 12:00	Orca	“Knowledge Management - 1”
MD	05	Monday	14:00 - 15:30	Orca	“Technology Assessment and Evaluation - 1”

Schedule of Sessions

TB	05	Tuesday	10:30 - 12:00	Orca	“Knowledge Management - 2”
TD	05	Tuesday	14:00 - 15:30	Orca	“Technology Assessment and Evaluation - 2”
TE	05	Tuesday	16:00 - 17:30	Orca	“Information Management - 1”
WB	05	Wednesday	10:30 - 12:00	Orca	“Information Management - 2”
WD	05	Wednesday	14:00 - 15:30	Orca	“Knowledge Management - 3”
WE	05	Wednesday	16:00 - 17:30	Orca	“Information Management - 3”
HB	05	Thursday	10:30 - 12:00	Orca	“Knowledge Management - 4”
HD	05	Thursday	14:00 - 15:30	Orca	“Knowledge Management - 5”
MB	06	Monday	10:30 - 12:00	Finback	“Emerging Technologies - 1”
MD	06	Monday	14:00 - 15:30	Finback	“Nanotechnology - 1”
ME	06	Monday	16:00 - 17:30	Finback	“Emerging Technologies - 2”
TB	06	Tuesday	10:30 - 12:00	Finback	“Emerging Technologies - 3”
TD	06	Tuesday	14:00 - 15:30	Finback	“Emerging Technologies - 4”
TE	06	Tuesday	16:00 - 17:30	Finback	“Technology Transfer - 2”
WB	06	Wednesday	10:30 - 12:00	Finback	“Technology Management Framework”
WD	06	Wednesday	14:00 - 15:30	Finback	“Nanotechnology - 2”
WE	06	Wednesday	16:00 - 17:30	Finback	“Project/Program Management - 2”
HB	06	Thursday	10:30 - 12:00	Finback	“Project/Program Management - 3”
MB	07	Monday	10:30 - 12:00	Beluga	“Technology Management in the Health Sector - 1”
MD	07	Monday	14:00 - 15:30	Beluga	“Productivity Management”
ME	07	Monday	16:00 - 17:30	Beluga	“Entrepreneurship / Intrapreneurship”
TB	07	Tuesday	10:30 - 12:00	Beluga	“Technology Marketing - 1”
TD	07	Tuesday	14:00 - 15:30	Beluga	“Technology Marketing - 2”
TE	07	Tuesday	16:00 - 17:30	Beluga	“Technology Management in the Health Sector - 2”
WB	07	Wednesday	10:30 - 12:00	Beluga	“Technology Adoption - 1”
WD	07	Wednesday	14:00 - 15:30	Beluga	“Technology Adoption - 2”
WE	07	Wednesday	16:00 - 17:30	Beluga	“Technology Adoption - 3”
HD	07	Thursday	14:00 - 15:30	Beluga	“Technology Diffusion - 2”
MB	08	Monday	10:30 - 12:00	Parksville	“Technology Transfer - 1”
MD	08	Monday	14:00 - 15:30	Parksville	TUTORIAL: “High Technology Creation, Transfer and Diffusion: Evidences from Scandinavian Companies”
ME	08	Monday	16:00 - 17:30	Parksville	“Technology Management in Services - 1”
TB	08	Tuesday	10:30 - 12:00	Parksville	“Technology Management in Services - 2”
TD	08	Tuesday	14:00 - 15:30	Parksville	“Technology Management in Services - 3”
TE	08	Tuesday	16:00 - 17:30	Parksville	“Technology Management in Services - 4”
WB	08	Wednesday	10:30 - 12:00	Parksville	“Competitiveness”
WD	08	Wednesday	14:00 - 15:30	Parksville	“Technology Transfer - 3”
WE	08	Wednesday	16:00 - 17:30	Parksville	“Technology Transfer - 4”
HB	08	Thursday	10:30 - 12:00	Parksville	“Commercialization of Technology - 1”

Schedule of Sessions

HD	08	Thursday	14:00 - 15:30	Parksville	“Commercialization of Technology - 2”
MB	09	Monday	10:30 - 12:00	Port Hardy	“Project/Program Management - 1”
MD	09	Monday	14:00 - 15:30	Port Hardy	“Science and Technology Policy - 1”
ME	09	Monday	16:00 - 17:30	Port Hardy	“Science and Technology Policy - 2”
TB	09	Tuesday	10:30 - 12:00	Port Hardy	PANEL: “Research Funding Sources for Engineering and Technology Management Research”
TD	09	Tuesday	14:00 - 15:30	Port Hardy	“New Product Development - 1”
TE	09	Tuesday	16:00 - 17:30	Port Hardy	“New Product Development - 2”
WB	09	Wednesday	10:30 - 12:00	Port Hardy	“E-Business”
WD	09	Wednesday	14:00 - 15:30	Port Hardy	“Management of Technology Based Organization”
WE	09	Wednesday	16:00 - 17:30	Port Hardy	“New Product Development - 3”
HB	09	Thursday	10:30 - 12:00	Port Hardy	PANEL: “Meet the Editors”
MB	10	Monday	10:30 - 12:00	Port McNeill	PANEL: “2020 Foresight: PICMET in the Year 2020”
MD	10	Monday	14:00 - 15:30	Port McNeill	“Detecting and Characterizing Technical Emergence: New Methods for Measuring Scientific and Technical Change”
ME	10	Monday	16:00 - 17:30	Port McNeill	“Technology Forecasting - 1”
TB	10	Tuesday	10:30 - 12:00	Port McNeill	“Technology Forecasting - 2”
TD	10	Tuesday	14:00 - 15:30	Port McNeill	“Telecommunication Industry”
TE	10	Tuesday	16:00 - 17:30	Port McNeill	“Manufacturing Management - 1”
WB	10	Wednesday	10:30 - 12:00	Port McNeill	“Manufacturing Management - 2”
WD	10	Wednesday	14:00 - 15:30	Port McNeill	“Technology Management Education - 1”
WE	10	Wednesday	16:00 - 17:30	Port McNeill	“Technology Management Education - 2”
MB	11	Monday	10:30 - 12:00	Port Alberni	“Management of Technical Workforce”
MD	11	Monday	14:00 - 15:30	Port Alberni	“Cultural Issues”
ME	11	Monday	16:00 - 17:30	Port Alberni	“Quality Management - 1”
TB	11	Tuesday	10:30 - 12:00	Port Alberni	“Collaborations in Technology Management - 1”
TD	11	Tuesday	14:00 - 15:30	Port Alberni	“Collaborations in Technology Management - 2”
TE	11	Tuesday	16:00 - 17:30	Port Alberni	“Collaborations in Technology Management - 3”
WB	11	Wednesday	10:30 - 12:00	Port Alberni	“Technology Diffusion - 1”
WD	11	Wednesday	14:00 - 15:30	Port Alberni	“Information Technology - 1”
WE	11	Wednesday	16:00 - 17:30	Port Alberni	“Information Technology - 2”
MB	12	Monday	10:30 - 12:00	Azure	“Patent Analysis - 1”
MD	12	Monday	14:00 - 15:30	Azure	“Patent Analysis - 2”
ME	12	Monday	16:00 - 17:30	Azure	“Intellectual Property - 1”
TB	12	Tuesday	10:30 - 12:00	Azure	“Patent Analysis - 3”
TD	12	Tuesday	14:00 - 15:30	Azure	“Intellectual Property - 2”
TE	12	Tuesday	16:00 - 17:30	Azure	“Patent Analysis - 4”
WB	12	Wednesday	10:30 - 12:00	Azure	“Convergence of Technologies”
WD	12	Wednesday	14:00 - 15:30	Azure	“Semiconductor Industry”

Personal Schedule

	Sunday July 29, 2012	Monday July 30, 2012	Tuesday July 31, 2012	Wednesday Aug 1, 2012	Thursday Aug 2, 2012
08:00 – 08:30 Bright Start					
08:30 – 10:00 (A)		Plenary (Pavilion Ballroom)	Plenary (Pavilion Ballroom)	Plenary (Pavilion Ballroom)	Plenary (Pavilion Ballroom)
10:00 – 10:30 Coffee Break					
10:30 – 12:00 (B)					
12:00 – 14:00 Lunch Break					
14:00 – 15:30 (D)					
15:30 – 16:00 Coffee Break					
16:00 – 17:30 (E)					PICMET '13 and PICMET '14 Planning Session (Pavilion Ballroom C)
19:00 – 22:00	Welcome Reception (Pavilion Ballroom)	Dinner (Fountain Square)	Awards Banquet (Pavilion Ballroom)		

PLENARIES

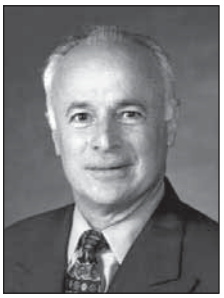
PLENARY SESSION—1

DATE: MONDAY, JULY 30, 2012
TIME: 08:30-10:00
ROOM: PAVILION BALLROOM CD

KEYNOTE

Dr. David M. Steele, Dean, College of Business and Lucas Graduate School of Business, San Jose State University, USA

"Innovation and Technology Management in Silicon Valley"



Silicon Valley has been the launching pad for innovative technology companies for over 100 years. The modern history of Silicon Valley can be traced over 50 years ago with the founding of Fairchild Semiconductor in San Jose in 1957. Companies that followed like Intel, Apple, Netscape, Google and Facebook have changed the practice of technology management worldwide. Global supply chain management and design thinking, in addition to traditional technology and R&D management, have been merged into an integrated management process. Managing virtual, multicultural and multi-country technology teams has also become integral to high-tech enterprise success.

So what can we learn from the history and technology management prowess of Silicon Valley? What is the secret sauce of success? How has technology management been redefined? What role does "failure" play in technology management?

We will explore the history of Silicon Valley, its entrepreneurship and innovation-based culture, its ability to reinvent itself about every decade, and some of the lessons for managing a technology-based enterprise.

Dr. David M. Steele joined San Jose State University (SJSU) as Dean, College of Business and Lucas Graduate School of Business, in July, 2008. He is building on the College's strengths by enhancing academic quality and student success; and by emphasizing practical business knowledge and global business education, including the new Thompson Global Internship Program.

Previously, he was Dean of the Silberman College of Business at Fairleigh Dickinson University, which includes the prestigious Rothman Institute of Entrepreneurial Studies; and Professor and Dean of the College of Business at Florida Institute of Technology.

Dr. Steele rose through the ranks of Chevron Corporation (ranked Fortune # 3 today) to become President of Chevron Latin America. He had a broadly diversified career track in R&D, project engineering, finance, strategic planning, and IT before moving to senior executive management positions. After leaving Chevron, Dr. Steele was an Executive Consultant to the founders of four international early-stage ventures, serving as Interim CEO of one of these ventures, a software startup.

Dr. Steele attended Birmingham University in England, receiving B.S. and Ph.D. degrees in Chemical Engineering. He later completed graduate business training at UC Berkeley and at the Wharton School.

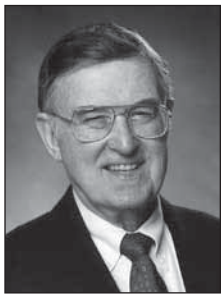
PLENARY SESSION—2

DATE: TUESDAY, JULY 31, 2012
TIME: 08:30-10:00
ROOM: PAVILION BALLROOM CD

KEYNOTE-1

Dr. Daniel Berg, University of Miami

"Reflections on the Management of Emerging Technologies by an Academic/Practitioner"



Emerging technologies are critically important and difficult to define. But we do define them! Are they emerging today or many indefinite decades from today? Are they managed in identical fashion in nanotechnology, biotechnology, information technology, energy technology, etc.? I don't think so.

After working for decades on technologies that have emerged or on some still emerging technologies or on not quite yet emerging technologies, and also having researched and taught the basics of the management of technology, in these reflections I will attempt to explore some of the continuing issues and dilemmas of the management of emerging technologies.

Dr. Daniel Berg is a Distinguished Research Professor of

PLENARIES

Engineering at the University of Miami. Previously, he was Dean and Provost at Carnegie Mellon University (CMU) as well as Provost and President at Rensselaer Polytechnic Institute (RPI) and Institute Professor of Science and Technology.

He received his B.S. in Chemistry and Physics from the City College of New York and his M.S. and Ph.D. in Physical Chemistry from Yale. He was employed by Westinghouse Electric in a variety of technical/managerial positions including Technical Director.

Dr. Berg serves as the American Editor of the International Journal of Services Technology and Management. *He is the author of four books, five book chapters and over 80 refereed journal articles.*

He is a member of the National Academy of Engineering, a Life Fellow of the Institute of Electrical and Electronic Engineers (IEEE), a Fellow of INFORMS, and a Fellow of the American Association for the Advancement of Science.

Dr. Berg's many awards and honors include the IEEE Engineering Management Section Educator of the Year Award; the IAMOT Award for Distinguished Achievement in Management of Technology; the IEEE Educational Activities Board Meritorious Achievement Award in Continuing Education; the National Academy of Engineering Service Award; the Townsend Harris Medal, City College of New York; the Wilbur Cross Medal, Yale University; and the Belden Prize for Mathematics.

KEYNOTE-2

Dr. Nam P. Suh, President, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea

"Rapid Development of Innovative Complex Technological Systems"

It is commonly accepted that large complex systems will take many years to design, develop, and deploy. This is the case because wrong design decisions are often made during the course of development. If the design of the system avoids coupling of functional requirements (FRs) and is properly decomposed, it can significantly reduce time and cost. We created three large innovative systems that support this claim: On-Line Electric Vehicle (OLEV), Mobile Harbor (MH), and Mixalloy. Between 2009 and 2011, we designed, developed and commercialized the OLEV system, an electric vehicle that receives its electric power wirelessly from an underground cable. It was selected as one of the "50 Best Inventions of 2010" by TIME. The mobile harbor (MH), equipped with cranes, goes out to large container ships parked in rough open sea to load and unload containers, and then transports them to the port nearest to the final destination of the containers, eliminating the need for large harbors. Mobile Harbor was ranked second in the "10 Best Start-up Ideas of 2011" by StartupSmart. Finally, Mixalloy (a Cu/TiB2 dispersion alloy) was developed in three years from a theoretical concept to mass production and commercialization. The use of Axiomatic Design Theory enabled rapid development of these complex systems. We checked the viability and acceptability of proposed designs by constructing the system architecture as the system is being developed. These examples suggest that the management of technology development can be made more rigorous and effective by using a theory based design process.

Dr. Nam Pyo Suh has been the President of the Korea Advanced Institute of Science and Technology (KAIST) since July 13, 2006.

Dr. Suh is the President of KAIST and the Cross Professor Emeritus at M.I.T. He was the Director of the Park Center for Complex Systems, and the Head of the Department of Mechanical Engineering, MIT. In 1984-1988, Dr. Suh was a Presidential Appointee in charge of engineering at the National Science Foundation (NSF).

He received the ASME Medal, the General Pierre Nicolau Award of CIRP, the Pony Chung Award, the Inchon Education Award, the Ho-Am Prize for Engineering, the Mensforth International Gold Medal of IEE, the Hills Millennium Award from IED, the Distinguished Service Award of NSF, and eight honorary degrees, among others.

He authored 300 papers and seven books, and holds more than 70 US patents. His contributions include the delamination theory of wear, the solution wear theory, a theory on the genesis of friction, Axiomatic Design, complexity theory, and microcellular plastics. He invented the On-Line Electric Vehicle (OLEV) and the Mobile Harbor (MH). He was educated at MIT and CMU.

PLENARIES

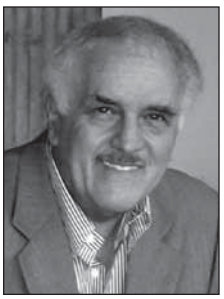
PLENARY SESSION—3

DATE: WEDNESDAY, AUGUST 1, 2012
TIME: 08:30-10:00
ROOM: PAVILION BALLROOM CD

KEYNOTE

Dr. Bulent Atalay, Scientist, Artist and Author, USA

"The Crucial Importance of Form and Function — Jobs, Newton and Leonardo"



Bulent Atalay, physicist, artist and author, compares the modus operandi of Leonardo da Vinci, Steve Jobs and Isaac Newton, underscoring the ways these three extraordinarily gifted individuals altered forever the way we see the world. This is a talk about how science and art can complement each other. But it is also about maximizing creativity by cross-fertilizing diverse disciplines. "Universal genius" Leonardo was the ultimate master of integrating art and science. In our own time Steve Jobs made it a practice to marry the best of form and function, indeed, better than anyone else had done since the Renaissance genius Leonardo. Finally, Isaac Newton, the greatest scientist-mathematician ever, who personally had little use for art, succeeded in irreversibly marrying mathematics and natural law (science). This cross-fertilization came in his monumental book, *Principia*, that fueled the Industrial Revolution, and signaled the beginning of the Enlightenment. For inventing the open-ended intellectual system — modern science — Newton has to be regarded as the architect of the modern age.

Bulent Atalay, a scientist, artist and author, has been described by NPR, PBS and the Washington Post *as a "Modern Renaissance Man." He is the author of two successful books on the intersection of art, science and mathematics, with Leonardo, the pre-eminent Renaissance man, serving as the foil. His best-selling book,* Math and the Mona Lisa, *(Smithsonian Books, 2004) has appeared in 13 languages, and* Leonardo's Universe *(National Geographic Books, 2009) in English and Japanese. Professor Atalay's academic background is in theoretical physics. He travels around the world lecturing at academic institutions and on cruise ships on the "A-subjects," art, archaeology, astrophysics, atomic physics and Ataturk, confessing that he knows much less about the "B-subjects," business, banking, biology and botany... See his website www.bulentatalay.com.*

PLENARY SESSION—4

DATE: THURSDAY, AUGUST 2, 2012
TIME: 08:30-10:00
ROOM: PAVILION BALLROOM CD

KEYNOTE-1

Dr. Aaron Shenhar, Professor of Project and Technology Management; Research Fellow, Rutgers University, Tel-Aviv University; CEO, The SPL Group

"How to Save the Economy with Management of Technology"

This presentation will analyze the pitfalls of the economic system and our society's neglect of technology management as a strong driver for growth and prosperity. While companies as well as governments focus on financial solutions, many overlook the potential and power of technology and its management. It may well be the only hope for the U.S. economy today for keeping its leadership position. Based on studying the role of government, industry, and academia, this presentation will show what each one of these sectors can do to help the economy grow again.

Dr. Aaron Shenhar is a leading expert in project and program management, technology management, and execution leadership. He holds five academic degrees in engineering and management, including three degrees from Stanford University and two from the Technion in Israel.

He was named, "Engineering Manager of the Year," by the Engineering Management Society of IEEE, and was the first recipient of the Project Management Institute (PMI) Research Achievement Award. Dr. Shenhar is a Fellow and Member of the Science Council of NASA USRA Center for Program and Project Management Research.

Dr. Shenhar is also an experienced manager and executive. He served in the Israeli Navy, before joining the defense industry in Israel, where he has been involved in managing projects, innovation, R&D, and high technology businesses for almost 20 years. Working for Rafael, Advanced Defense Systems, he participated in all phases of engineering and management, from project manager up through the highest executive posts. As executive, he served as Corporate Vice President, Human Resources,

and later, President of the Electronic Systems Division.

In his second career of over 20 years in academia, he was a tenured professor, serving at several universities where he founded new programs in areas such as Project Management at Stevens Institute of Technology, Master of Business and Science at Rutgers University, Executive Education at the University of Minnesota, and MBA in Technology Management and a Master's in Systems Engineering Management at Tel-Aviv University. Dr. Shenhar's research has focused on project and program management, and technology and innovation management. He is also focusing on the leadership of professionals in technology-based organizations. He developed the concepts of Strategic Project Leadership(R) as well as the "Diamond Approach" that help corporations focus projects on business results and dynamically adapt their management practices to the specific project context.

With over 150 publications, which were cited more than 2,400 times and published in leading journals such as Strategic Management Journal, Management Science, Sloan Management Review, Research Policy, *or* IEEE Transactions on Engineering Management*, his writings have influenced project and technology management research and education around the world. His publications are highly regarded and used in the curriculum of corporate and university programs in project and technology management.*

He served as consultant to major corporations such as Intel, 3M, Honeywell, AT&T, Trane, Dow Jones & Co., US Army, NASA, NSA, Lockheed Martin, Tata Industries, and Israel Aerospace Industry.

In 1993 he led a team of 30 researchers in an industry-wide study involving most defense development programs in Israel, and resulting in recommendations to the defense department on how to overhaul the industry and the department's acquisition and program management processes. In 2005 he led a large NASA study building a NASA-specific program management framework. Dr. Shenhar has also developed the framework used by the Aerospace Industry Program Excellence Award and is serving as a member of Aviation Week's evaluation team. Dr. Shenhar is currently CEO of The SPL Group, an education and consulting group dedicated to aligning business and projects in industry and government.

He is co-author of the recent book Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation*, Harvard Business School Press. The book was selected among the top five best business books of 2007.*

KEYNOTE-2

Dr. Itti Rittaporn, Toyota Tsusho Electronics Co., Ltd., Thailand

"Sharing of Experiences and Views on Implementing/ Initiating High Tech Projects and Industrial Infrastructure in Thailand"

From the early 1960s, Thailand is a country that strives to move up the technology ladder toward being a high-tech country. Yet, it seems Thailand has not done well enough compared to other similar countries. Based on personal experiences in both public R&D organizations (microelectronics, semiconductor industry) and private sectors (automotive and software), I would like to share with the audience the paths Thailand has taken, the achievements, the challenges it is facing, and the possible technological and industrial roadmaps for Thailand from a personal perspective. I would also like to define "power devices and green electronics" to be the crucial keywords for Thailand's automotive and electronics industries to survive and thrive in the coming decades.

Dr. Itti Rittaporn is an executive with Toyota Tsusho Electronics (Thailand) Co., Ltd., in charge of new business development in the areas of ITS, traffic information services, small EV development and smart mobility, and smart energy management.

Dr. Rittaporn was principle researcher at the International Superconductivity Technology Center/Superconductor Research Laboratory, a project under METI/NEDO funding, from 1988 1996. He was Deputy Director of the National Electronics and Computer Technology Center (NECTEC), Thailand, where he was in charge of building the first silicon wafer fabrication line from 1996 2006. In 2006 he joined Toyota Tsusho Electronics, Japan, and was in charge of offshore embedded software business development, ITS, and smart energy related projects.

Dr. Rittaporn received the Japanese Government Monbusho Scholarship to study in Japan in 1978. He received bachelor's (1983), master's (1985) and Ph.D. (1988) degrees in Applied Physics from the University of Tokyo.

PhD Colloquium

GETTING YOUR PH.D.… AND BEYOND

Critical Stages and Career Paths for the Ph.D. Student

DATE: SUNDAY, JULY 29, 2012
TIME: 13:00—17:00
LOCATION: ORCA ROOM (SOUTH TOWER, 3RD FLOOR)
REGIST: $35

The PICMET Ph.D. Colloquium is targeted at students in all stages of the Ph.D. process, as well as recent graduates. Through guest lectures and workshop discussions, we will cover various aspects of PhD education and career opportunities in engineering and technology management, including:

- The Ph.D. process and career paths in different countries
- Critical stages in the Ph.D. process and how to successfully master them.
- Coping with possible personal problems while pursuing a Ph.D. (lack of time or motivation, problems with advisers, insufficient time for family and friends, etc.)
- What's next - academia or industry?
- Entering the academic job market as future junior faculty
- Landing your first industry job
- To publish or to perish?

Guest lectures will provide a starting point for workshop discussions. Workshops will tackle topics the participants are most interested in. They provide a unique opportunity to meet colleagues, share experiences and ideas, and network with students and faculty from different countries and university systems.

We encourage students in all stages of the Ph.D. process, as well as recent graduates, to join us.

TUTORIALS

HIGH TECHNOLOGY CREATION, TRANSFER AND DIFFUSION: EVIDENCE FROM SCANDINAVIAN COMPANIES

DATE: MONDAY, JULY 30
TIME: 14:00-15:30
LOCATION: PARKSVILLE

SPEAKER: Nazmun Nahar, University of Jyvaskyla, Finland

Too many companies fail to utilize the advantages of modern information technologies (ITs) for technology creation, transfer across borders and effective utilization. Rapid and effective technology creation, transfer and utilization are essential for survival when facing intense global competition accompanied by a rapid reduction in product and technology life cycles. Our empirical research indicates that the utilization of ITs by Scandinavian companies has distributed the technology development process among technology suppliers, subcontractors, and technology recipients who are located in different countries; and has improved the technology development, transfer across borders and utilization significantly. The tutorial is delivered by the speaker through a) presentation, b) case study analyses of Scandinavian companies that are highly successfully utilizing the advantages of modern ITs in technology creation, transfer across borders and utilization, and c) group discussions. The tutorial is targeted toward students, researchers and practitioners who are interested in technology creation, transfer and utilization at a quicker pace.

Dr. Nazmun Nahar joined the Department of Computer Science and Information Systems at the University of Jyvaskyla in Finland in 2001. She earned two PhD degrees, in Economics with a major in Information Systems Science from the University of Jyvaskyla and in Information Systems Engineering from Tallinn Technical University. She obtained two MBAs, with majors in International Business and in Information Technology.

She has long experience with university research, led several research projects and supervised a number of PhD and MSc students in information systems, high technology and business. She has produced some excellent PhD dissertations and MSc theses. She has published many papers in leading IS journals, books, monographs and conference proceedings. Her research interests include: a) research processes innovation, b) globally distributed creation of closed and open innovations in the high-tech sector and their diffusions, c) commercialization of innovations and technologies in the global arena, d) IT-supported technology package creation, R&D level technology transfer and diffusion, e) knowledge management, f) global outsourcing and offshoring and g) management and business models innovation. She has given keynote speeches and served as a track chair, workshops chair, tutorials chair and program committee member of various international conferences. Since long, she has been guiding several organizations in Scandinavia and South Asia in their global business and IT strategy formulation.

Since 2001, she has been teaching a variety of courses in information systems, high-technology and business at master's and PhD levels in Finland. In addition, she has taught as a visiting lecturer in France, Norway, Spain, Czech Republic, Estonia, Singapore, India, etc. She has served as an Adjunct Faculty Professor in Singapore and Visiting Associate Professor in Estonia. She has also given numerous guest lectures, research seminar talks and industry seminar talks at national and international universities and organizations.

A HANDS-ON INTRODUCTION TO TECHNOLOGY FORECASTING USING DATA ENVELOPMENT ANALYSIS

DATE: TUESDAY, JULY 31
TIME: 14:00-15:30
LOCATION: PAVILION-BALLROOM C

SPEAKER: Timothy Anderson, Portland State University, USA; Dong-Joon Lim, Portland State University, USA

Over the years, technology forecasting using data envelopment analysis (TFDEA) has been used in a wide range of applications. This includes predicting release dates for new products and setting future design targets. Applications include fighter jets, microprocessors, flat panel displays, passenger aircraft, wireless telecommunications protocols, digital cameras, and others. A barrier to TFDEA adoption has been the lack of available tools. Recently developed software will be demonstrat-

ed and attendees will be given copies. If you bring your own laptop, you can do the installation and then follow along with us.

Dr. Timothy R. Anderson is an Associate Professor of Engineering and Technology Management at Portland State University. He received Master's and Ph.D. degrees in Industrial Engineering from the Georgia Institute of Technology and a Bachelor's in Electrical Engineering from the University of Minnesota. He has worked for and consulted with a variety of companies and organizations including Honeywell, Nike, Menlo Logistics, Oki Electric, the U.S. Postal Service, and the American Association for the Advancement of Science. He is currently Co-Director of Technical Activities for the Portland International Conference for the Management of Engineering and Technology. He has served as Program Chair or Co-Chair for PICMETs in 1997, 1999, 2001, '03, '05, '06, '07, '08, '09, '10, '11 and '12. His current research interests are productivity analysis, operations research, service engineering, technology forecasting, and new product development. Recent journal articles have been published in the *IEEE Transactions on Engineering Management, R&D Management, Technological Forecasting and Social Change, International Journal of Innovation and Technology Management,* and *the Journal of Productivity Analysis.*

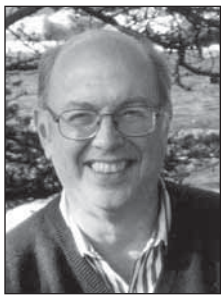
Dong-Joon Lim is a full time Ph.D student of Engineering and Technology Management at Portland State University, USA. He studied at the Sungkyunkwan University, South Korea, and received the degree of M.S. in R&D Management after receiving his B.S. in Systems Management Engineering. He has participated in several consulting projects including Samsung, Nike, and Sharp. His research areas include efficiency measurement, technology forecasting, frontier analysis, and new product development. Recent journal articles have been published in *Mathematical and Computer Modeling and the Journal of the Korea Association of Defense Industry Studies.*

MAKING EXCELLENT R&D/TECHNOLOGY PORTFOLIO DECISIONS

DATE: THURSDAY, AUGUST 2
TIME: 10:30-12:00
LOCATION: PAVILION-BALLROOM D

SPEAKER: Michael M. Menke, President, Value Creation Associates, USA

Project portfolio management (PPM) is the process to decide which projects get funded and which have to be dropped or deferred. This is critical for all organizations with scarce resources, i.e. more good project ideas than people or money to do them all. Most R&D and technology organizations have this problem, but also many IT, marketing, manufacturing, capital project and even public sector organizations. PPM helps organizations align and execute strategy, maximize value and manage risk. PPM also helps optimize the use of scarce resources and manage bottlenecks as the funded projects progress through the project pipeline. This tutorial defines portfolio management, discusses why it is important, presents the most useful frameworks, concepts, tools and displays, reviews several PPM case studies, and presents the results of a new international benchmarking study on the best practices organizations use to achieve excellence in portfolio management. It concludes with some advice on how organizations can improve in the areas that the benchmarking study showed are most difficult to execute with high quality. The tutorial will be very helpful to all R&D, technology and innovation organizations that have many great opportunities but limited budgets.



Dr. Michael Menke is a Fellow of Knowledge Management at Decision Strategies Inc. assisting a wide range of companies with strategy, decision making and portfolio management. Formerly he was the chief portfolio advocate for HP advising executives and working teams at all levels and in all segments of HP on strategy development, decision making, portfolio management and new business creation. Before joining HP he was a founding partner of and led the R&D management practice at Strategic Decisions Group, a consultancy where many of the portfolio management approaches in use today by leading companies were initially developed. He has consulted with Alcoa, Amgen, AT&T, Bayer, Chevron,

TUTORIALS

DuPont, Exxon, Ford, GlaxoSmithkline, HP, IBM, J&J, Kodak, Lilly, Mitsubishi, Novartis, Owens-Corning, Pfizer, Roche, Shell, Sumitomo Electric, Texas Instruments *et al*. on strategy, major decisions and/or portfolio management. He has been on the program committee for the IIR-PDMA portfolio conference for seven years, is a founding member of the Enterprise Portfolio Management Council, co-chair of the IEEE standards working group on Strategic Enterprise Decision Management, and has also been an invited speaker at dozens of international conferences on portfolio management, innovation, R&D/technology and business strategy and decision making over the past 25 years.

PANELS

2020 FORESIGHT: PICMET IN THE YEAR 2020

DATE: MONDAY, JULY 30
TIME: 10:30-12:00
LOCATION: PORT MCNEILL

MODERATOR: Charles W.N. Thompson, Northwestern University;

PANELISTS: John Whittaker, University of Alberta; Simon Philbin, Imperial College London; Donald Kennedy, Kennedy Technical Services Inc.; Joseph Martino, Yorktown University

Our panel (a few experts, a few wannabes) will offer a picture of where PICMET will be in the year 2020—where it will meet, what will be the theme, who will attend, and so on. And, the context—where will the field of technology management be, what will be the major concerns, the major challenges, the major achievements? We cannot (and will not) attempt to tell the experts what they should focus on; we will expect the wannabes to at least read our abstract before talking. And we will have a judicious (and stern) chairman, primarily for the latter (and any rambunctious members of the audience).

All of us, with the possible exception of professional historians, are likely to agree that hindsight is often a useful, necessary, and widely shared skill. Foresight is different. A very few are gifted with (or have acquired) a useful and often desirable if not also necessary ability to exercise foresight; among the rest of us, there may be a few "wannabes," varying from well-meaning naifs to hard-core con artists. Our panelists in the former category have clearly acquired well-recognized skills in foresight; our panelists in the second category are near the former end of that dimension (we hope).

RESEARCH FUNDING SOURCES FOR ENGINEERING AND TECHNOLOGY MANAGEMENT RESEARCH

DATE: TUESDAY, JULY 31
TIME: 10:30-12:00
LOCATION: PORT HARDY

PANELIST: Tugrul Daim; Portland State University

This panel will explore funding sources for research in engineering and technology management.

MEET THE EDITORS

DATE: THURSDAY, AUGUST 2
TIME: 10:30-12:00
LOCATION: PORT HARDY

MODERATOR: Timothy Anderson, PICMET

PANELISTS: C. Chang, State University of New York at Buffalo; Scott Cunningham, Delft University of Technology; Tugrul Daim, Portland State University; Jeremy Hall, Simon Fraser University; Saku Mäkinen, CITER / Tampere University of Technology; Steve Walsh, University of New Mexico

Meet the editors of the Technology Management related journals. The editors will be discussing the philosophies, criteria, and submission processes of their journals and answer questions from prospective authors.

PICMET '13 AND '14 PLANNING SESSION

DATE: THURSDAY, AUGUST 2
TIME: 16:00-17:30
LOCATION: PAVILION-BALLROOM C

This panel session will provide an opportunity to give feedback on PICMET '12 and to get involved in the planning for PICMET '13 and '14 conferences. PICMET '13 will be held July 28-August 1, 2013, at the San Jose Marriott in San Jose, California, USA. PICMET '14 will be held in July 2014, in Kanazawa, Japan.

SESSIONS

MA-00 PLENARY - 1

DATE: MONDAY, 7/30/2012
TIME: 08:30 - 10:00
ROOM: PAVILION BALLROOM
CHAIR: TBA

MA-00.1 [K] Innovation and Technology Management in Silicon Valley

David M Steele; San Jose State University, United States

Silicon Valley has been the launching pad for innovative technology companies for over 100 years. The modern history of Silicon Valley can be traced over 50 years ago with the founding of Fairchild Semiconductor in San Jose in 1957. Companies that followed like Intel, Apple, Netscape, Google and Facebook have changed the practice of technology management worldwide. Global supply chain management and design thinking, in addition to traditional technology and R&D management, have been merged into an integrated management process. Managing virtual, multicultural and multi-country technology teams has also become integral to high-tech enterprise success. So what can we learn from the history and technology management prowess of Silicon Valley? What is the secret sauce of success? How has technology management been redefined? What role does "failure" play in technology management? We will explore the history of Silicon Valley, its entrepreneurship and innovation-based culture, its ability to reinvent itself about every decade, and some of the lessons for managing a technology-based enterprise.

MB-01 Innovation Management-1
Monday, 7/30/2012, 10:30 - 12:00
Room: Pavilion Ballroom A
Chair(s) Dov Dvir; Ben Gurion University of the Negev

MB-01.1 [R] Constructing Customer Understanding for Innovation Process: Case Study of a Life Science Company

Laura Kanto; Aalto University, Finland
Kirsi Polvinen; Aalto University, Finland
Anne-Sisko Patana; Aalto University, Finland
Jussi Pihlajamaa; Aalto University, Finland
Pekka Berg; Aalto University, Finland

This paper discusses how the customer understanding is created and spread among the organization in knowledge-intensive life science companies. The case company in the analysis is a diagnostic company and customers are hospital and private laboratories (business-to-business context) and also key opinion leaders. Research methods used in the study were qualitative face-to-face interviews and literature review. Interview questions were designed to elicit open-ended responses from participants. Ten participants were selected from different departments within one business unit, which had new discontinues products in the innovation pipe line. The data show that there was no common practice to collect, save and analyze the customer data for creating customer understanding and only few employees involved in the innovation process really knew the customers. And although open innovation has changed the role of customers also in life science industry, in this case study, most of the customers were used as information sources and only key opinion leaders as consultative partners. Promoting and preventing factors in both constructing customer understanding and utilizing customer understanding in innovation front-end were identified. Further study is needed especially about what kind of customer information is critical for the front end of the innovation process.

MB-01.2 [A] Convergence of Judgments in Technological Innovation Audit: A Case Study Application in a Sheet Metal Processing Equipment Manufacturer

Claudio A Santos; University of Minho, Portugal
Madalena Araujo; University of Minho, Portugal
Nuno Correia; INEGI, Portugal

As part of their technology strategy formulation, firms need ways to evaluate their internal technological innovation capability more effectively. Traditionally, staff meetings with personnel involved in the innovation process are used to manage the implementation of these self-assessments. The effectiveness of these meetings may be compromised by the presence of dominant personalities, by time pressures, or by bias imposed through organizational hierarchy. In this study, a technological innovation audit that encourages participation of the staff involved in innovative developments is proposed. The audit is composed of a list of statements aimed at assessing the capability of a firm to make such technological innovations. The audit is online for a predefined period of time, allowing participants to answer anonymously, make comments and check other participants' answers. They then repeat the process, altering answers as desired, as in an adapted Real Time Delphi survey. This new form of audit has been tested in a medium-sized producer of sheet metal processing equipment, and has proven to be a useful approach in firms with no formal innovation department or team. It provides a solid basis for the identification of inner strengths and weaknesses in the technological innovation process, and also offers a bottom-up view free from social pressures.

MB-01.3 [R] Assessing Innovation Management in a Company from the Steel Industry

Angelo Varandas Junior; Universidade de São Paulo, Brazil
Paulo A Cauchick Miguel; Universidade Federal de Santa Catarina, Brazil
Mário Salerno; Universidade de São Paulo, Brazil

Innovation management is a structured process that enables an organization to perceive new ways to create value. In this context, this paper aims at analyzing how a steel firm manages innovation. It makes an analysis based on a conceptual model from the literature that represents innovation value chain. Other important aspects for understanding organizational practices of innovation management are how new ideas are generated, selected, and prioritized, whether the process of innovation is aligned with company strategy, and which performance measures are adopted. Field data indicate that the company does not have a structured methodology for the development of new ideas and further diffusion of such ideas into new business models. Therefore, such issues should be further explored in future work.

MB-02 Technology Management in the Energy Sector - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Pavilion Ballroom B
Chair(s) Paulo T Nascimento; University of Sao Paulo

MB-02.1 [A] New Co-products and Ethanol Availability in Brazil

Paulo T Nascimento; University of São Paulo, Brazil
Ana Paula F Paes Leme Barbosa; University of São Paulo, Brazil
Aline Ishikawa; University of São Paulo, Brazil
Abraham S Yu; University of São Paulo, Brazil
Alceu S Camargo Jr; University of São Paulo, Brazil

Since the introduction of flex-fuel light vehicles, Brazilian drivers have had the option of choosing between ethanol or gasohol at the filling station. Whenever the price of ethanol rises above 70 percent of gasohol per liter, drivers tend to switch to gasohol. As both ethanol and sugar require sugarcane as their feedstock, when international sugar prices are more appealing, distilleries and production facilities shift from ethanol to sugar, thereby reducing ethanol supply which results in price increases. Are there other co-products that may further affect this availability issue? Polyethylene (the petrochemical largest volume feedstock) and Farnesene (a biodiesel alternative) may be such products. Polyethylene is in production by Braskem. Farnesene is at the initial stages of a joint-venture between Amyris and San Martinho. We harness secondary sources to understand the potential impact of co-products on ethanol availability. Our preliminary studies demonstrate that if polyethylene from ethanol is successful in the international arena, it may impact ethanol as fuel alterna-

tive. Likewise, Amyris' success with Farnesene may also hinder the availability of ethanol as a fuel, as large volumes may be required to produce biodiesel. Alcohol chemistry, on the other hand, does not seem to have the potential to impact ethanol use as fuel.

MB-02.2 [R] Trends in Renewable Energy Production and Media Coverage: A Comparative Study

Tuisku Pelkonen; Tampere University of Technology, Finland
Aija Tapaninen; Tampere University of Technology, Finland

Our paper tests the use of news media data in technology diffusion analysis, building on the premise of Watts & Porter's Life Cycle Indicators. Bibliometrics can be used in determining the level of technology diffusion, but most studies are made using patents or scientific publications as data sources. The target of this study is to examine if news media data portrays technology diffusion on part of wind, solar photovoltaic and hydroelectric energies. Correspondently, the news media data is collected from LexisNexis from a period of 1995-2008, in Germany. The news media data is first, examined to discern resemblances with technology diffusion S-curve, and second, compared with each renewable energy forms primary production data using Spearman correlation. The results indicate that the news hits of all three renewable energy forms construct S-shaped trends similar to technology diffusion curve, and the news media data and energy production data are significantly correlated on part of wind and solar photovoltaic energies, but not on hydroelectric energy. The results serve many avenues for diffusion research on determining and comparing the trends in the renewable energy technologies and media.

MB-02.3 [R] The Evaluation of Innovation Policy Efficiency for the Emerging Energy Industry in China: Wind Industry

MingJie Lu; Tongji University, University of California Davis, United States
Song Chen; Tongji University, China
Xin Liu; Tongji University, China
Yong Lou; Tongji University, China

This article studies the present situation of wind industry development in China and concludes that all the regions can be divided into four groups depending on development stage. Then it compares the role of policy instruments stimulating long-term technological change in the wind industry in Inner Mongolia, Jiangsu, and Hainan. It concludes that Inner Mongolia and Jiangsu's broad portfolio of policies and measures has been well adapted to the different stages in the development of their wind industry, which has contributed to a high degree of innovation, diffusion and establishment of domestic markets, and, in recent years, increasingly successful self-creations in technology from the introduction of technology. Hainan's wind energy policies and measures have been weaker than in Inner Mongolia and Jiangsu and decreasing in stability over time, resulting in the loss of stimulation in demand. They have not sufficiently covered the wind industry's perceived needs on different stages in the development of new technology nor have they stimulated continuous improvement, learning, and new product development in industry. This has been part of the reason as to why the extent of innovation and diffusion of wind technology in Hainan is limited.

MB-03 Sustainability - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Pavilion Ballroom C
Chair(s) Dietmar H Winzker; University of Pretoria

MB-03.1 [R] Sustainability of Emerging Technology and Economic Projects Implemented by Donor Communities in Developing Country

James K Chen; Asia University, Taiwan
Bulgan Bayaraa; Asia University, Taiwan
Yu-Rong Dai; Asia University, Taiwan
Yi Ren Chen; Asia University, Taiwan

The fields of sustainable technology and emerging economic projects development of developing countries have been converging in recent years to form a main discipline, which is termed as sustainability of emerging economic development. The integration of technology of industry, economy, environmental biotechnology and social resources of the sustainable economic development of a country is very essential for government decision-making. Development focuses only on economic growth that leads to excessive exploitation and endangers natural resources. This research focuses on the consideration of how donor communities contribute to build sustainability for technology and the economy in Mongolia. Mongolia has made significant steps toward to establishing a market economy since the 1990s. The challenge over the twenty years, donor communities, such as United Nations Development Program and World Bank, which have been playing an important role to strengthen and support sustainable economic development in developing countries. The objective of the research aims to facilitate present and future scenarios to consider alternative possible outcomes. This research has also intended to donor's achievement to strengthen sustainable technology and economic development, capacity of national economy and further trend of economic development.

MB-03.2 [A] Reintroduction of Trolleybuses in Colombia: An Opportunity for the Development of Sustainable Transport

Andrés Emiro Díez; Universidad Pontificia Bolivariana, Colombia
Edder Velandia; Universidad de la Salle, Colombia
Armando Bohórquez; Universidad Pontificia Bolivariana, Colombia
Mauricio Restrepo; CIDET, Colombia
Ernesto Guggenberger; Sytecsa, Colombia

Colombia is a country privileged in its energy level: it has enough water, coal and renewable energy reserves to meet the electricity needs of future generations. However, it is a lagging country at mass transit in its cities, especially electric transit, because despite having five cities with over one million inhabitants, only one, Medellin, has an electrical system, while others favor the use of a few modes of transportation based on fossil fuels. Although the country is known worldwide for BRT use, as is the case of Bogota, in the use of electric transportation systems there are great opportunities, especially in the use of a trolleybus system in such exclusive BRT corridors. This article describes the opportunities in Colombia for the re-introduction of trolleybuses in electrical transportation systems through these corridors, emphasizing its benefits for the optimal use of energy resources, the reduction of air quality impact of public transport in Colombian cities, and the opportunity for transport operators to reduce their operating costs with technology alternatives that are more economic and stable over time. Additionally, an analysis of a demonstration project with trolleybuses carried out at Universidad Pontificia Bolivariana in Medellin (Colombia) is presented, which demonstrates the applicability of this technology in the Colombian context.

MB-04
Decision Making - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Pavilion Ballroom D
Chair(s) Hongyi Chen; Portland State University

MB-04.1 [R] A Web-based Intelligent Collaborative Logistics Management Decision Support System for Enhancing the Cost Effectiveness of Door-to-door Delivery

Canhong Lin; The Hong Kong Polytechnic University, Hong Kong
King Lun Choy; The Hong Kong Polytechnic University, Hong Kong
Hoi Yan Lam; The Hong Kong Polytechnic University, Hong Kong
David W.C. Wong; The Hong Kong Polytechnic University, Hong Kong

With the rapid development of customer-to-customer E-Commerce in China, a large number of small- and medium-sized logistics companies (SMLCs) has emerged, which focus on highway transportation between cities. In particular, the co-loading method and the door-to-door service are usually used by SMLCs to further improve profit margin and customer satisfaction. In practice, many SMLCs cannot achieve the overall capacity of their vehicles due to shortage of cargos, whereas others cannot satisfy all customer orders even while

overloading their vehicles. In addition, they are confronted with other problems, such as costly freight consolidation and distribution. In the present paper, a web-based intelligent collaborative logistics management decision support system (ICLMDS), consisting of three modules, is proposed to formulate intelligent solutions to these problems. Information on cargos is provided by individual cargo providers in different parts of the city. First, the cargo-to-vehicle matching advisor is initialized to match and recommend suitable cargos to vehicles. Second, an allocate-cargo-to-container optimizer configures the optimal combination of cargos for vehicle consolidation. Finally, the pick-up and delivery routing planning module determines the optimal pick-up and delivery vehicle routes in the cities. By running the ICLMDS on the Internet, the cost of communication, freight consolidation, and transportation is significantly reduced.

MB-04.2 [R] Decision Support System for Sample Development in the Hong Kong Garment Industry

Carmen K.H. Lee; The Hong Kong Polytechnic University, Hong Kong
King Lun Choy; The Hong Kong Polytechnic University, Hong Kong
Kris M.Y. Law; The Hong Kong Polytechnic University, Hong Kong
G.T.S. Ho; The Hong Kong Polytechnic University, Hong Kong

In today's garment industry, speed to market is important considering the fast fashion trend. In particular, the efficiency of new product development (NPD) is critical in gaining competitive advantages. The garment industry is material intensive, thus making it more difficult for merchandisers to ensure material availability for sample development compared with other manufacturing industries. Conventionally, when materials with a long lead time affect the sample-making progress, merchandisers formulate action plans based solely on experience. Without any knowledge support for merchandising operations, these merchandisers may fail to make wise decisions, resulting in a long sample development cycle and poor customer satisfaction. The current paper proposes a sample development decision support system to provide knowledge support for sample development. The present study attempts to use rule-based reasoning for determining sample-making operation lead times and material delay times for sample making, followed by case-based reasoning to support the knowledge manipulation involved in sample order processing. After a pilot study in a Hong Kong garment company, the proposed system is found to help accelerate NPD processes by considering both material arrival dates and sample delivery dates to provide merchandisers with suggested guidelines in the sample development process.

MB-04.3 [R] Emerging Trends in Decision Making of It Leaders

Paul Rohmeyer; Stevens Institute of Technology, United States
Tal Ben Zvi; Stevens Institute of Technology, United States

IT leadership roles are changing in response to emerging trends in IT architectures. Advances in cloud computing, virtualization, software as a service (SaaS), and mobility have dramatically changed IT management models, and therefore have altered the role of IT managers. Service based computing models such as cloud have shifted the responsibilities of organizational IT managers away from technology implementation and support and towards activities of sourcing and monitoring. Similarly, increased technical abstraction presented by service based models has moved IT architecture decisions into the domain of business managers who are uniquely equipped to shop for IT services that fit their respective business needs. Additionally, technical knowledge has become increasingly diffused throughout organizations and is no longer dominated by specialized IT departments. As a result the locus of decision making for IT architecture has shifted away from IT and into business. IT's role, therefore, is undergoing a fundamental shift, with a technical emphasis on connectivity and integration rather than on the design of architectures, systems, and solutions. This paper identifies emerging IT management trends within two sample organizations. While the degree of transformation varies between the organizations, the effect is unmistakable: technology decision making has shifted to the business, and the role of IT leaders has been transformed from solutions builder to service manager. The paper identifies and explores emerging trends in IT management and provides a foundation for survey research across a wider sample of organizations.

MB-04.4 [R] Why Companies Go BOP: An Exploratory Study in Chinese Context

Liping Zhang; Tsinghua University, China
Yunhuan Tong; Tsinghua University, China

Alleviating poverty through market-based approach is increasingly capturing the attention of academia and practitioners. However, there remains a lack of empirical and theoretical work on why companies are interested in exploring BOP market. We conducted a multi-case study of the motivations and contextual factors that induce firms' BOP initiatives. Based on the analytic induction on eight companies in China, three motivations were revealed: legitimacy, corporate social responsibility, and competitiveness. These motivations are influenced by three levels of contextual conditions: the institutional context, the organizational context and the individual context. Our research has made insightful expansion and contributions to the existing BOP literature.

MB-05 Knowledge Management - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Orca
Chair(s) Kunio Shirahada; JAIST

MB-05.1 [R] Does Guanxi Matter to Knowledge Sharing?

Wan-Yu Chen; TransWorld University, Taiwan

In today's competitive, rapidly changing work environment, knowledge management has become a necessary factor in achieving both individual and organizational success. Only by continually innovating and accumulating knowledge can organizations compete effectively. However, knowledge innovation begins with the interaction among people and the willingness to share personal knowledge and experiences with others. In Chinese society, the concept of guanxi is far more complicated than Western relationships. In this study, we adopt both Eastern and Western perspectives to explore the link between interpersonal relationships, guanxi, and knowledge sharing. To address this oversight, 60 sets of completed questionnaires from 260 R&D employees from Taiwan formed the basis of our empirical analysis. We found that members with higher level expressive ties tend to offer a higher level of knowledge sharing, but that members with higher levels of instrumental ties tend to offer lower levels of knowledge sharing. Team members with good relationships will be positive to knowledge sharing. We discuss our findings in terms of their implications for management practices and future research.

MB-05.2 [R] Knowledge Management Systems and Innovation in KIBS: A Brazilian Case

Jose Manuel M Cardenas; University of Sao Paulo, Brazil
Mauro M Spinola; University of Sao Paulo, Brazil

Knowledge-intensive based services are service companies that have been successful as agents of technology transfer. They are mainly knowledge providers. Regarding innovation, such companies are not innovation consumers but innovators in services. Most of the innovations in this direction come from the staff of professionals that make up KIBS, innovations expressed in the experience from each professional. Thus, this article reviews a) the mechanisms established to recover the experience in KIBS, and b) the manner in which KIBS develop knowledge management systems compliant with their service processes. In this paper the characteristics of KIBS firms and their types are initially reviewed in order to seek an alignment with a case study on the structure of knowledge management within a technology company in Brazil. Results indicate strong evidence that the people capabilities are the main foundation of a knowledge management system, and the fact that the perception of technology does not represent its innovator face but has implications in the search for new uses for innovations in order to generate new services.

MB-05.3 [A] Study of the Relationship between Organizational Culture and Knowledge Management: Case Study of Iran Khodro Company

Fariborz Zoroufi; Azerbaijan Nation, Iran

Ali Akbar Majidian; IKCO, Iran
H. Adabi; Azerbaijan Nation , Iran

The present research aims to investigate organizational culture and knowledge management at IKCO. For this purpose, 17 hypotheses composed of one main hypothesis and 16 subsidiary hypotheses were codified after reviewing the research literature. To test the research hypotheses a sample composed of 230 individuals was selected among IKCOs managers, responsible and experts. Afterwards, the research questionnaires were distributed among the statistical sample that its outcome was 96 percent. After collecting the questionnaire, the collected data was summarized, classified and inserted in Lisrel & SPSS software. In this research descriptive statistics techniques such as frequency distribution tables & circular and pillar diagrams were used to analyze and investigate the demographic variables, and structural equations modeling approach was used to investigate and rate the research hypotheses. The results suggest that all of the research hypotheses were validated. Rating the correlation coefficients revealed that the most significant relation is between involvement at work and knowledge transfer. At the end, the offers resulting from this study's statistical outcomes were delivered to IKCO and similar companies which are seeking adequate opportunities to successfully apply management of knowledge.

MB-06 Emerging Technologies - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Finback
Chair(s) J. Michael Munson; Santa Clara University

MB-06.1 [A] Managing Clean Technology Research, Development, and Commercialization: Success Stories and Lessons Learned from Washington State University

Howard Grimes; Washington State University, United States
Jane Payumo; Washington State University, United States
Anson Fatland; Washington State University, United States

Demand for renewable energy, the threat of global warming and climate change, and the question of how to make the transition to an economy based on fossil-fuel alternatives are concerns for everyone. Washington State University (WSU) has joined the green innovation race to help transform to a global economy based on safer, more diverse energy alternatives; and to develop innovative ideas and technologies that balance climate change mitigation and increased global energy needs. This paper highlights WSU's experience in using interdisciplinary and innovative approaches to accelerate research, development, and commercialization of clean technologies. WSU's experience shows how creative efforts can generate valuable public goods via: 1) prioritization and implementation of transformational research linked to learning and scholarship; 2) formation of innovation partnerships and stakeholder engagement; 3) innovation sharing, intellectual property rights protection, and new modes of technology transfer; and 4) development and implementation of progressive policies. The paper's reflection on WSU's successes and future challenges in managing and delivering new and innovative clean technologies to bring economic value can serve as an important reference for other public research institutes, policymakers, and businesses wanting to help contribute to the further establishment of a bio-economy and spur sustainable growth, nationally and globally.

MB-06.2 [A] Technological Competence and the Impact of Emerging Technologies on Rural Development: Some Lessons from South Africa's Civil Aircraft Industry

Daphney H Mayindi; Dept. of Rural Development and Land Reform, South Africa

The objective of the paper is to provide a framework on how governments should steer technological capability building and competence that would impact positively in improving infrastructure and rural development. It emphasizes aggressive government interventions, coupled with that of the private sector, to promote collaboration amongst technological firms, research and higher education institutions, followed by major investment in R&D which could result in new and improved technologies. It displays how emerging technologies could be deployed in rural areas to improve livelihood and the facilitation of rural development through providing improved infrastructural facilities. The paper also indicates how South Africa could draw lessons from the pockets of knowledge existing in the countries studied on how they have built technological capabilities within the civil aircraft industry that could be applied to R&D, thus leading to the discovery of emerging technologies that need to be implemented in rural areas. The key areas of focus that seem to have led to the successes of countries on innovation and successful implementation of emerging technologies include government's involvement in supporting international co-operation, mergers and attracting investment. This complemented the findings of the study where it became evident that successful firms have been involved in collaboration activities with their local institutions as part of building local technological capabilities or competencies within the civil aircraft sector.

MB-06.3 [R] Impact of Emerging Technologies on Public Road Transport in India: Study of KSRTC

R. Srinivasan; Indian Institute of Science, India
Sushmitha Priyadarshini ; Indian Institute of Science, India

Improvements in technology have changed the transportation scenario of India. Karnataka State Road Transport Corporation (KSRTC) is the state-run road transport in Karnataka. KSRTC has been one of the first corporations to capitalize on changing technologies to provide improved services to passengers. The result has been that Karnataka is one of the pioneering states in India where state-of-the-art buses ply even in interior rural areas. The onset of the liberalization process in India has also opened up the transport sector to private players. In a situation where the country is heading towards a free market economy, the private players have also capitalized on emerging technologies and are giving stiff competition to KSRTC. The present paper looks at the impact of emerging technologies on one of the popular routes in the state, operated by KSRTC, namely Bangalore-Mangalore. It looks at how the technologies have impacted the customer's expectation of services and his perception after availing the service. To arrive at the results SERVQUAL instrument has been used. The paper identifies the gap between perception and expectation of service provided by KSRTC as a result of emerging technologies.

MB-07 Technology Management in the Health Sector - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Beluga
Chair(s) Daniel Berg; Rensselaer Polytechnic Institute

MB-07.1 [R] System Requirements for an Electronic Health Record System Using Smartphones for Homecare

Futaba Kaneyasu; The University of Tokyo, Japan
Masanori Akiyama; The University of Tokyo, Japan

In the Japanese healthcare system, demand for homecare for relatively severe diseases has recently been increasing. In providing such homecare, privacy must be maintained with high security because the service is carried out not in hospital but at home, which has insufficient security. It is important to share a common platform to integrate several service providers virtually because there are many types of service providers located in different places involved in the treatment of a single patient. We developed an electronic health record (EHR) system for homecare, which is based on cloud computing technology using smartphones. In this paper, we discuss the technical aspects of information security, which are required especially for homecare based on the results of a field survey. Our focus is on strict personal authentication with SIM cards to prevent the cybercrime of stealing ID in order to maintain strict privacy of patient medical information.

MB-07.2 [R] Exploring the Consumer Acceptance of and Preferences in Nutrigenomics-based Personalized Health Management Service

Hsiang-Ling Su; National Chung Hsing University, Taiwan
Ta-Jung Lu; National Chung-Hsing University, Taiwan

Nutrigenomics is an emerging technology that offers opportunities for personalized health management from the preventive and promoting perspectives. Despite general agreement on the value of nutrigenomics as a powerful approach to unravel the complex diet-health relationships, challenges in applications at the scientific, regulative, and ethical levels have also been widely discussed. However, research into the consumer acceptance and potential service models of such an application is relatively scarce. As the awareness and demand for preventive medicine continues to grow worldwide alone along with the ever-increasing market of health optimizing improving product and service, the successful development of such innovative applications would require better knowledge from consumers' perspectives. In the present study a multimedia online survey was carried out to understand the consumer acceptance of nutrigenomics based personalized health management and to explore the consumer preferences of related service, particularly in the Asian population. In accordance with previous findings, perceived benefit was found to be the most critical in consumer acceptance while other suggested factors remained insignificant. In addition, strong potential in the market of the nutrigenomics-based personalized health management service under certain conditions was revealed. In summary, the findings of this study will provide guidelines for the future development of personalized health management services.

MB-07.3 [R] Detecting Effective Categories of Medical Incident Reports for Patient Safety Management

Katsuhide Fujita; The University of Tokyo, Japan
Masanori Akiyama; The University of Tokyo, Japan
Keunsik Park; Osaka City University Hospital, Japan
Etsuko Yamaguchi (Nakagami); Osaka City University Hospital, Japan
Hiroyuki Furukawa; Yamaguchi University Hospital, Japan
Ichiro Sakata; The University of Tokyo, Japan
Yuya Kajikawa; The University of Tokyo, Japan

The analysis of medical incident reports is indispensable for patient safety management. The cycles between analysis of incident reports and proposals to medical staffs are a key point for improving the patient safety management in the hospital. Most of the incident reports include free descriptions, however, the analysis of free descriptions are not enough in the medical area. We aimed to accumulate, to interpret information again by structured incident information, and to clarify the point that should be improved for the cause of the accident and safe medical treatment improvements in the present study. We employ the natural language processing and the network analysis for detecting effective categories of medical incident reports. The network analysis can find various relationships that are not only direct relationships but also indirect relationships. First, some important characteristic words were extracted in three categories: the accident's background, details, and solutions using TF-IDF measure. Next, we show the co-occurrence networks using the extracted words. Then, we detect the new categories based on the network analysis and compare between existing categories based on experts' decisions and bottom-up ones. By the network analysis, some of new perceptions for improving the patient safety management have appeared.

MB-08 Technology Transfer - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Parksville
Chair(s) Dilek Cetindamar; Sabanci University

MB-08.1 [R] Influential Factors of the Commercialization of Academic Patents: The Taiwan Experience

Ming-Yeu Wang; National Chiayi University, Taiwan
Jei-Heng Lin; National Taiwan University, Taiwan
Hsien-Chen Lo; National Chiayi University, Taiwan

Universities are sources of knowledge creation. They play the role of conducting basic research, and the research results lay a foundation for subsequent technology developments and commercialization. Compared to foreign top universities, Taiwanese universities have a weak capability to convert research results into commercial products, and they yield a lower value after cooperating with enterprises. Patents are an important output of research results, so this study attempts to find the influential factors for the commercialization of academic patents. This study investigated the centers for technology licensing and patenting in Taiwan universities and used the results from expert interviews and a literature review to derive five major influential dimensions: policy and environment, the market, academic organizations, inventors, intellectual property, and technology. This study used the analytical hierarchy process to derive the importance of the dimensions and evaluation criteria. The results show that the market is the most influential factor for commercialization of patents. The results indicated that different cognitions exist between the industry and academic institutions in Taiwan. Finally, this study proposed suggestions for universities in Taiwan to help them make strategies for patent commercialization. Universities that implement patent commercialization can refer to these suggestions.

MB-08.2 [A] Commercialize Technology Assets Comprehensively: A Case Study for Automated Tissue Engineering

Toni Drescher; Fraunhofer Institute for Production Technology IPT, Germany
Guenther Schuh; Fraunhofer Institute for Production Technology IPT, Germany

Competition has become increasingly technology based. From an economic perspective, the value appropriation of technologies is an essential part of technology management. While most industrial firms focus on the internal application of technologies in their own products and services, the external mode of technology exploitation, i.e. the commercialization of disembodied technological knowledge, has long been neglected. This is due to the fact that companies lack in a systematic approach to evaluate their technologies in terms of all available exploitation opportunities. The goal of the present paper is to propose a new approach for a decision-making model to identify the appropriate exploitation strategy considering the key internal and external factors characterizing the commercialization situation. Therefore, a target system for technology exploitation is established and the contribution of the different exploitation strategies, such as spin-off, joint-venture and licensing to the different targets, is evaluated. Afterwards, the influence of the characteristics concerning market, exploiting company and technology is discussed. The decision-making model is developed and applied to the case Automated Tissue Engineering on Demand, which has been accomplished by the Fraunhofer Institute for Production Technology IPT. The aim of the project was to identify the company and technology-specific exploitation strategy for a production facility capable of automatically producing tissues on demand for toxicity and efficacy testing.

MB-08.3 [R] A Comparison of North American Universities with and without Medical Schools and Their Technology Transfer Initiatives

Mary Mathew; Indian Institute of Science, India
Srigowtham Arunagiri; Indian Institute of Science, India
Dipanjan Nag; IPShakti, India

Empirical research available on technology transfer initiatives is either North American or European. Literature over the last two decades shows various research objectives such as identifying the variables to be measured and statistical methods to be used in the context of studying university-based technology transfer initiatives. AUTM survey data from years 1996 to 2008 provides insightful patterns about the North American technology transfer initiatives, and we use this data in our paper. This paper has three sections: a comparison of North American Universities with (n=1129) and without Medical Schools (n=786), an analysis of the top 75th percentile of these samples, and a DEA analysis of these samples. We use 20 variables. Researchers have attempted to classify university-based technology transfer initiative variables into multi-stages, namely, disclosures, patents and license agreements. Using the same approach, however with minor variations, three stages are defined in this paper. The first stage is to do with inputs from R&D expenditure and outputs, namely, invention disclosures. The second stage is to do with invention disclosures being the input and patents issued being the output. The third stage is to do with patents issued as an input and technology transfers as outcomes.

MB-09 Project/Program Management - 1

SESSIONS

Monday, 7/30/2012, 10:30 - 12:00
Room: Port Hardy
Chair(s) Hans J Thamhain; Bentley University

MB-09.1 [R] New Tools in Project Planning: An Introduction to the Rodenbeck Project Tower

Phillip D Rodenbeck; Rose-Hulman Institute of Technology, United States
Terry Schumacher; Rose-Hulman Institute of Technology, United States

Gantt and PERT charts are well known and widely used among project managers. However, these tools have seen little change in past decades, even as the environment in which they function has changed dramatically. Globalization, the computer age, virtual teaming, contracting technology cycles - these elements have permanently altered project environments. A great need now exists for innovation in project planning to better suit the modern project environment. This paper introduces the Rodenbeck Project Tower (RPT) - an innovative new tool and framework for project planning. The RPT is a 3D graphic that represents project tasks as elements of a physical building. It is composed of pillars, bridges, and floors representing work tasks, dependencies, and milestones, respectively. These building elements are displayed in three dimensions: criticality, resourcebility, and time. Criticality - a measure of importance and difficulty and resourcebility - a measure of dedicated resources define the width and length of pillar and floor elements while the height of the RPT is defined by time (project duration). Through this structure, RPT communicates information on core competencies, cross-functional need and support, the suitability of resource allocations, the critical set of tasks, general project stability, and many other insights previously unavailable through PERT or Gantt tools.

MB-09.2 [R] The Impacts of the Formal Structure of Customer and Supplier on the Outcome of an IT Project

Kari K Lilja; Tampere University of Technology, Finland
Ari Linden; Tampere University of Technology, Finland

The cooperation between partners of different sizes, different internal structures, different juridic formats or different ownership is not necessarily easy. The differences in the design of organizations and businesses have impacts on language as well as on the ways of thinking and operating. The different languages and different ways of thinking and doing things may cause misunderstandings between the partners, which in turns can lead to failure of the project. In this paper we will concentrate our interest on different designs of organizations and their effects on the cooperation and on the requirements assessment process. Some organizations are more bureaucratic than the others, some are strictly hierarchic and some extremely democratic in their decision making. In some organizations the power is delegated to lowest possible level and in opposite situations all the decisions are made at the top level. Understanding the partner and its way of making decisions is necessary for successful cooperation and is especially needed in big IT-projects where the knowledge is bipolarized: Each partner knows well only its own business. To avoid misunderstandings we should get to know our partner's background and structure and have an open before-hand discussion concerning the problems which may occur in the future.

MB-09.3 [R] Management of Multi-Project Environment by Means of Critical Chain Project Management: A Brazilian Multi-Case Study

Carlos B Morais; Ferrous Resources do Brasil, Brazil
Roberto Sbragia; University of Sao Paulo, Brazil

The present work discusses the recent experience of Brazilian companies in continued management of multi-project environments by means of critical chain project management (CCPM) through a multiple case study conducted on the companies EMBRAER and EMBRACO. The bibliographic review has allowed the determination of conceptual differences among portfolio management, program management, project management and multi-project environment management, has positioned the CCPM inside the roll of multi-project solution algorithms, and has identified characteristics that explain its widest adoption in the universe of project management to the detriment of other propositions, although mathematically even more robust than CCPM itself. The field research identified that, among the six practices advocated by the Viable Vision managerial philosophy for the conduction of CCPM, three of them stand out as critical success factors for managing multi-project environments: reducing harmful multitasking, planning and executing. Finally, the data collected indicates that the CCPM brings significant performance gains, especially related to the throughput increase of project delivery, to the management of multi-project environments considering a constant size pool of resources, and that their effective implementation is impacted by the organizational structure and by the company maturity in project management.

MB-10 PANEL: 2020 Foresight: PICMET in the Year 2020
Monday, 7/30/2012, 10:30 - 12:00
Room: Port McNeill
Panelist(s) Charles W. N. Thompson; Northwestern University
John Whittaker; University of Alberta
Simon P Philbin; Imperial College London
Donald A Kennedy; Kennedy Technical Services Inc
Joseph P Martino; Yorktown University

Our panel (a few experts, a few wannabes) will offer a picture of where PICMET will be in the year 2020—where it will meet, what will be the theme, who will attend, and so on. And, the context—where will the field of technology management be, what will be the major concerns, the major challenges, the major achievements? We cannot (and will not) attempt to tell the experts what they should focus on; we will expect the wannabes to at least read our abstract before talking. And we will have a judicious (and stern) chairman, primarily for the latter (and any rambunctious members of the audience). All of us, with the possible exception of professional historians, are likely to agree that hindsight is often a useful, necessary, and widely shared skill. Foresight is different. A very few are gifted with (or have acquired) a useful and often desirable if not also necessary ability to exercise foresight; among the rest of us, there may be a few "wannabes," varying from well-meaning naifs to hard-core con artists. Our panelists in the former category have clearly acquired well-recognized skills in foresight; our panelists in the second category are near the former end of that dimension (we hope).

MB-11 Management of Technical Workforce
Monday, 7/30/2012, 10:30 - 12:00
Room: Port Alberni
Chair(s) W. A Spivey; UTSA

MB-11.1 [A] Calculating Pay Adjustments and Raises Using Regression and Multiple Goal Linear Modeling

James Eastham; TriQuint Semiconductor, United States

This paper presents an objective approach to wage adjustments and raise calculations using regression and multiple goal linear modeling. The model comprehends key input items and constraints such as available budget, human resource maximum/minimum guidelines, employee ranking, existing salary, and deviation from "target" salary. The model rewards employee performance by weighting adjustments/raises based on peer ranking while making sure all budgetary constraints are maintained.

MB-11.2 [R] The Relationships between Work-Family Conflict and Job Performance under Different Sources of Social Support: Nursing Staffs as Examples

Mei-Ling Wang; Hungkuang University, Taiwan
Tzu-Ming Lin; Kuang Tien General Hospital, Taiwan
Li-Jane Tsai; Kuang Tien General Hospital, Taiwan

Generally, nursing staff members play a dual role in their family and at work, and hope to achieve a balance between their work and family life, thus work-family conflict (WFC) is more likely to be problematic. This study followed the concept of Lin (2008) and aimed to

explore the effects on WFC (family to work and work to family conflict) to job performance under different sources of social support in the nursing context. The questionnaire survey method was adopted. 520 questionnaires were released to nurses working in five hospitals in Taiwan. A total of 495 valid questionnaires were collected. The results showed that: 1) the level of work to family conflict in nursing staff is higher than that of family to work conflict; 2) a degree of family to work conflict has a negative influence on job performance; 3) four sources of social support all have positive influences on job performance; 4) friend support will strengthen the negative effect on family to work conflict to job performance; 5) co-worker support has a moderating effect on the relationship between work to family conflict and job performance. It is hoped that the findings will be useful for hospital managers, organizations and future research.

MB-11.3 [A] The Evaluation Framework of a Chinese Top Young Scientists Prize Launched by Chinese Academy of Sciences and Elsevier: The Case Study of the 'Seeking Future Star of Science Scheme'

Haoshu Peng; Shanghai Advanced Research Institute, CAS, China

The "Seeking Future Star of Science Scheme" is the first evidence-based award targeting young scientists (under 40) in China jointly launched by Science News Bi-Weekly (Chinese Academy of Sciences) and Elsevier since September 2009 based on a combination of bibliometric evaluation and peer review by leading Chinese scientists. The awards have created huge impacts on the Chinese science community. More than 400 promising young scientists from more than 100 universities and research institutes participated and over 100 media reported on the event.

MB-12 Patent Analysis - 1
Monday, 7/30/2012, 10:30 - 12:00
Room: Azure
Chair(s) Wang Liying; China Jiliang University

MB-12.1 [R] Patent Value Indicators: Case of Emerging Wind Energy Markets

Rahul Kapoor; Lappeenranta University of Technology, Finland
Matti Karvonen; Lappeenranta University of Technology, Finland
Matti Lehtovaara; Lappeenranta University of Technology, Finland
Tuomo Kässi; Lappeenranta University of Technology, Finland

The rapid rise in clean energy initiatives has seen wind energy take center stage in renewable energies. A study of patent data of emerging wind energy players shows interesting trends in emerging technologies with a possibility to identify fast moving new entrants. The market value of patents is extremely skewed. This paper aims to confront patent value indicators for established wind energy players. The value indicators are measured using forward citation analysis, patent family size and International Patent Classification. The most important wind energy technologies and possible new entrants are determined using consultancy reports and interviews with experts. The value indicators are determined using the patenting activity of Siemens Wind and Vestas using the EPO Worldwide PATSTAT database. Technology managers can use these indicators for measuring the strength of patents. These indicators can provide a basis for patent pricing and licensing. Furthermore, finding commercially valuable patents earlier can help business managers to formulate technology strategies and improve their decisions.

MB-12.2 [R] To Sue or Not to Sue: Co-opetition in the Patent Market

Yu-Chao Cheng; National University of Singapore, Singapore
Yuhong Lan; National University of Singapore, Singapore
Wenting Liu; National University of Singapore, Singapore
Shang-Jyh Liu; National Chiao Tung University, Taiwan

The emergence of non-practicing entities (NPEs) has drawn mixed responses from the practicing entities (PEs), suggesting sophisticated interactions between the two. The extant literature, however, focuses largely on the legal aggressiveness of NPEs, and the competition between NPEs and NPEs. Therefore, the aim of this study is to offer a more comprehensive view of the NPE-PE interactions using Game Theory. It is revealed in this study that, when encountering NPEs, PE's decision is critical and might often determine the outcome of the game. And the PE's decision is predominantly influenced by the interplay of factors, such as the requested royalties, the cost of negotiation/litigation and the expectation of litigation outcome. Depending on the player's decision, the NPE - PE Game could develop into either competition (to sue) or cooperation (not to sue). In particular, NPEs with R&D capabilities are in a strong position to engage in technology transfer, and therefore can assume diverse roles, i.e. as both competitor and complementor, in the patent market. In conclusion, NPE-PE game could take many forms, such as licensing partnership, litigation counterparts, or a mixture of technology and patent transactions, and consequently drive the patent market dynamics in various ways.

MB-12.3 [R] Note on a Heuristic Procedure to Identify the Most Valuable Chain of Patent Priority Network

Yu-hsin Chang; Yunlin University of Science and Technology, Taiwan
Kuei Kuei Lai ; Yunlin University of Science and Technology, Taiwan
Shao Yu Peng; Yunlin University of Science and Technology, Taiwan
Tsung-Hsien Kuo; LungHwa University of Science and Technology, Taiwan

Patent portfolio is more valuable than single patent. However, the analysis approach of a company's patent portfolios is still ambiguous. Patent priority approach (PPA) presented a clearer analysis method to explore the inside of patent family. Patent family provides an outline of patent portfolio. Patent priority analysis (PPA) could get a better picture of patent portfolio path and technical tracks through patent family priority. This article brings up patent family priority network (PFPN) by joining whole patent family members to PPA. Participating infringe law suit more than others do, the basic patent shows important status of its family. The length and quantity of patent chain represent depth and width of technical developing. Special nodes are also found. When patent family priority network has any "merge patent," GR of patent chain would fail to choose the right critical chain. Burst patent node bursts one path into several paths. SSR fails to choose the right significant chain with burst patent nodes. Although GR and SSR fail in the special situation, PFPN still could provide a company a simple, precise and wide using approach of technical developing.

MB-12.4 [R] A Study of Technological Collaboration in Solar Cell Industry Using Patent Analysis

Xiao-Ping Lei; Institute of Scientific and Technical Information, China
Zhi-Yun Zhao; Institute of Scientific and Technical Information, China
Xu Zhang; Institute of Scientific and Technical Information, China
Dar-Zen Chen ; National Taiwan University, Taiwan
Mu-Hsuan Huang; National Taiwan University, Taiwan
Run-Sheng Liu; Institute of Scientific and Technical Information, China
Jia Zheng; Institute of Scientific and Technical Information, China
Yun-Hua Zhao; Institute of Scientific and Technical Information, China

This study examines the technological collaboration in the solar cell industry by using the information of patent assignees and inventors as defined by the United States Patent and Trademark Office (USPTO). Three different collaborative types, namely local (same city), domestic (different cities of the same country), and international collaboration are discussed. The general status of solar cell patent collaborations, transforming trends of collaborative patterns, average numbers of assignees and inventors for three collaborative types, and international collaboration countries are studied. It is found that co-invented patents and co-assigned patents have both increased in numbers during the four decades; the collaboration of technology owners is very low, while the collaboration of inventors is active. Domestic collaboration is the main collaborative pattern for both assignee collaboration and inventor collaboration. The other two collaborative types show contrary trends: international collaboration has slowly risen in the past decades while local collaboration dwindled away. The US has the largest number of internationally collaborative patents worldwide, though such patents occupy a low portion of total US patents. In contrast, China has small number of total patents and internationally collaborative patents, but its international collaborative

shares are higher.

MD-01 Innovation Management - 2
Monday, 7/30/2012, 14:00 - 15:30
Room: Pavilion Ballroom A
Chair(s) Christian Marxt; University of Liechtenstein

MD-01.1 [R] Investigating the Technology-based Innovation Gap in Materials Sector

Byung Keun Moon; Korea Institute of Materials Science(KIMS), Korea, South
Jae Woo Chae; Korea Institute of Materials Science (KIMS), Korea, South

For the successful management of materials innovations, it is essential to consider the relationship and interactions between science and technology in materials. However, relatively little attention has been paid to the research on the gap between scientific output (papers) and technological output (patents) in materials. This paper aims to identify the relationship between science and technology and to discuss the innovation gap in the materials sector, especially in metallurgy and metallurgy engineering.

MD-01.2 [R] How Does Social Capital Work in Regional Innovation Systems? The Moderating Role of Contract Design

Bih-Huang Jin; Tung Hai University, Taiwan
Yu-Tzu Liao; Tung Hai University, Taiwan
Chien-Tzu Tsai; Feng Chia University, Taiwan
Chih-Yun Wu; Tung Hai University, Taiwan

Social capital theory is frequently cited by more and more studies in many social science fields. The primary objectives of this study are to better realize the effect of social capital on the cooperative performance of regional innovation systems, and to explore an important moderating effect of the contract design, which can reinforce trust level between partners. This study focused on the SMEs in central Taiwan, which cover a wide range of economic activities and comprise several industrial clusters, and surveyed them by questionnaire. Using regression analysis, the empirical results indicated that: 1) there is a positive relationship between social capital and the cooperative performance of regional innovation systems; 2) the contracts facilitate cooperation and trust among partners, and then the relationship between social capital and the performance of regional partners is enhanced as well. This research contributes to the regional innovation field by disentangling the moderating role of contracts, which is also a good help to facilitate the flow of resources, knowledge transfer and organizational learning between members, thereby strengthening the competitiveness of the region.

MD-01.3 [R] Do IP Management Strategies Spur Innovative Outputs and Firm's Performance? Evidence from Korean Manufacturing Industries

Dukrok Suh; Korea Institute of Science and Technology, Korea, South
Dong-hyun Oh; Inha University, Korea, South
Jongjoo Kim; Korea Institute of Science and Technology, Korea, South

The main objective of this study is to find relationships among IP management strategies, innovative outputs and firms' performance. In measuring the effect of IP management strategies, we investigated firms in Korean manufacturing industries focusing on the relationship between IP management strategies and financial performance after categorizing the level of IP management. Our empirical results signify that i) firm's IP management strategy positively affects their innovative outputs, and ii) patents and trademarks have a positive effect on enhancing the financial performances of firms whilst industrial designs do not have. Large firms showed a noticeably strong linkage between the IP management level and innovative outputs by using robust IP management frameworks.

MD-01.4 [R] Coevolution of Organizational Culture and Innovation Capabilities: The Case of Hylsa, the Laggard that Became Technology Leader

Carlos E Atoche-Kong; Universidad de Monterrey (UDEM), Mexico

This paper analyzes the case of Hylsa, a Mexican steel company that was capable to transform from a laggard company into a technology leader. It combines two approaches, the organizational culture tradition with the accumulation of innovation capabilities literature, finding that it is not just organizational culture that fosters the innovation activity, but that positive innovation outcomes create and configure this organizational culture, providing evidence that there is a mutual relationship in the development of both, an innovation friendly organizational culture and the development of innovation capabilities. Hylsas organizational culture evolves as well as its innovation capabilities. The former from elementary determinants into a strong organizational culture that favors innovation, and the latter from routine levels into advanced innovative levels, when Hylsa was capable to create first to the world innovations. The study uses a framework of determinants of organizational culture and the innovativeness levels framework to facilitate this analysis.

MD-03 Environmental Issues - 1
Monday, 7/30/2012, 14:00 - 15:30
Room: Pavilion Ballroom C
Chair(s) Oladiran O Abidakun; University of Pretoria

MD-03.1 [R] A Software-based Environmental Data Analysis for Product Life Cycle

Manocher Djassemi; California Polytechnic State University, United States

One of the major opportunities for practicing sustainability in material usage is selecting materials with minimal environmental degradation over the entire life cycle of a material. This includes initial acquisition, manufacturing, use and eventual disposal/recycling stages. This study provides a data analysis approach for investigating the impact of material selection decisions on the environment. Several eco-sustainability metrics including embodied energy, CO2 footprint, water usage and processing energy will be reviewed. A product example will be used to illustrate the application of a digital database for environmental data analysis. The results of this analysis can assist product managers and designers in incorporating environmental factors into the business and product design decisions.

MD-03.2 [R] The Influences of Green Perceived Quality and Green Brand Awareness on Green Brand Equity: The Mediation Effect of Green Perceived Risk

Yu-Shan Chen; National Taipei University, Taiwan
Ching-Hsun Chang; Tamkang University, Taiwan

This paper explores the relationships among green perceived quality, green brand awareness, green perceived risk, and green brand equity. The research object of this study focuses on Taiwanese consumers who have the purchase experience of information and electronics products in Taiwan. The empirical results show that green perceived quality and green brand awareness would positively affect green brand equity. Furthermore, this study demonstrates that green perceived risk, which is negatively influenced by green perceived quality and green brand awareness, would negatively affect green brand equity. The positive relationships between green brand equity and its two antecedents - green perceived quality and green brand awareness - are partially mediated by green perceived risk. Hence, investing resources in the increase of green perceived quality and green brand awareness and the decrease of green perceived risk is helpful to enhance green brand equity.

MD-03.3 [R] The Effect of Corporate Environmental Commitment on Green Product Innovation

Ching-Hsun Chang; Tamkang University, Taiwan

This study utilizes structural equation modeling (SEM) to explore the positive effects of corporate environmental commitment on green relationship learning and green human capital, which are positively associated with green product innovation in the Taiwanese manufacturing industry. This study selects the external factor, green relationship learning, and the internal factor, green human capital, as two mediators, and discusses their mediation effects on the positive relationship between corporate environmental commitment and green

product innovation. The results show that corporate environmental commitment is a driver of green relationship learning and green human capital. This study shows that corporate environmental commitment can positively affect green product innovation performance via the two mediators: green relationship learning and green human capital on the relationship.

MD-03.4 [R] Corporate Eco-innovation Patterns and Performance Indicators in China

Ying Dong; Zhejiang University of Science and Technology, China
Xiao Li; Tsinghua University, China
Lei Shi; Tsinghua University, China

There are many controversies on eco-innovation types and performance. We can find many different research perspectives such as environmental economic, innovation management and evolution theory. The aim of this article is to collect and make up the most important contributions in the economic literature in relation to the special characteristics of the management of the eco-innovation. Specifically, we want to show their strengths and weaknesses in order to make up the main conclusions of these analyses with the literature in relation to the way public administrations. Two parts will be included. The first part makes an overview on the development history and current situation of eco-innovation. The concept of eco-innovation was clarified and three characteristics were distinguished from general eco-innovation: a) double externalities, b) special technology push and market pull effect, and c) environmental governance push/pull effect. Subsequently, the classification systems of eco-innovation were discussed and a new system was established based on environmental protection paradigms, comprising end-of-pipe-oriented eco-innovation, process-oriented eco-innovation, product-oriented eco-innovation and system-oriented eco-innovation. The second section reviewed the performance of eco-innovation, such as performance evaluation, index system, data base and methodology. Finally, define and make measure indicators of eco-innovation of Chinese corporation.

MD-04 R&D Management - 1
Monday, 7/30/2012, 14:00 - 15:30
Room: Pavilion Ballroom D
Chair(s) Tugrul Daim; Portland State University

MD-04.1 [R] A Study of Nanotechnology R&D Alliance Networking

Chunhsien Wang; National Chiayi University, Taiwan
Pei-Yu Chien; National Sun Yat-sen University, Taiwan
Chih-Cheng Lo; National Changhua University of Education, Taiwan

Nanotechnology is an interdisciplinary technology and it has tremendous impact on various fields. The nature of interdisciplinary nanotech makes it widely applied in many domains' applications. Nanotechnology is now a growing attention to interdisciplinary collaboration and R&D activities in developing nanotech opportunities. However, up to now, very few studies have fully explored what kinds of factors drive nanotech R&D alliance activities across different disciplines. A key issue and the focus of this study are the cross-border collaborative capabilities and networks required at the firm level to engage in meaningful network relationships to enhance nanotech collaborative R&D alliance activity. By establishing linkages between the nanotech firms and other various domains, firms may help to accelerate nanotech development activities. Thus, according to the network embeddedness theory, this study seeks to confirm the distinctiveness of measures of inter-organizational collaborative network capabilities that may enhance interdisciplinary technology and knowledge exchange to increase emerging nanotech collaborative R&D alliance activities. Our efforts to develop an integrative framework theorizing inter-organization collaborative R&D networks based upon nanotech R&D embeddedness and nanotech cross-border R&D network status. Specifically, our findings show that nanotech R&D ties and structural holes have positively significant effects on nanotech R&D collaborative efforts which are contingent upon the technological uncertainty. Furthermore, the results show that technological uncertainty is a moderator negatively affecting the effect of nanotech R&D ties, structural holes on nanotech R&D collaborative activities.

MD-04.2 [A] Technology Innovation (TI) R&D Budget Flexibility

James R Bowen; Bonneville Power Administration, United States
Judith Estep; Bonneville Power Administration , United States
Justin Reel; Bonneville Power Administration , United States

Traditional organizational budgeting model in BPA are developed to help managers control costs and live within established rate cases. Technology Innovation has an increasing complex budget as we continue to ramp of our program to half of one percent of the agencys total revenue approximately $17M we required to comply with BPAs policy of spending 100% of our funding. Given Technology Innovation board scope of work we believe a successful approach to manage a dynamic portfolio where negative outcomes can not be either predict nor control budget flexibility is a must. I am suggesting a budget of plus or minus 10% is needed in any given year. This flexibility within Technology Innovation would not force us to continue work on projects that and not progressing just to meet finical goals.

MD-04.3 [R] Foresight for Public Policy of Solar Energy Industry in Taiwan: An Application of Delphi Method and Q Methodology

Ting-Lin Lee; National University of Kaohsiung , Taiwan
Mei-Chun Chuang; National University of Kaohsiung , Taiwan

This research aims at investigating of official's and stakeholder's patterns of cognitions toward policy foresight of solar energy industry in Taiwan by using Delphi survey and Q methodology. Foresight approaches in science and technology policy have been implemented by many countries to search the developing opportunities and uncertainty in the future. This is one response to the policy priority-setting and resources allocated. Taiwan has well foundation to develop the solar energy industry, and the government also regards it as the main promotion emerging energy. However, foresight research on the solar energy industry is insufficient. Hence, this study aims to find out what the solar energy industry will be in the future. Q methodology is often used to explore the multidimensional viewpoint issues, which is helpful for the interviewees to point out the real point of view on the research subject. This study makes sense of the types of solar energy industry policy foresight by using Q method that is a combination of questionnaires, interviews, and statistical analysis. Furthermore, for forming the Q statements, this study adopts the Delphi method as a tool to be authorized by the subjects within expertise, and subsequently stakeholders' perceptive types of policy foresight will be sorted out.

MD-05 Technology Assessment and Evaluation - 1
Monday, 7/30/2012, 14:00 - 15:30
Room: Orca
Chair(s) Yang Yang Zhao; National University of Singapore

MD-05.1 [R] Dynamic Antecedents of Customer Value Entering to New B2B-Markets

Aija Tapaninen; Tampere university of technology, Finland

This paper aims to investigate customer value when entering to new B2B-markets with an innovation. Expectations, evaluations and experiences are focused as dynamic antecedents of customer value. These antecedents are studied with qualitative interview-method and cross-analyzed with customer value determination process. The results provide empirical guidelines for strategic customer value creation and evidence of the opportunities and challenges faced before launch. However, contrary to expectations, the analysis indicated the diversity between provider experiences and potential targeted customer value.

MD-05.2 [R] Integrating Product Life Cycle Issues in Technology Selection

Amir Sanayei; Wayne State University, United States
Leslie Monplaisir; Wayne State University, United States

Technology selection is one of the most important and strategic decisions made in new product development. Companies need to consider product life cycle issues during the technology selection process. Effective strategies for considering life cycle issues and

technology selection together during product development have not been fully explored in the existing literature. In this paper, we review the current literature regarding technology selection and life cycle issues. We also propose a decision-making framework using a mathematical programming method to select the best alternative technology and planning and management of the development project. We do this by considering management control actions, product launch time, budget constraints, and sales volume, as well as demand and market requirements during the product life cycle.

MD-05.3 [R] Characterizing the Evolution of Technologies: An Introduction of Technology-DNA

Sarah Roepke; University of Bremen, Germany
Martin G. Moehrle; University of Bremen, Germany

For a deeper understanding of the evolution of technologies, we introduce a novel method to characterize technological fields by means of patent classifications and analytical coding. In the method technological fields are disaggregated into four system levels. Patent activities within the technological fields are classified with respect to the four system levels. The dominant system level showing the highest patent activity is identified for each year and sequenced over the course of time. Therefore, an individual fingerprint for a technological field is created. As we see a strong analogy to the DNA classification of living organisms, we call the method technology-DNA (T-DNA). T-DNA is applied in a case study, in which the technological field of logistics is examined. In the case study we find that inventive activities, after a period of unstable evolution, focus on system components and basic system elements, clearly indicated in the T-DNA. As a result, generating T-DNA of a technology offers several starting points for in-depth research.

MD-06 Nanotechnology - 1
Monday, 7/30/2012, 14:00 - 15:30
Room: Finback
Chair(s) Fernando Palop; Universitat Politecnica de Valencia

MD-06.1 [R] Proposal for New Global Nanotechnology Research and Education Complex Model in Japan

Shinichirou Morimoto; AIST , Japan
Atsushi Ogasawara; RIKEN, The Institute of Physical and Chemical Rese, Japan
Fumihiko Matsukawa; AIST, Japan
Masayoshi Watanabe; Ministry of Economy, Trade and Industry, Japan

In order to reinforce the international industrial competitiveness of nanotechnology through promoting the industry-academia-government collaboration under a common platform and implementing open innovation, global research and education complexes such as IMEC (Belgium), MINATEC (France), and Albany Nanotech (USA) have been established. These global nanotechnology complexes are successfully managing open user facilities, promoting education programs for the next generation, creating value for the global market, and growing their cluster scale with the support from federal and regional governments. This paper aims to research and evaluate the critical elements and key factors of the success of these three nanotechnology complexes, including each complex's operation mechanisms, budgets, private-public partnership models, research areas, development process, organizational structure, decision making mechanisms for research project and management, intellectual property management, and business model. Through this evaluation and analysis, the new global nanotechnology research and education complex model (TIA-nano model: Tsukuba Innovation Arena for nanotechnology model) has proposed taking advantage of the advanced manufacturing industry of Japan, and of the accumulated research/human resources in Tsukuba city. The innovation model and R&D model is changing rapidly toward an "open innovation model" where technology convergence and research/education integration is possible under a common research platform. The conclusion of this paper will provide significant ideas in order to build a research and education complex that considers the nation's industrial structure and political/economical situation.

MD-06.2 [R] Emerging Micro/Nanofabrication Technologies as Drivers of Nanotechnological Change: Paths of Knowledge Evolution and International Patterns of Specialization

Alfonso Avila-Robinson; Tokyo Institute of Technology, Japan
Kumiko Miyazaki; Tokyo Institute of Technology, Japan

The field of nanoscience and nanotechnology (N&N) epitomizes the archetype of an emerging technology; it is rapidly expanding, heavily science-driven, and potentially disruptive in terms of its effects on the global economy and society. Besides its alleged potentials, the true benefits of nanotechnology boil down to the capacity of N&N to deliver nano-based products to the market. Within this context, the building up of manufacturing capabilities at the nanoscale is a crucial aspect as micro/nanofabrication and micro/nanomanufacturing technologies have been regarded as enabling technologies, as a bridge between N&N research and innovation and commercialization. Despite its importance, up to now few social nano-related studies have approached N&N from a "manufacturing lens." This paper takes initial steps into this stream of research. Building on a general taxonomy for micro/nanofabrication technologies, two main research questions are addressed in this paper: how has the knowledge structure underpinning the field of micro/nanofabrication technologies evolved over time? What patterns of specialization can be discerned for relevant countries and regions across the micro/nanofabrication spectrum? For that purpose, a series of bibliometric methods on scientific publications drawn from the ISI/SCI database were used: longitudinal bibliometric analysis, co-word analysis, and the estimation of revealed scientific advantage (RSA) indexes. Given the alleged deindustrialization of advanced economies toward services, our study repositions the importance of manufacturing in general and micro/nanofabrication in particular in the efforts of countries toward the development and commercialization of nano-based products and the future generation of nano-based applications.

MD-06.3 [R] Nanotechnologies: An Exploratory Study to Orient the Implantation of Labs in Research Institutions and Universities

Mauro S Ruiz; Nove de Julho University, Brazil
Abraham Sin Oih Yu; Institute for Technological Research of Sao Paulo , Brazil
Fernando E Martins; Institute for Technological Research of Sao Paulo , Brazil
Rosany Correa; Nove de Julho University, Brazil

Nanotechnology is growing up in importance due to its application in several industrial sectors. Developed countries have defined research agendas in this area to develop new products and processes to meet future demands. Some of these countries are carrying out prospective studies, roadmaps and technology forecasting to orient their investments. As it regards to investments and ongoing research projects, the USA, Japan, South Korea and Taiwan are the leading countries nowadays. Europe, Germany, England, and France are also running nanotechnology projects, most of them in universities and research institutions. China and India are the developing countries that have invested the most in this area. Based on both research and development (R&D) initiatives and funding worldwide, ROCO (5) developed a conceptual model that can be used to orient prospective studies to help developing countries to define their investment strategies in nanotechnologies. The objective of this study is to use the ROCO model to set up guidelines to be followed by some R&D institutions to optimize their efforts, capabilities and investments in nanotechnology. It is expected that some research institutions and universities can take advantage of its results.

MD-07 Productivity Management
Monday, 7/30/2012, 14:00 - 15:30
Room: Beluga
Chair(s) Dong-Joon Lim; Portland State University

MD-07.1 [R] Investigating the Relationship between Organizations' Financial Distress and Operating Efficiency Using Data Envelopment Analysis

Zijiang Yang; York University, Canada
Mehrnoush Ashrafi Mahabadi; York University, Canada

Financial distress identification has attracted significant global attention. Its large economic significance makes it one of the most challenging research topics. However, it is still unknown how organizations' operating inefficiency exerts influence on the financial distress. Is operating inefficiency correlated with the financial distress? Can the top management improve their organizations financial condition through eliminating the underlying causes of operation inefficiencies? This paper is proposed to investigate the relationship between and organization's financial distress and its operating efficiency. The operating efficiency of 165 Chinese public companies with or without financial distress is evaluated using data envelopment analysis (DEA). Then the statistical tests are done to further investigate the correlation between operating inefficiency and financial distress. Furthermore, the factors affecting organizations' efficiency will be explored.

MD-07.2 [R] Social Dynamism and Its Impact on Productivity: A Case Study

Pule A Kholopane; University of Johannesburg, South Africa
Katlego Mabote; Lonmin mines, South Africa

Nowadays, social dynamics may no longer be fashionable but its core principles (culture, norms, practices attitude, value and behavioral systems) have become the paradigm for many organizations. Combining normative and critical theory with empirical material drawn from literature studies, the research argues that social dynamics can underpin competitive advantage if the firm is able to appropriate the productivity savings it creates. The research clarifies the concept of social dynamics and its impact on productivity and performance at Lonmin, a mining company situated in South Africa. It commences with the review of social dynamism and existing models that identify the variables and components embedded in that company. Research questions will be developed and incorporated into structured survey questionnaires and interviews for frontline employees. The figure derived will allow hypothesis testing and a quantitative analysis leading to a model design that will address social issues and their impact on productivity and performance in the mining sector. The results from the survey will be presented and conclusion made to illustrate the application and usefulness of a model. Given this pre-eminence, the research will establish what impact proper and controlled social dynamism has on the productivity and performance in an organization.

MD-07.3 [R] Effectiveness of a Middle Mediator Model

Hiroki Nakagawa; Nagoya Institute of Technology, Japan
Akihiko Nagai; Nagoya Institute of Technology, Japan
Takayuki Ito; Nagoya Institute of Technology, Japan

Collaboration is generally a useful technique for creating new businesses and developing products because it ascertains market needs and the complementary relationships of resources held by the partners such as technologies, knowledge, secret information, funding, and networks. In this paper, we propose a middle mediator model (MMM) that facilitates cooperation. We examine a case study that was achieved by a middle mediator in which a graphic processing unit LSI (GPU) was developed in collaboration with the user company.

MD-07.4 [A] Empirical Study on the Technical Efficiency of Beijing High-tech Industry Based on Three-stage DEA Model

Lu-cheng Huang; Beijing University of Technology, China
Xue-mei Zhang; Beijing University of Technology, China
Fei-fei Wu; Beijing University of Technology, China
Hong Miao; Beijing University of Technology, China

The high-tech industry has evolved to reflect the importance of a country's scientific level and lead the development of new industries and economic growth. Technical efficiency relates to the viability and development opportunities of an industry or business and is an important way to effectively improve the area or industrial economy. By using the three-stage DEA model, which is combined with SFA, and selecting the data of Beijing's high-tech industry between 1995 and 2009, this paper provides an empirical study of its technical efficiency. The purpose of the study is to compare the difference of the technical efficiency after separating the environmental variables and the statistical noise. Meanwhile, by analyzing the five industries within Beijing's high-tech industry, this article elaborates the present situation and the problem of the technical efficiency of Beijing's high-tech industry, and then it puts forward the related countermeasure proposal. Finally, the future research on the technical efficiency of high-tech industry is discussed.

MD-08 TUTORIAL: High Technology Creation, Transfer and Diffusion: Evidence from Scandinavian Companies
Monday, 7/30/2012, 14:00 - 15:30
Room: Parksville
Speaker(s) Nazmun Nahar; University of Jyvaskyla

Too many companies fail to utilize the advantages of modern information technologies (ITs) for technology creation, transfer across borders and effective utilization. Rapid and effective technology creation, transfer and utilization are essential for survival when facing intense global competition accompanied by a rapid reduction in product and technology life cycles. Our empirical research indicates that the utilization of ITs by Scandinavian companies has distributed the technology development process among technology suppliers, subcontractors, and technology recipients who are located in different countries; and has improved the technology development, transfer across borders and utilization significantly. The tutorial is delivered by the speaker through a) presentation, b) case study analyses of Scandinavian companies that are highly successfully utilizing the advantages of modern ITs in technology creation, transfer across borders and utilization, and c) group discussions. The tutorial is targeted toward students, researchers and practitioners who are interested in technology creation, transfer and utilization at a quicker pace.

MD-09 Science and Technology Policy - 1
Monday, 7/30/2012, 14:00 - 15:30
Room: Port Hardy
Chair(s) Jonathan C Ho; Yuan Ze University

MD-09.1 [A] A Study on Risk Factors in Decision Making Structure of Government R&D Investment

Yoon Been Lee; KISTEP, Korea, South
Jiho Hwang; KISTEP, Korea, South

A pre-feasibility study on government R&D programs, which was introduced in 2008 by the Korean government, performs in a comprehensive and systematic way: not only economic analysis, but also technological and policy analyses have been included in the analysis framework. Among the criteria, a provision against risk factors is a crucial one because poorly prepared programs are prone to fail, extend the period or increase budget size. Even though many researchers have studied risk analysis of public investment, we cannot find definite results in the field of government R&D investment due to measurement problems or lack of reliable data. In this study, we analyzed pre-feasibility studies on government R&D programs, which have been carried out since 2008. The contents and weightings on final results in cases were examined. Also, we carried out an expert survey in order to investigate the opinions on risk analysis in the ex-ante evaluation. Not only the budget problem but also diverse factors are enumerated as the risk factors which should be dealt with in ex-ante evaluations of R&D programs.

MD-09.2 [A] Research on Management of National R&D Performance in South Korea

YuCheong Chon; Korea Institute of S&T Evaluation and Planning, Korea, South
Hong Bum Kim; Korea Institute of S&T Evaluation and Planning, Korea, South
Kil-Woo Lee; Korea Institute of S&T Evaluation and Planning, Korea, South

The objective of this study is to analyze the problems and provide political implications concerning the management process of national R&D performance in South Korea. The national R&D budget of the Korean government is continuously increasing. Thus, interest on performance of national R&D programs has also been increasing. Based on regulations related to the management of national R&D programs, institutes which exclusively manage

the national R&D performance are formed. The institutes collaborate on R&D performance through the National Science & Technology Information Service (NTIS), a system which government officials, researchers, and other users can freely access. This study identifies the problems resulting from the R&D performance management process and provides solutions based on investigations on the current status of both performance information achieved by managing institutes and NTIS, interviews with experts, statistical analysis, etc. The findings of this study can be applied as basic information in terms of the decision-making process for efficient management of national R&D performance.

MD-09.3 [R] Characteristics of Chinese Public Demands on Science Communication

Ren Fujun; China Research Inst. for Science Popularization, China
Xie Xiaojun; China Research Inst. for Science Popularization, China

In recent years, there has taken place vast improvement in public science communication work in China. The government's original motivation and end of public science communication is to fulfill various demands of the nation and lay public. Meanwhile, there appeared the concept of science communication on people's livelihood, which intends to emphasize that science communication should be an important public service for improving people's livelihood. According to latest survey data of public demands on science communication in China, the Chinese public generally has continuous and exuberant requirements on science communication. The main characteristic of Chinese peoples' demands on science communication can be summarized as follows: public demands tend to be more multiple and individual. There are distinct differences among social groups in science communication demands. There is an obvious change in channels by which the Chinese public gets access to science information. While traditional media, such as TV and newspaper, remain the major way for Chinese people to obtain science information, the important role of the Internet and other news media catches more and more attention. Lastly, Chinese public demands on science communication tend to be utilitarian. Relevant research findings of this study can be meaningful references for China and other countries to carry science communication work forward.

MD-10 Detecting and Characterizing Technical Emergence: New Methods for Measuring Scientific and Technical Change

Monday, 7/30/2012, 14:00 - 15:30
Room: Port McNeill
Chair(s) Jeffrey M Alexander; SRI International
Alan Porter; Georgia Institute of Technology

MD-10.1 [R] Emergence as a Conceptual Framework for Understanding Scientific and Technological Progress

Jeffrey M Alexander; SRI International, United States
John Chase; SRI International, United States
Nils Newman; IISC, United States
Alan Porter; Georgia Institute of Technology, United States
J. David Roessner; SRI International, United States

The global science, technology and innovation (STI) system is characterized by some researchers as a complex adaptive system (e.g. Heimricks, 2009). Scientific and technological progress entails both evolutionary and revolutionary change, with a high degree of non-linearity and unpredictability. In the terms of complexity science, this progress is emergent it defies a reductionist approach to characterizing the phenomenon. We discuss the properties associated with emergent behavior (Goldstein, 1999; Deguet et al., 2002), and apply them to an integrative framework for describing activities in scientific research and technological development. We further elaborate on this framework to suggest the developments and events in the global STI system which may be hallmarks of technical emergence, defined as the set of properties and phenomena observed in the development of a concept with potential scientific and technological significance. The conceptual framework provides a useful tool for focusing further research on specific dynamics of scientific and technological activity.

MD-10.2 [R] Comparing Methods to Extract Technical Content for Technological Intelligence

Nils Newman; IISC, United States
Alan Porter; Georgia Institute of Technology, United States
David Newman; University of California at Irvine, United States
Cherie Courseault; University of New Orleans, United States
Stephanie Bolan; Georgia Institute of Technology, United States

We are developing indicators for the emergence of science and technology (S&T) topics. We are targeting various S&T information resources, including metadata (i.e., bibliographic information) and full text. We explore alternative text analysis approaches, principal components analysis (PCA) and topic modeling, to extract technical topic information. We analyze the topical content to pursue potential applications and innovation pathways. In this presentation we compare alternative ways of consolidating messy sets of key terms (e.g., using natural language processing (NLP) on abstracts and titles, together with various keyword sets). Our process includes combinations of stopword removal, fuzzy term matching, association rules, and tf-idf weighting. We compare PCA results to topic modeling results. Our key test set consists of 4104 Web of Science records on dye-sensitized solar cells (DSSCs). Results suggest good potential to enhance our technical intelligence payoffs from database searches on topics of interest.

MD-10.3 [R] Characterizing Emergence Using a Detailed Micro-Model of Science: Investigating Two Hot Topics in Nanotechnology

Kevin W Boyack; SciTech Strategies Inc., United States
Richard Klavans; SciTech Strategies Inc., United States
Henry Small; SciTech Strategies Inc., United States
Lyle H Ungar; University of Pennsylvania, United States

The structure and evolution of science and technology can be studied at multiple levels. Most such studies explore the developments of fields, disciplines, or specialties. Given the large numbers of articles underlying these analyses, developments appear to be continuous and smooth in most cases. By contrast, analysis of structure and evolution at the level of research problems results in a combination of stable and instable features. We characterize the development of two emerging topics within nanotechnology, graphene and dye-sensitized solar cells (DSSC), at the research problem level. The analysis shows two different types of emergence, one in which the topic is spread throughout a large number of research problems prior to emergence and does not become a research problem of its own for many years, and one in which the topic quickly dominates a few research problems.

MD-11 Cultural Issues

Monday, 7/30/2012, 14:00 - 15:30
Room: Port Alberni
Chair(s) Robert Dryden; Portland State University

MD-11.1 [R] Qualitative and Quantitative Evidence on the Affect of Vision, Artifacts, and Leader Values on Citizenship Behavior and Success in Technology Driven Projects

Zvi H Aronson; Stevens Institute of Technology, United States
Peerasit Patanakul; Stevens Institute of Technology, United States
Paul Rohmeyer; Stevens Institute of Technology, United States

This two-phase study examines a model which posits that leader-building activities affect employees' emotions, attitudes and behavioral norms that are focused on expected project outcomes, termed project spirit. Furthermore, spirit is proposed to affect employees' citizenship behavior and through citizenship behavior, to affect project success. In the first phase of the study, we conduct an empirical investigation. Results based on 193 employees partaking in 60 projects sampled across a variety of organizations suggest that project leader-building activities affect employees' spirit, and citizenship behavior mediates this

relationship with project success. In the second phase, we present three case studies to ground the empirical results in the context of technology-driven projects and to highlight the value of managing the intangible aspects of a project captured by spirit. Our empirical and qualitative results suggest that leaders can be coached to execute behaviors that generate a project's spirit, which in turn boosts citizenship behavior and increases success in project-based work.

MD-11.2 [R] Decompose the Model of Value Creation for Cultural and Creative Industry from Industrial Characteristics

Yi-Wen Chen; Tamkang University, Taiwan
Yu-Ju Lo; National Chengchi University, Taiwan

For decades, industrial policies in Taiwan have mostly focused on high technology industries and have developed an effective subsidy models. However, over the last few years, the culture and creative industries (CCI) have become another economic force. The culture and creative industries subsequently gained a new challenge on the political agenda. Moreover, Taiwan's successful industrial policy and experience in high tech industries is difficult to transfer to CCI. We think that policy and subsidy models should be adjusted according to industrial characteristics, but there remain important gaps in what we know is a lack of understanding of how the industrial characteristics influence the CCI to create value; and a clear view of where the strategic investment competitive advantage in these industries lies. Therefore, we adopted an exploratory case study method to analyze deeply one research question: What are the value drivers of CCI? This study found that CCI has four value drivers, which are novelty, complementarity, network externality and resource scarcity. The results of this study will help the growth of the cultural and creative industry in Taiwan, rapidly and successfully improving its competitiveness.

MD-11.3 [R] Knowledge Transfer from Researchers to Society: How to Offset the Cultural Gap?

Yayoi Hirose; Japan Science and Technology Agency, Japan

This study discusses how project member's engagement affects the implementation process of new research technology into society. This study selects three successful projects of commercialization of research technology in terms of that potential users understood the value of the technology and the project generated new sample products which integrated user's needs. The cases show how the human engagement promoted the commercialization process of research technology. In particular, it focuses on how the knowledge transfer and generation between technology researchers and users are affected by their engagement. The analysis shows that the member's engagement overwhelmingly overcame several cultural gaps between technology researchers and potential users which can be impediments to knowledge transfer and generation. The discussion of this study can present a recommendation of the importance of the project member's engagement to many organizations which have been trying to generate new commercial technology regarding as well as technology transfer, entrepreneurship, patent strategy, and marketing strategy.

MD-12 Patent Analysis - 2
Monday, 7/30/2012, 14:00 - 15:30
Room: Azure
Chair(s) Mary Mathew; Indian Institute of Science

MD-12.1 [R] Determinants of Patent Renewal Decisions by Patent Indicators and Social Network Analysis: The Case of the Biotech Industry in Taiwan and Korea

Ming-Yeu Wang; National Chiayi University, Taiwan
Hsien-Chen Lo; National Chiayi University, Taiwan
Y. Y. Liao; National Chiayi University, Taiwan
Pei-Yi Lin; National Chiayi University, Taiwan

Patents are important knowledge assets that allow firms to defend against rivals and earn returns in a competitive environment. To maintain the rights of patents in force, firms must regularly pay renewal fees, which are a burden for R&D spending. Firms must cautiously examine the value of their patents in order to determine whether to maintain their legitimacy, thus controlling the R&D cost. The renewal decisions of firms open up an opportunity for economists and researchers to estimate the patent value. Research on patent renewal has tended to estimate patent value through patent indicators such as backward and forward citations; however, the knowledge flow among patents has not been considered. This study incorporated social network analysis to determine patent value by examining the dissemination of information mastered by a patent within the patent citation network. This study proposed that a patent that vigorously disseminates knowledge is economically valuable because it is a knowledge bridge. The study collected biotech patents in Taiwan and Korea that were granted by the US Patent and Trademark Office between 1994 and 2006. The empirical results showed that the technology knowledge momentum indicators obtained by social network analysis and a number of patent indicators provided significantly different effects on the patent renewal decisions of both Taiwanese and Korean firms and research institutes. Based on the findings, this study provides some guidelines for policy-making.

MD-12.2 [R] Does Non-Patent Reference Measure University-Industry Collaboration?

Carey Ming-Li Chen; S&T Policy Research and Information Center , Taiwan
Hsin-Ning Su; National Chung Hsing University, Taiwan
Pei-Chun Lee; S&T Policy Research and Information Center, Taiwan

This study aims to examine the validity of using non-patent reference (NPR) in a patent document to measure the performance of university-industry collaborations. A total of 77,013 patents with a number of assignees equal to two are retrieved from a USPTO patent database and classified into different groups based on the type of co-assignation. The fundamental assumption in literature for justifying the use of NPR to measure university-industry collaboration is that university-industry co-assigned patents should contain the highest number of NPRs per patent than other types of co-assignations, e.g. university-university or industry-industry, because university-industry co-assigned patents are inventions substantially based on the collaboration between university and industry. However, it is found in this study that university-university co-assigned patents contain the highest number of NPR (27.18 NPRs per patent) instead of the expected university-industry co-assigned patents (20.13 NPRs per patent). Also, the industry-industry co-assigned patents contain a significantly low number of NPRs (2.42 NPRs per patent). This signifies that the assumption in the literature is invalid and the use of NPR to measure university-industry collaboration is not proper. Furthermore, NPR can also be added by patent examiner, and this enhances the uncertainty when using NPR to measure university-industry collaboration generated by patent inventor or patent applicant. According to the above reasons, this study suggests that it is not proper to use NPR as an indicator to measure university-industry collaboration.

MD-12.3 [R] Why Patents Have Lower Citation on Non-Patent References?: A Case Study from Taiwan

Ya-Lan Chin; National Chengchi University, Taiwan
Feng-Shang Wu; National Chengchi University, Taiwan
Tien-Chi Lin; National Chengchi University, Taiwan
Bou-Wen Lin; STPI, Taiwan
Te-Yi Chan; STPI, Taiwan

In recent years, we have witnessed the increasing importance of research in patent analysis, especially in non-patent references (NPRS), as patents become the key intangible assets of enterprises. While many people want to know the degree of linkage between the science and technology through the analysis of NPRS, some of the scholars did show that the number of NPR citations is positively correlated with the degree of science linkage. Other related studies also investigate the issue mainly by looking at the process of how science is transformed into technology. Nevertheless, there remain a lot of questions, such as how the characteristics of technologies in patent and the types of patent affect the number of NPRs, which are still unknown to both academia and industrial practitioners. Consequently, the study aims to explore the issue in depth. We use the case study as main research method

and interview experts from universities, law firms, high-technology companies, research institutes, and government IPOs (intellectual property office). The issue is even watched at the national level in Taiwan since Taiwan is currently ranked at fifth place in patent numbers issued by USPTO, but the average number of its NPR citations is much lower than other counterparts. The preliminary results indicate that although patents with lower NPR citations mean their weaker linkage with scientific efforts and inventions, the other issues are also very important in interpreting underlying reasons for low NPRs: 1) Which industrial sectors (such as biotechnology vs. electronics) do the patents belong to? 2) What is the degree of technological complexity embodied in patents? 3) Is English the mother language of inventors and assignees? 4) Are databases of scientific journals sufficiently provided with for patent reviewers and attorneys? The study finally addresses the implications of research results to both government policy makers and industrial practitioners.

MD-12.4 [R] The Key Determinants of Patent Implementation of SME: Evidence from Zhejiang Province in China

Liying Wang; China Jiliang University, China
Jing Hu; China Jiliang University , China
Fei Cai; Academy of Metrology Science of Zhejiang, China

It is important to know the characteristics and influencing factors of implementing patents while enterprises improve the transformation of patents to realism productivity. Gathering data of 1378 patents with surveys from 639 small- and medium-sized enterprises in Zhejiang Province, China, this paper empirically studies the impacts of a patent-promoting policy, R&D investment, R&D cooperation mode, and strategy management of patents on patent implementation in Chinese small- and medium-sized enterprises. The results show that they all affect patent implementation significantly. Specifically, a stronger promoting policy, more R&D cost and employees, cooperation with universities and institutes, and higher levels of strategy management of patents can improve the possibility of patent implementation. Moreover, more R&D cost and employees as well as cooperation with universities and institutes can improve the method of patent implementation. The results have great significance to help Chinese small- and medium-sized enterprises improve their capabilities for patent implementation. Then, there are some inspirations and suggestions for reinforcing the transformation of patents to realism productivity for enterprises.

ME-02 Technology Management in the Energy Sector - 2

Monday, 7/30/2012, 16:00 - 17:30
Room: Pavilion Ballroom B
Chair(s) Matti Karvonen; Lappeenranta University of Technology

ME-02.1 [R] The Influence of Raw Material Prices on the Diffusion of Renewable Energy Technologies

Nathalie Sick; University of Muenster, Germany
Birte Golembiewski; University of Muenster, Germany
Jens Leker; University of Muenster, Germany

Currently, there are several approaches trying to explain the diffusion of renewable energy technologies (RET). The most commonly used instruments in this respect are learning and experience curves; followed by further economic, policy and barrier analyses. In order to obtain a more comprehensive understanding, additional influence factors on RET diffusion need to be studied. We will contribute to research on RET diffusion by adding the raw material price perspective. As raw material prices account for a large share of the cost of energy, they are an important competitive factor for diffusion. In addition, latest rises and volatilities of raw material prices are subjects of major relevance in academia as well as in industry. Based on the verified influence of raw material prices on the diffusion of hydrogen storage technologies [48], we now picture their influence on RET diffusion. The technological focus of our paper is on emerging renewable technologies for electricity generation, namely wind and solar power. Using regression analysis, we find evidence for the impact of energy commodity prices on RET diffusion. Academically, our results contribute to a better understanding of the drivers and barriers of RET diffusion and enable deducing recommended procedures for practitioners.

ME-02.2 [R] A Tetranomial Tree Real Option Model on Renewable Energy R&D Project Valuation

Yuanchin Chen; Kainan University, Taiwan

The real option models have been developed vigorously by many researchers and been applied in different kinds of fields since the 1970s. Meanwhile, the traditional real option models usually considered only one kind of risk and ascribe the other risk conditions to market price. Actually, there is definitely not only one risk condition in any project. Especially in new technology development, which aims to substitute for existing technology or products, the value of a project depends on technical risk and market price. So far, this dissertation attempts to include two independent risk sources simultaneously and proposes a tetranomial tree model to measure the option value of a new research and development project. It uses tetranomial tree model to simulate several scenarios of market trade, feed-in tariffs, and subsidies with R&D risks and market energy price changes. Then, it discusses the real option values of renewable energy technological research project on different scenarios.

ME-02.3 [R] How Technologies and Capability Co-evolve: The Example of Lithium Battery Industry Evolution in Taiwan

Marian (Danwei) Wen; National Cheng Kung University, Taiwan
Shih-Chieh Fang; National Cheng Kung University, Taiwan
Fu-Sheng Tsai; Cheng Shiu University, Taiwan

This paper argues that firm capability development process is intertwined with the fundamental technology trajectory of the industry. Also, this paper proposes the key co-evolutionary mechanisms, which are: First, the selection process, driven by capability differences, shapes how the firm is positioned in the industry. Second, technology is changed on one hand by firms as they try to gain more control of the technology or re-position themselves in the industry and on the other hand by other organizations such as universities out of scientific purposes. Third, changes in the industry position affect how firms develop their capability. And finally, the changes in capability development processes reshape the industry capability pool. These dynamics of technology and industry are well illustrated through the example of Lithium battery industry in Taiwan. The emerging applications of lithium battery for green energies trigger industry change as well as technology advances.

ME-02.4 [R] Evolution of Technology Fronts in Organic Solar Cells

Tung-Ying Wu; National Taiwan University, Taiwan
Huei-Ru Dong; National Taiwan University, Taiwan
Mu-Hsuan Huang; National Taiwan University, Taiwan
Dar-Zen Chen; National Taiwan University, Taiwan

This article explores the evolution of emerging technology fronts in the field of organic solar cells so as to observe technological evolution. We apply bibliometrics to analyze highly cited organic solar cell patents issued by the USPTO from 1999-2010 and observe technology evolution during three separate periods (1999-2002, 2003-2006, 2007-2010). That way enables us to observe the inheritance, enhancement, continuance, or even demise of certain technologies occurring in the organic photovoltaic arena. The result indicates that dye-sensitized solar cell and polymeric material technology have enhanced and enriched the organic photovoltaic technologies. By applying bibliometric analysis to highly cited patents, the proposed research offers an opportunity to monitor technological change and developing tendencies in the hope for discovering potential areas of interest for the solar cell industry.

ME-03 Environmental Issues - 2

Monday, 7/30/2012, 16:00 - 17:30
Room: Pavilion Ballroom C
Chair(s) Chien-Chiang Lin; Shih Hsin University

ME-03.1 [R] The Life Cycle Analysis Applied to Determine Environmental Impacts in the Pharmaceutical Industry

Ahmed Cherifi; Ecole de Technologie Supérieure, Canada

Nafika Kihal; Université M'hamed Bougara, Algeria
Mickael Gardoni; Ecole de Technologie Supérieure, Canada
Abdelaziz Tairi; Université M'hamed Bougara, Algeria

The desired objective of this research is to propose an approach to assess the main impacts of the production of medicines, particularly suppositories, and evaluate the impact of the pharmaceutical production unit chosen on the environment. The tool of choice is eco-design, which is the analysis of the life cycle, also known as stroke, and is little used even in the pharmaceutical industries. To propose a system of environmental indicators, we did an analysis of the existing information in the unit of study, followed by identification and a qualitative assessment of aspects and impacts of the production of drugs on the environment. We then select the most significant environmental impacts and propose a number of indicators to measure these impacts. Some of these indicators have been evaluated and measured on the ground (quantification). We estimated the energy required for production processes, regarded as separate modules (energy consumption of production processes suppositories). To include emissions related to energy, we considered the energy sub-modules (process auxiliaries). We calculated the energy expenditure of auxiliary processes for the production of steam, cooling and refrigeration using an ice water cooling tower, production of compressed air, air treatment and water treatment processes. For output emissions generated during the treatment and disposal, we created sub-modules of waste treatment. Some models were developed to install a wastewater treatment plant and a compressed air device and also an incinerator. The bulk of results are the presentation of graphs simplified to identify impacting flux factor sources from complex representation. This will result in better control calculations of impacting factors.

ME-03.2 [R] Remediation in Capua Street: How to Learn from Full-scale Applications

Abraham Sin Oih Yu; Institute for Technological Research of Sao Paulo , Brazil
Leandro R Gonçalves; Institute for Technological Research , Brazil
Lilian K Kowano; Institute for Technological Research , Brazil
Fernando E Martins; Institute for Technological Research of Sao Paulo , Brazil
Elvander S Quaresma; Institute for Technological Research, Brazil
Mauro S Ruiz; Nove de Julho University, Brazil

The selection process of remediation technology for a contaminated area can be highly improved by the ability to learn from previous remediation efforts in similar areas. The key factor in this learning is the identification of similar cases based on past experiences. This paper reports a procedure developed to identify similar cases to the Capua Street site, Santo Andre, Brazil, taking the EPA's Cost and Performance Case Studies as a reference. This site is contaminated with hexaclorocyclohexan (HCH) and just a few similar cases were found in the EPA's database. The research question is: Can we learn from other remediation cases with similar contaminants and site profile? The definition of similarity in this procedure is based on an analogy with medical treatment: patients (contamination sites characteristics) and pathologies (types of contaminants and process of contamination). The adopted procedure identified more than ten contaminants similar to HCH present at Capua Street site. A search in EPA's database revealed around ten remediation cases in which only two technologies (thermal and biological treatments) were used. Remediation costs and technologies' performance reported for these cases are also important inputs for the present selection process.

ME-03.3 [A] Energy Efficiency and Eco-Innovation: A Case Study of Nigeria Breweries Plc

Emmanuel E Ejim-Eze; National Centre for Technology Management, Nigeria
Gordon M Bubou; National Centre for Technology Management, Nigeria

Energy efficiency remains the easiest way to tackle climatic change. The sustainability and competitiveness of firms in the wake of global warming, high cost of energy and energy insecurity depends highly on energy efficiency. This paper critically examines the secondary energy generation in some manufacturing firms in the literature. A literature survey was used to identify technological innovations where waste heat is used to generate power. A case study approach was used to identify companies that have successfully generated energy from waste heat from their electricity generating power plants. Nigerian Breweries Plc utilizes excess energy from its electricity generating sets in Enugu-Ama Brewery by converting the heat energy for use in other industrial processes and logistics. This has reduced fossil fuel consumption and the consequent carbon emissions. They also recover heat energy from spent grains, reducing industrial solid waste generation. There is also a Green Logistics Master Plan Project in Lagos Brewery to improve the efficiency of the over 60-year old brewery operations. The paper concludes by proposing that Nigeria Breweries Plc could be used for eco-innovation bench marking in the Nigerian Industrial sector and in other developing economies in Sub-Saharan Africa.

ME-04 R&D Management - 2
Monday, 7/30/2012, 16:00 - 17:30
Room: Pavilion Ballroom D
Chair(s) Michael M Menke; Value Creation Associates

ME-04.1 [R] R&D Management Based on the Relationship between the Achievement of R&D and Commercialization

Yuji Hirabayashi; JAIST/ Shimizu Corporation, Japan
Yasuo Ikawa; JAIST, Japan
Sigeru Aoki; Shimizu Corporation, Japan
Kunihiko Hiraishi; JAIST, Japan
Tarou Sugihara; JAIST, Japan
Shunsei Sai; JAIST, Japan
Naoshi Uchihira; Toshiba Corp., Japan
Tetsurou Chino; Toshiba Corporation, Japan
Kentarou Torii; Toshiba Corporation, Japan

In this study, we will discuss R&D management which shares the timeline of achievements and issues of different business cases through questionnaires, assuming business cases at the beginning of projects in order to share goals among members of an academic-industrial alliance project. In order for project members to share the goals about the academic-industrial alliance project which we participate in, we carried out a questionnaire when one and a half years had passed since the project started. Thanks to this survey, we can share the similarities and differences of our ideas about customer needs for the businesses, the time of starting the business and the time of achievement of the necessary technical level.

ME-04.2 [A] Evaluation System of Government Funded Research Institutes (GRIs)

Woo Chul Chai; Korea Institute of S&T Evaluation and Planning, Korea, South

With the increase of national investment in R&D, the demand for accountability and effectiveness of national R&D investment has been increasing. Especially in the investment of government-funded research institutes (GRIs), which accounts for about 25 percent of national R&D funds, the demand for excellent R&D performances of GRIs is increasing through effective allocation of their R&D investment. The purpose of the study is to review the history and current evaluation systems of GRIs in S&T areas, which conducts the evaluation of both research results and management performances. It also shows how qualitative evaluation methods are applied for promoting the R&D performances of GRIs and the accomplishment of appropriate roles suitable for national S&T development strategy.

ME-04.3 [A] R&D Management Issues for Small to Medium Sized Technology Oriented Manufacturing Firms: A Case of Material Development for Dental Application

Yuji Sato; Yamamoto Precious Metal Co. Ltd, Japan
Osamu Tomisawa; Kochi University of Technology, Japan

This paper discusses R&D strategy for small- to medium-sized technology oriented manufacturing firms. Specifically, issues to catch up to the top runner and to establish competitive advantage will be discussed based on a case study of Yamamoto Precious Metal

Company Ltd. This company was originally established as a retailer of gold material more than 55 years ago, but it changed its business model to a manufacturing company. Major businesses were refinement and processing of precious metals and production of precious-metal alloys for dental applications. In accordance with market requirement changes, the company expanded the product portfolio to ceramics and resin material, keeping the application domain the same. The company was late to deal with composite resin, a popular material used by dentists. The composite resin system is composed of main body and interface to the tooth. Existing players provide the main body and the interface separately. Typically, the interface material is profitable as opposed to the main body. In order to get in this business, Yamamoto Precious Company is developing a unified material to integrate the two parts. This will reduce the dentist's burden tremendously at the cost of profitability for the manufacturer. The R&D strategy which can be categorized as a destructive innovation will be discussed.

ME-06 Emerging Technologies - 2
Monday, 7/30/2012, 16:00 - 17:30
Room: Finback
Chair(s) Anne-Sisko Patana; Aalto University

ME-06.1 [R] Nanotechnology and Biotechnology Research in South Africa: Technology Management Lessons from a Developing Country

Anthipi Pouris; University of Pretoria, South Africa
Anastassios Pouris; University of Pretoria, South Africa
Andre J Buys; University of Pretoria, South Africa

Emerging technologies, and in particular nanotechnology and biotechnology, promise to create a multitude of new products and processes and to substantially advance productivity and quality of life internationally. South Africa, a scientifically small country, has initiated a number of efforts in these scientific fields (DST 2001 National Biotechnology Strategy and DST (2005) South African Nanotechnology Strategy) aiming to capitalize on the promises of the emerging areas and to improve the quality of life of all inhabitants. The objective of this article is to compare and contrast the country's initiatives in biotechnology and nanotechnology, including their implementation; set the management approaches used for the development of the two technologies within international best practice; identify their current impacts and status (in terms of publications, patents and high-level manpower) and identify policy implications and lessons learned applicable to countries aiming to catch up scientifically. The article identifies that despite the fact that South African implementation efforts suffer from lack of coordination, short-termism and sprinkler malaise in the distribution of research funding, the country has been successful in taking off scientifically in both fields but not technologically. A number of policy implications are discussed.

ME-06.2 [R] An Organizational Approach for Fostering and Developing Emerging Technologies in Government-supported Research Institute

Hyongbae Jeon; Korea Institute of Machinery and and Materials, Korea, South
Gyunghyun Choi; Hanyang University, Korea, South

Gradually, the role of the government-supported research institute (GRI) is becoming more emphasized in the rapidly changing modern market. This study deals with organizational approaches and how they can foster and develop emerging technologies in GRI. Through organizational analysis, the case of the Department of Future Technology (DFT) in the Korea Institute of Machinery and Materials (KIMM) provides some meaningful implications. The organization shows factors including boosting research effectiveness, a lack of restriction on the research scope, multidisciplinary members, collaborative culture and leadership.

ME-07 Entrepreneurship / Intrapreneurship
Monday, 7/30/2012, 16:00 - 17:30
Room: Beluga
Chair(s) Antonie J Jetter; Portland State University

ME-07.1 [A] Job to be Done: Connections for Technology Entrepreneurs

W. Austin Spivey; University of Texas at San Antonio, United States
J. Michael Munson; University of Santa Clara, United States

To paraphrase prevailing wisdom with few exceptions, every job users need to do has a social, a utilitarian, and an emotional dimension. When technology entrepreneurs understand these motivations, emerging technological innovations focus on the nuances of a job; then, users can recognize their connection to the innovation. The key to commercial success, therefore, is a focus on the job, per se, not the technology: the job must be the fundamental unit of analysis that leads to ideas, goods, and services that users will hire. For example, why exactly do users hire hybrid transportation? They have five, distinct motivations: to maximize the economics of mobility; to show off; to gain investiture among pioneers; to salve egos about helping to slow global warming; and merely to understand the subtleties of this emerging technology. What are the motivations for other emerging technologies such as induced pluripotent stem cells, nano-gels, computing clouds, artificial photosynthesis, nano-particle inks and PEM fuel cells? And what are the implications for defining target markets for emerging technological innovations? Appreciating a motivational framework helps technology entrepreneurs answer these questions and cements the connections between their innovation and prospective users.

ME-07.2 [R] Educating Technology-based Entrepreneurs: The Development of an MBA Program in Creative and Cultural Entrepreneurship

Dwi Larso; Bandung Institute of Technology, Indonesia
Dona Saphiranti; Bandung Institute of Technology, Indonesia
Amilia Wulansari; Bandung Institute of Technology, Indonesia

The state of business in Indonesia shows that 1) the number of entrepreneurs compared to its population is very low and 2) the proportion of micro and small businesses to total businesses is very high. Therefore, Indonesia needs to develop more higher-value-added entrepreneurs. Bandung Institute of Technology (ITB) has taken on the responsibility to develop such entrepreneurs. With its strengths in science, technology, art and design, ITB is in good position to play this role. ITB's School of Business and Management takes a lead in harnessing these strengths to develop a breakthrough MBA Program in Creative and Cultural Entrepreneurship. The program was launched in July 2011 and started accepting students in August 2011. This paper explains why creative and cultural-related industries are targeted. Entrepreneurship education issues will be addressed since educating entrepreneurs needs a different approach than a conventional one. A methodology was followed including literature review, benchmarking, site visits and interviews. The results of this development consist of 1) a complete curriculum of MBA program in Creative and Cultural Entrepreneurship and 2) entrepreneurship education ecosystem which supports the curriculum to achieve the program's goal in developing new entrepreneurs in creative and cultural related industries.

ME-08 Technology Management in Services - 1
Monday, 7/30/2012, 16:00 - 17:30
Room: Parksville
Chair(s) Daniel Berg; Rensselaer Polytechnic Institute

ME-08.1 [R] Organizational Determinants of Innovations in the Service Sector of Taiwan

Mao-Shong Lin; National Chengchi University, Taiwan
Mu-Yen Hsu; National Cheng-chi University, Taiwan

Due to the increasing importance of service industries, a growing number of innovation researchers turn their focus from the manufacturing sector to the service sector. However, the studies particularly examining organizational determinants for various types of innovations and the complementarities between the innovations in the service sector by using large scale samples are very rare. We initiate an empirical study to comprehensively identify the organizational determinants and complementarities for various types of innovations in the service sector by applying a multivariate Probit regression model and the data from the Taiwan Community Innovation Survey. The study mainly finds that: 1) larger service firms

have a higher propensity to innovate but with decreasing margin (inverse-U function); 2) service firms with larger market reach have a higher propensity to innovate; 3) types of main customers influence the innovations of service firms; and 5) the organizational determinants and complementarities differ by service industries. These findings fill the research gap on the organizational determinants and the complementarities for service innovations in previous empirical studies.

ME-08.2 [A] Organisational Resilience in the South African Services Sector

Sandisiwe N Ncemane; Coega Development Corporation, South Africa
Richard V Weeks; University of Pretoria, South Africa

This research article analyses the concept of organisational resilience (OR), with a specific focus on how this is understood in the South African services sector. The research constitutes both a literature study and a narrative inquiry. The latter entails interviews conducted with 32 South African business leaders involved in the services sector. The institutions concerned range from financial and technical institutions to commercial enterprises. The objective of the research is to gain an insight on the nature of resilience within these organisations, based on the personal observations and experience of the business leaders interviewed. A consolidated interpretation of organisational resilience emerges from the research, which distinguishes the concept from that of business continuity management (BCM). The influence of leadership in building a resilient organisation is explored, as well as the extent to which diversity management and an innovative capacity relates to building a resilient workplace. Furthermore, the relationship between institutional resilience, people, business processes and technology is analysed. The patterns that emerge from the similarities and differences between the insights gained from the research participants provide an indication of the stance on organisational resilience in the South African services sector.

ME-08.3 [R] Improving Service Technology and Business Process: A Case of an Insurance Company in Taiwan

Calvin S Weng; Takming University of Science and Technology, Taiwan

This case study depicts how the company improved its service technology and business process by business process reengineering (BPR) and total quality management framework from practical perspectives. BPR was used to define, analyze, and reengineer workflows for new business workflow redesign to improve customer satisfaction and implement total quality management (TQM) activities into all departments. Through the redesign of business workflows, the performance in cycle time, core processes, sub-processes, management layers, and productivity has been improved internally. In contrast to internal improvement, external appraisals and awards have been received to show this project was successful, and the results of this project were prominent.

ME-09 Science and Technology Policy - 2
Monday, 7/30/2012, 16:00 - 17:30
Room: Port Hardy
Chair(s) Yuya Kajikawa; The University of Tokyo

ME-09.1 [R] Did the Disaster Change the Public Attitudes for Science and Technology?: Evidence from Japan

Hiromi Saito; Chiba University, Japan
Jun Suzuki; National Graduate Institute for Policy Studies, Japan
Hiroshi Nagano; National Graduate Institute for Policy Studies, Japan

This paper aims to explain public attitudes for science and technology (S&T) using data from an original survey designed rigorously. Confidence in S&T largely was shaken after the great earthquake and nuclear accident in Japan on March 11, 2011. It is a significant topic to explore public attitudes for S&T based on evidences for redesigning what S&T should become. Therefore, we conducted an original survey in Japan in September 2011. The final sample was 2,703. We asked them how they think about S&T through some questions. Based on this data, we empirically approach public attitudes for S&T. Surprisingly, many people are interested in S&T (62.6 percent) and also expect that S&T improve nation's life (65.7 percent) regardless of such earthquake and nuclear accidents. In addition, we could find that differences for these responses depend on a nation's background (age, sex, income, experience of science course, residence in stricken area) by simple linear regression analysis.

ME-09.2 [R] Capability and Competence of Science of Science Policy in Japan

Yuya Kajikawa; Tokyo Institute of Technology, Japan

Science of science policy has become a global agenda for academia and government. It is expected to offer intellectual and evidential basis for decision making about science and industrial policy. In this contribution, capability and competence of research on science of science policy is evaluated with bibliometric indicators. Scientific publications in models and tools for science of science policy, including econometrics, simulation, infometrics, data science, which was published by Japanese researchers, are analyzed. The capability and competence of Japanese think tanks are also evaluated and compared with those by U.S. think tanks. The results identified much room to be developed in a variety of sectors in academic research, public think tanks, government, and education. Functions of each sector and collaborative approaches among them are also discussed.

ME-09.3 [R] Policy Recommendations for SME R&BD by Utilizing Government-Supported Research Institutes

Seo-Kyun Kim; ETRI, Korea, South
Beoum-Soo Park; ETRI, Korea, South
Song Juho; ETRI, Korea, South
Kyoung Seok Oh; ETRI, Korea, South

This policy research is to provide policy recommendations for strengthening technology competitiveness and shared growth of SMEs R&BD with government-supported research institutes. To this end, analyzing government-supported research institutes and SMEs R&D status and flow of the change, get the needs and issues for SMEs R&BD support of government-supported research institutes and set up 4 types (Future-oriented core technology R&BD, Technology-oriented medium-term R&BD, Technology commercialization-responsibility R&BD, Market-oriented short-term R&BD) possible shared growth of SMEs R&BD with government-supported research institutes and suggest five policy recommendations promoting them to be the actual policy.

ME-10 Technology Forecasting - 1
Monday, 7/30/2012, 16:00 - 17:30
Room: Port McNeill
Chair(s) Joseph P Martino; Yorktown University

ME-10.1 [R] Forecast of Wireless Communication Technology: A Comparative Study of Regression and TFDEA Model

Dong-Joon Lim; Portland State University, United States
Timothy R Anderson; Portland State University, United States
Jisun Kim; Portland State University, United States

This study presents a formal comparison of TFDEA with regression model to forecast wireless communication technology. In addition to the data set from the former research, up-to-2011 4G network technologies are added and analyzed. The research was designed to set the point of forecasting in 2001 so that technologies between 2001 and 2011 are to be forecasted using the data set between 1979 and 2001. The results from both TFDEA and the regression model are compared and discussed. This comparative study can provide forecasters with different aspects between best-practice measurement and average-practice measurement and, ultimately, help them to select the suitable approach for their purposes.

ME-10.2 [R] TFDEA Application for Solar Industry

Daria Spatar; Portland State University, United States
Mitra Amini; Portland State University, United States

Manar Al mallak; Portland State University, United States
Sajeda Tamimi; Portland State University, United States
Sara Bahreini; Portland State University, United States

Nowadays, there is a big interest in solar technology as a very promising source of energy. The industry is developing with a great speed and technology experts along with researchers propose different methods to predict the future state of the industry, especially in terms of efficiency of solar panels and their cost. The paper presents the application of data envelopment analysis for forecasting the solar technology with focus on thin film and crystalline silicon photovoltaic solar panels as they are the main players in the market.

ME-10.3 [R] An Introduction to Technology Forecasting with a TFDEA Excel Add-in

Dong-Joon Lim; Portland State University, United States
Timothy R Anderson; Portland State University, United States

This paper describes an Excel add-in program that can run technology forecasting using data envelopment anlaysis (TFDEA) within the spreadsheet. It utilizes freely available statistical software R and its packages developed by Statconn. This add-in allows access to both user-friendly tools for data manipulation in spreadsheet available and the power and precision of the results via R.

ME-11 Quality Management - 1
Monday, 7/30/2012, 16:00 - 17:30
Room: Port Alberni
Chair(s) Robert Dryden; Portland State University

ME-11.1 [R] The Influence of Customer's Quality Perception of Commercial Vehicles on Their Maintenance Behavior

Geneviève Alberts; University of Pretoria, South Africa
Jasper L Steyn; University of Pretoria, South Africa

The relationship was examined between commercial vehicle customer's quality perception of their vehicle brands and their subsequent maintenance of the vehicles. In an increasingly competitive commercial vehicle market, it is important to know what influences the customer decisions that drive revenue, specifically, the customer's maintenance choices. Qualitative (interview) data was obtained on the maintenance approach of fleet managers and the perceived industry norms and perspectives of industry experts, together with quantitative (survey) data on the quality perceptions and maintenance behavior of fleet and maintenance managers. This information was drawn from the case of a large South African subsidiary of a leading multinational commercial vehicle manufacturer. Associations were found between quality perception and maintenance behavior, especially with regard to the constructs of product quality and warranty support quality. The results on the constructs of service support and parts support quality led to them being interpreted as hygiene factors, i.e. essential to secure the initial product sale. Practical use of the findings may be made by manufacturers to evaluate and tailor their after-sales support offering. The findings also reaffirm the importance to a commercial vehicle manufacturer of its brands quality reputation.

ME-11.2 [R] Identifying Weaknesses in the Design for Six Sigma Concept through a Pedagogical Structure

Evelina Ericsson; Royal Institute of Technology, Sweden
Joakim Lilliesköld; Royal Institute of Technology, Sweden

All product-developing organizations strive with challenges regarding how to organize and structure their development projects. Faster market changes, increased number of competitors, ambivalent customers, new regulations and standards have made product development become more complex. Due to these challenges organizations need to focus on product development to be able to stay competitive in the market. Therefore, several concepts fostering improvement in product development organizations have been developed during the last decades. One such concept is Design for Six Sigma (DFSS) aiming to improve and structure development processes and their included activities. The concept is still considered as new and until today based on a complex structure. This article introduces a pedagogical way to structure the DFSS concept simplifying organizational implementations and benchmarking of the concept. Also, remaining gaps in the concept and hypotheses regarding how to counter these gaps are presented in the article.

ME-11.3 [R] Analysis of the Suitable Modes of the Occident Quality Regulation in the Formation of Engineer for Global Economic Growth

Shimei Jiang; Hebei University of Technology, China
Reuben Chu; Hong Kong Institution of Engineers, Hong Kong
Ling Wang; Chinese Mechanical Engineering Society, China

After the content analysis of 17 countries' cases, the research finds out the four comprehensive modes of the quality regulation in the formation of engineer: free mode, single-unit moderate regulation mode, single-unit stern regulation mode, and multi-unit moderate regulation mode. Then, the research points out those modes' institution background, organization structure, and culture background. Finally, the paper analyzes the current situations and the future trends of those four modes, and draws out the conclusion, which is that single-unit moderate regulation mode and multi-unit moderate regulation mode are the suitable modes for global economic growth. Single-unit moderate regulation mode and multi-unit moderate regulation mode can ensure the quality of the formation of engineers and promote the international movement of qualified engineers for global economic growth, while free mode is too loose so that it cannot ensure the quality of engineers for their national and international movement, and single-unit stern regulation mode is too stern so that it will prevent the international movement of engineers even if it can ensure the quality of engineers. Finally, the paper discusses the current situation and its future ideal of the Chinese engineer quality regulation.

ME-12 Intellectual Property - 1
Monday, 7/30/2012, 16:00 - 17:30
Room: Azure
Chair(s) Martin G Moehrle; University of Bremen

ME-12.1 [R] The Case for a Different Public Sector Intellectual Property Policy

Sul Kassicieh; University of New Mexico, United States

It has been a generation since the US enacted the congressional technology transfer acts, but we are still struggling with the idea of public sector technology discoveries being transferred to commercial activities. The paper analyzes the focus of the mechanisms that have been deployed and suggests a change from the micro models that have centered on the technology transfer office to a more macro set of considerations that focus on the economic health of the country. This change should address job and wealth creation to provide the needed spark to the economy that depends on innovation as its base competitive advantage.

ME-12.2 [R] Exploring Patent Quality Indicators in Pre-filing Stage: Development of Propositions and Suggestion of Research Method

Chien-Tzu Tsai; Feng Chia University, Taiwan
Hui Yu Shih; Feng Chia University, Taiwan
Benjamin Wang; Industrial Technology Research Institute, Taiwan
Tai-Jun Chen; ndustrial Technology Research Institute, Taiwan
Chan-Chih Chang; Industrial Technology Research Institute, Taiwan

Patent has been considered as an important asset nowadays. People pursue the increase of patent quantity whereas less attention has been paid on the patent quality. Patent growth without quality assurance may result in financial and management burden that comes from great maintenance cost and unsatisfied profit-returned of these patents. To raise the ROI (return-of-investment) of patent filing, especially under the tough conditions, such as limitation of R&D funds and high risk of involving in patent litigation, people have gradu-

ally realized how important the patent quality is. Nevertheless, prior studies on the indicators of patent quality mostly focused on post-granted patents with little understanding of what indicators or criteria really help to assess patent quality in pre-filing stage. This paper aims to explore indicators for evaluating quality before formally filing a patent application. Through comprehensively reviewing existing literature, collecting practitioners' technical reports, and survey of experts' opinions, we developed a series of criteria and indicators for patent quality, including several constructs, e.g. possibility for being granted, potential market value, and competitiveness in litigation. These indicators are expected to help the decision for patent filing and enhancing the quality of patents, ultimately reducing the cost of patent maintenance and increasing patent value.

ME-12.3 [R] Exploring Knowledge Flows of Network on Patent of Dye Sensitized Solar Cell

James K Chen; Asia University, Taiwan
Ming-Yeu Wang; National Chiayi University, Taiwan
Yi Ren Chen; Asia University, Taiwan
Yu-shan Chen; Asia University, Taiwan

Research on green energy industry becomes one of the main fields in many countries that focus on global warming and energy shortage in recent years. Green energy industry is for reducing the crisis of global warming and finding the alternative energy sources to solve the issue of energy shortage. In the past, the limited raw material was confined by geographical factors. green industry was not effectively distributed over the world, but the industry proactively and continuously innovates the research to overcome existing problems. In recent years, the advanced technology of dye-sensitized solar cell has been used. It made solar energy industry step into the third generation of innovation, and highlight the importance of solar energy industry. By using patent citing, it helps to understand the technology development and knowledge flows become a main trend. This study was based on the U.S. patent database collection data of the third-generation dye-sensitized solar cell with the five countries, the U.S., Japan, Germany, Spain and Taiwan. Through the structural analysis, it explored patentees and company matrix with social network analysis method. By this method, practitioners can understand the patentees, technology development and activities of knowledge flow from these five countries. This study discovered that Japan is the master country on dye-sensitized solar cell industry. The main patent technology number is H01G009. In addition to the knowledge which flows between the research unit, subsidiary and patent company, this study is expected to provide a reference for the industry, government and academia so that they will understand the importance of the knowledge, specialist cultivation and future development in dye-sensitized solar cell industry.

TA-00 PLENARY - 2

DATE: TUESDAY, 7/31/2012
TIME: 08:30 - 10:00
ROOM: PAVILION BALLROOM
CHAIR: TBD

TA-00.1 [K] Reflections on the Management of Emerging Technologies by an Academic/Practitioner

Daniel Berg; University of Miami, United States

Emerging technologies are critically important and difficult to define. But we do define them! Are they emerging today or many indefinite decades from today? Are they managed in identical fashion in nanotechnology, biotechnology, information technology, energy technology, etc.? I don't think so. After working for decades on technologies that have emerged or on some still emerging technologies or on not quite yet emerging technologies, and also having researched and taught the basics of the management of technology, in these reflections I will attempt to explore some of the continuing issues and dilemmas of the management of emerging technologies.

TA-00.2 [K] Rapid Development of Innovative Complex Technological Systems

Nam P Suh; Korea Advanced Institute of Science and Technology, Korea, South

It is commonly accepted that large complex systems will take many years to design, develop, and deploy. This is the case because wrong design decisions are often made during the course of development. If the design of the system avoids coupling of functional requirements (FRs) and is properly decomposed, it can significantly reduce time and cost. We created three large innovative systems that support this claim: On-Line Electric Vehicle (OLEV), Mobile Harbor (MH), and Mixalloy. Between 2009 and 2011, we designed, developed and commercialized the OLEV system, an electric vehicle that receives its electric power wirelessly from an underground cable. It was selected as one of the "50 Best Inventions of 2010" by TIME. The mobile harbor (MH), equipped with cranes, goes out to large container ships parked in rough open sea to load and unload containers, and then transports them to the port nearest to the final destination of the containers, eliminating the need for large harbors. Mobile Harbor was ranked second in the "10 Best Start-up Ideas of 2011" by StartupSmart. Finally, Mixalloy (a Cu/TiB2 dispersion alloy) was developed in three years from a theoretical concept to mass production and commercialization. The use of Axiomatic Design Theory enabled rapid development of these complex systems. We checked the viability and acceptability of proposed designs by constructing the system architecture as the system is being developed. These examples suggest that the management of technology development can be made more rigorous and effective by using a theory based design process.

TB-01 Innovation Management - 3

Tuesday, 7/31/2012, 10:30 - 12:00
Room: Pavilion Ballroom A
Chair(s) Xiaohong Quan; San Jose State University

TB-01.1 [R] An Integration of Broadcast Search in Innovation Intermediary for SMEs: A Preliminary Study of iTAP in Thailand

Songphon Munkongsujarit; Portland State University, United States
Sabin Srivannaboon; Chulalongkorn University, Thailand

This preliminary study focuses on the intermediary process of open innovation by extensively reviewing the related literature and examining the approaches in searching and matching the experts with technology-related problems and challenges. The study looks at a web-based broadcast search mechanism for further improvement of the operations of innovation intermediaries. In particular, it addresses possible alternatives to include the web-based broadcast search into the operations of an intermediary organization for small and medium enterprises (SMEs) in Thailand, the so-called iTAP (Industrial Technology Assistance Program).

TB-01.2 [R] Combining Disruptive Innovation and Open Innovation:Evidence Based on Case Studies of Chinese Latecomers

Yang Yang Zhao; National University of Singapore, Singapore
Chang Chieh Hang; National University of Singapore, Singapore
Wim Vanhaverbeke; Hasselt University - ESADE Business School, Belgium
Annapoornima M Subramanian; National University of Singapore, Singapore

By focusing on relations between latecomer disruptors and incumbents that go beyond competitive interactions, we give a fresh perspective to the disruptive innovation literature. This paper uses case study to investigate disruptive innovation cases in China's high-tech industries and identifies unique situations where both latecomer disruptors and incumbents can benefit from cooperation. This kind of open innovation may enable latecomer disruptors to catch up with or surpass the industry leaders and it allows incumbents to seize new

disruptive innovation opportunities. Our analysis suggests that the decision whether or not to combine disruptive innovation and open innovation depends on the presence of complementary assets and intellectual property.

TB-01.3 [R] Towards Optimal User Involvement in Innovation Processes: A Panel-centered Living-lab Approach

Dimitri Schuurman; Ghent University, Belgium
Bram Lievens; IBBT - SMIT, Belgium
Lieven De Marez; Ghent University, Belgium
Pieter Ballon; IBBT - SMIT, Belgium

Living labs are seen as a rather new research area with only a limited amount of supporting theories for understanding this concept. The absence of supporting theories, or rather the lack of agreement regarding the supporting theories, has induced on the one hand a proliferation of papers and articles on living labs and on the other hand a wide variety of approaches and projects carried out under the living labs-umbrella. In short, on a theoretical as well as on a practical level, a further narrowing and specifying of the living-lab concept remains a task in progress. Within this research paper, we will show that the living lab-approach is in many ways a logical extension of some of the principles of the open-innovation concept. In order to aid to the concrete conceptualization of living labs, we will give an overview of history of the living-lab concept with a focus on characteristics and applications. This allows us to make a meta-analysis of discerning elements that, according to the most recent literature, should or should not be present in best practice living-labs research. Based on this meta-analysis and on the literature review, we will construct a modified consensus definition of the living-lab concept as it is currently understood, described and practiced. By adding the panel-centered characteristic, we also add a living-lab characteristic that remained overlooked in most literature on living labs that, however, bears a large potential in terms of sustainability and added value of living labs.

TB-01.4 [R] A Framework to Assess Technological Innovativeness of a Company: Case Studies at Indonesian Pharmaceutical Industry

Leo Aldianto; Bandung Institute of Technology, Indonesia
Jann H Tjakraatmadja; Bandung Institute of Technology, Indonesia
Dwi Larso; Bandung Institute of Technology, Indonesia
Ina Primiana; Padjadjaran University, Indonesia

Indonesian companies recognize the importance of technological innovation for competing in the global competition. However, still they have done few innovations. Though people acknowledge the important of measuring innovation and people have studied several measuring frameworks and methodologies, there is yet an approach to be found that can be easily used by an organization in measuring its innovativeness and improve that condition. This research aims to develop a framework to assess technological innovativeness of a firm. The framework will be used to identify the current ability of a firm to make innovations and guide the activities to improve that ability. The study is based on the previous research in the area of the management of innovation, competences and capabilities creation and exploitation as well as the study on technology system as one of the enabling factors of innovation. This research applies the case study research method. Cases are selected from firms in the pharmaceutical industry, which are intensively utilizing technology and giving significant contribution to the Indonesian economy. Data from the cases have shown that the technological innovativeness of a company is influenced by factors in the technological innovation process (the technology system and competences and capabilities) and the management of innovation.

TB-02 Resource Management
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Pavilion Ballroom B
Chair(s) Hongyi Chen; University of Minnesota Duluth

TB-02.1 [A] Evaluation of Transportation Contract Using Simulation-Based Approach

Siri-on Setamanit; Chulalongkorn University, Thailand
Nattaya Sirasuk; Chulalongkorn University, Thailand

Distribution and transportation management is one of the areas that has strong impact on cost and performance of an organization. Generally, there are two ways to deal with a transportation provider, which are forming a transportation contract and buying at spot rate. The transportation contract generally offers a better rate than a spot rate, but the organization has to commit to the minimum volume requirement. If the actual volume is less than the minimum requirement, the organization may end up paying more with the contract. Due to the fluctuation in the demand from customers, the delivery requirement differs across time. Thus, it is difficult to decide whether to purchase service at spot rate or form a transportation contract (and at what minimum volume requirement). This paper presents a simulation-based approach in making decisions regarding transportation outsourcing. A Monte Carlo simulation model was developed to help the organization forecast the delivery volume requirement and also serves as a platform to evaluate different transportation contract policies under different circumstances. A case study company was chosen to illustrate the usefulness of the model. The finding helps the company in planning and negotiating the contract with the provider and in lowering the transportation cost.

TB-02.2 [A] Adjusting Inventories Based on Demand Prediction Using Dynamic Inventory Balancing Model

Ari Happonen; Lappeenranta University of Technology, Finland

This study examined inventory adjustment based on demand prediction in a real case study environment. In this case study, the action research method was applied to the case, in which the manufacturer faced fluctuating demand, averaging to have four different phases in a year. Demand peaks follow the valleys on a yearly basis, but the location of the peaks and valleys is not exactly known beforehand, which makes the demand and supply availability prediction and adjustment a hard task to achieve in this manufacturing network. The research data has been collected from an actual case in which the case company applied the ideology of dynamic inventory management model to their purchasing operations. By using costs calculations, the researcher has been able to show that the company saved in average of 20,000 in a 9-month time period just in interest. This case is considered a good example of practicality of applying simple ideologies in practice on inventory management to achieve good impact without applying too much resource on management level. Using the demand prediction model presented in this paper, the case company was able to synchronize inventories to the demand and also they were able to give their suppliers more time to prepare for future demand rises, which then gave them better service level in the situation of demand curve going up. The model is based on an idea of using both long and short time period history data to anticipate the future demand and its variations.

TB-03 Software Process Management
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Pavilion Ballroom C
Chair(s) Samuel A Ajila; Carleton University

TB-03.1 [R] Using Google Scholar as a Tool for Literature Review in Software Engineering

Kari K Lilja; Tampere University of Technology, Finland
Jari Palomäki; Tampere University of Technology, Finland

An established practice in literature reviews seems to be to scan different databases with their own search engines using queries and search terms defined individually for each engine and database. Although this might be effective in disciplines where the number of databases is relatively small and search terms can be defined unambiguously, in many cases it may run the risk of bias unless we are able to make sure that the terms and queries

used have exactly the same meaning in every search. Google Scholar provides an alternative search engine for searching for research studies and papers. This paper presents a literature review conducted by Google Scholar, evaluates the usability of Google Scholar for serious scientific research and discusses the reliability and validity of the results obtained. We find that Google Scholar may be suitable for collecting papers in the first phase of review, but other tools are also required. The use of Google Scholar proved that with some minor modifications it might be a worthy tool for a basic literature review.

TB-03.2 [R] New Product Development Processes for ICT-for-Development Projects

Bryan Mc Alister ; University of Pretoria, South Africa
Jasper L Steyn; University of Pretoria, South Africa

The potential applicability of established new product development processes to information and communications technology (ICT)-for-development projects is investigated. The demand for ICT solutions to serve numerous societal information needs in developing regions of the world is increasing rapidly. A number of methods and practices have been used by organizations to develop and deliver such ICT solutions, but a need exists to formalize product development processes for use in the ICT-for-development context. Existing literature on product development in the ICT-for-development context is explored to derive a theoretical model that may be suitable for addressing product development process problems encountered in such projects. An ICT-for-development project to disseminate government information to rural communities with limited literacy is evaluated against the derived theoretical model in a case study. The project was carried out by the CSIR (Council for Scientific and Industrial Research), a government agency in South Africa. The presence and positive effect of certain established product development practices is identified, while the absence or unsatisfactory execution of other established practices are assessed for their contribution to decreased levels of product success.

TB-03.3 [A] A Management System for Software Package Distribution

Sophon Mongkolluksamee; NECTEC, Thailand
Chavee Issariyapat; NECTEC, Thailand
Panita Pongpaibool; NECTEC, Thailand
Koolachat Meesublak; NECTEC, Thailand
Nontaluck Nulong; KMITNB, Thailand
Sirikarn Pukkawanna; NAIST, Japan

There are two popular ways to distribute software in the Linux world, by distributing source code or pre-compiled binary. Source-code distribution is suitable for open-source software. However, for close-source software pre-compiled binary is the only option. Unlike Windows, there are many versions of Linux distributions, such as Ubuntu, Red Hat, CentOS, and Debian. Different Linux distributions require different binary installation package. For example, Red Hat and CentOS use .rpm package while Ubuntu and Debian need .deb package. To generate a software package suitable for many Linux distributions, developers must compile software on as many Linux machines as their supported Linux versions. This process is cumbersome, inefficient and difficult to manage. We develop a system to generate and manage software packages which requires only one Linux machine. This system automatically exports software source code from a version control system, edits package configuration, builds the software package, and manages the software version. This system is tested and used on a production scale to build our network management software named NetHAM. It is shown to expedite the software release process and reduce the number of computers required. In addition, it is easy to use even by someone with no Linux skill.

TB-04 R&D Management - 3
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Pavilion Ballroom D
Chair(s) Nathasit Gerdsri; Mahidol University

TB-04.1 [R] Knowledge Transfer of Research and Development Results on the Petrochemical Industry

Kaori Shinozaki; Tokyo Fuji University, Japan

Research and development outcomes should be effectively turned into products for a business to achieve competitiveness. The business, however, must often overcome a valley of death that often lies between R&D and new products. The present work investigates factors contributing the formation of the valley of death in the chemical industry in which R&D outcomes are particularly vital to the innovation processes. Analysis involving the function and location of the R&D facility revealed that the valley of death is relatively often seen when the R&D department has independent R&D facilities only, or independent facilities along with facilities associated with production sites. It is suggested that the valley of death results from knowledge transfer problems, i.e. too heavy dependence on information transfer in the former case, and association with personnel relocation in the latter case where science-oriented and product-oriented projects go in parallel in the same site.

TB-04.2 [A] Knowledge Transfer in R&D Project Management: Application to Business-Academia Collaboration Project

Naoshi Uchihira; JAIST, Japan
Yuji Hirabayashi; Shimizu Corporation, Japan
Taro Sugihara; JAIST, Japan
Kunihiko Hiraishi; JAIST, Japan
Yasuo Ikawa; JAIST, Japan

This paper proposes a method of project management knowledge transfer in order to increase the success probability of R&D projects. Our method consists of knowledge externalization and knowledge internalization. “Structured project analysis” is a method of knowledge externalization that reviews a finished project and produces a structured project case. “Internalization workshop” is a method enabling managers to internalize the project management knowledge based on the analogical transfer approach. The method selects success and failure scenarios (future chance and risk items) from the structured project cases that have some similarities to the ongoing target project. Then, the method prompts the managers to imagine and analyze future scenarios of their target project by analogy and take action concerning them. We apply this method to an ongoing business-academia collaborative project in which Toshiba, Shimizu Corporation, and the Japan Advanced Institute of Science and Technology (JAIST) are developing an innovative healthcare information system. We qualitatively evaluate the effectiveness of the proposed knowledge transfer method and show how to fill the project management knowledge gaps among project team members drawn from business and academia.

TB-04.3 [A] Cooperation in Regional Innovation Networks Among Small and Medium Enterprises: Case Study of a Veterinary Pharmaceutical Company in Jalisco, Mexico

Ricardo Arechavala; Universidad de Guadalajara, Mexico
Rogelio Rico; Universidad de Guadalajara, Mexico
Francisco Leonel de Cervantes; Universidad de Guadalajara, Mexico

Regional innovation networks (RINs) in emerging countries often struggle with the absence of sufficient social capital necessary for development. The current research analyzes factors that have led an SME from the veterinary pharmaceutical sector in Jalisco to cooperate in RINs. These groups develop cooperation as an innovative strategy to confront threats within their market, as well as competition from large transnational producers. Specialized literature shows a tight relationship between cooperation in innovation networks and success in the market, especially among firms in high technology industrial sectors. This paper discusses the processes and phases involved in generating the synergy required for a company to build a cooperation network with other companies in the industry, with firms from complementary sectors, and with public agencies. This research documents the building process of the network including the agents involved, the role played by the leader company and the surrounding innovation processes. Results show that internal factors such as learning and absorptive capabilities, and external factors such as market configuration and public policy, are determining factors for involving the company in RINs. These

networks lead to the creation of new boundaries for innovation, and the ultimate success of companies involved.

TB-05 Knowledge Management - 2
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Orca
Chair(s) Donald A Kennedy; Kennedy Technical Services Inc

TB-05.1 [R] Knowledge Creation for Complex Software and Systems Development in Globally Distributed High-Tech Organizations: The Utilization of Appropriate IT Tools

Nataliia Samoilenko; University of Jyvaskyla, Finland
Nazmun Nahar; University of Jyvaskyla, Finland

Creation of knowledge and its effective utilization is essential for high-tech organizations to survive and grow in today's intense competitive business environment. An in-depth literature review reveals that the earlier research did not deal with a wide variety of relevant IT tools and methodologies sufficiently for knowledge creation in complex software and systems development in globally distributed high-tech organizations. Thus, this research has been undertaken to identify and analyze different suitable IT tools and how these tools can contribute greatly to knowledge creation. A framework has been developed based on an in-depth study of the utilization of appropriate IT tools for knowledge creation, expert experience and our personal knowledge in this area. The framework can have a wide variety of applications in research and practice. This study also provides some future research directions.

TB-05.2 [R] Sustaining Firm Performance through Cross-Border Knowledge Transfer: The Foskor-Coromandel Case Study

Mahendri Krishanduth; University of Pretoria, South Africa
Kai-Ying Chan; University of Pretoria, South Africa

Knowledge (both internal and external) has been identified as a critical resource to give firms competitive advantage in the ruthless global markets in which they operate. A very adept vehicle to achieve this is strategic alliances. Extensive conceptual work has been done on cross-border knowledge transfer, but insufficient empirical work. This research study sets out to use an empirical case study of the Foskor-Coromandel cross-border collaboration to investigate the knowledge transfer. The strategic alliance is a buyer-supplier type of inter-firm alliance. The study uses a conceptual model derived from literature to discuss the influence of factors (knowledge characteristics, knowledge recipient characteristics, knowledge supplier characteristics and relationship characteristics) on the effectiveness of the knowledge transfer. The study also examines the impact of effective knowledge transfer on firm performance. The study findings indicate that of the factors considered, knowledge complexity, absorptive capacity, recipient collaborativeness, transfer capacity and organizational distance had the most significant impact on the knowledge transfer and its effectiveness. Firm performance is positively impacted by effective knowledge transfer, leading to the conclusion that inter-firm strategic alliances as a vehicle to transfer knowledge can be an effective source of competitive advantage.

TB-05.3 [R] Managing Knowledge Flow in Inter-Organizational Knowledge Transfer: The Dual Hazard Model

Shih-Chieh Fang; National Cheng Kung University, Taiwan
Wen-Chun Li ; National Cheng Kung University, Taiwan
Chen-Wei Yang; Fooyin University, Taiwan
Sabrina Tsai; National Cheng Kung University, Taiwan

Moral hazards and cognitive hazards play as dual barriers in inter-organizational knowledge transfer. However, in order to overcome these dual barriers, the governance mechanisms of appropriation concern and coordination are designed to assist focal firm to facilitate knowledge flow for inter-organizational knowledge transfer. The main purpose of this study is to develop an inter-organizational knowledge transfer model for governing inter-organizational knowledge flow. For this purpose, this study explores and examines the governance determinants (coordination factors and appropriate factors), knowledge flow, and knowledge transfer performance of inter-organizational relationship in the high-tech sector. This study empirically tested the theoretical model at the inter-organization level. The empirical setting is the semiconductor industry in Taiwan. Our findings suggest that the inter-organizational knowledge flow are influenced by coordination factors and appropriate factors and impact the collaborative knowledge sharing performance. Finally, in addition to discussing the theoretical and managerial implications of the research findings, this study compares related arguments in the literature to show that our framework offers a new way of conceptualizing research on governing inter-organizational knowledge flow and new directions for future research.

TB-06 Emerging Technologies - 3
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Finback
Chair(s) Alisa Kongthon; National Electronics & Computer Technology Center

TB-06.1 [R] An Investigation of Factors that Influence User Intention to Use Location Based Mobile Applications

Nevzat Cakmak; Bogaziçi University, Turkey
Nuri Basoglu; Bogaziçi University, Turkey

There is an increasing number of mobile applications that cover a variety of usage areas, and there is a reality that most of these applications are going cumbersome after a short time of usage. In order to investigate success factors for mobile applications, we tried to elaborate location based mobile applications which (LBMA) is one of the prominent mobile application categories. Conducting one to one interviews using two actively used mobile applications, we have had the ability to reach insightful ideas about certain characteristics that have impact over customer intention. While one of the mobile applications we elaborated was directly related with customers' usage of location, the other one was indirectly related. Our interview responses have led us to separate the value that affects the user's intention in two: functional value and emotional value. When we look at these two value categories, functional value constitutes the big proportion in affecting the intention. According to our findings, while the most prominent determinants of functional value are usefulness and ease of use (EoU), task-technology fit (TTF) and minimum memory load concepts were found to be the most important independent determinants in creating the functional value. Awareness, which has a moderate effect on functional value, is found to have a significant impact as well. On the other hand, enjoyment is found to be an important variable in creating the emotional value.

TB-06.2 [R] New Markets and New Products: Strategies for Reaching the Base of the Pyramid

Akkanad M Isaac; Governors State University, United States

This paper examines new evidence regarding the following: 1) the potential for profitability at the base of the pyramid consisting of over four billion people, mostly from third world countries; and 2) entrepreneurial qualities displayed by the informal sector, mostly in the developed economies. A few large corporations have targeted the economically poor emerging new markets by developing new products and new technologies. There is no evidence to support the view that sustainable profitability is possible by catering to the needs of this new market segment. Multinational corporations have two options: 1) sell new products using adaptive technology to the middle-income segment of the population with traditional marketing approaches; and 2) sell entirely new products at a substantially low price to the vast number of economically poor in the third world countries. This paper examines the critical factors associated with these two business strategies.

TB-06.3 [R] Overcoming Technological, Commercial, Organizational and Social Uncertainties of Innovation: The Case of Forest Biomass as a

Replacement of Petroleum-Based Feed Stocks

Jeremy Hall; Simon Fraser University, Canada
Stelvia Matos; Simon Fraser University, Canada
Michael Martin; 2 Spruce Close, United Kingdom
Vernon Bachor; Simon Fraser University, Canada

The replacement of petroleum-based feed stocks with more environmentally sound alternatives has gained widespread interest in a number of industries. Sustainably managed, forest biomass can be a key driver in this transition by providing a source of biofuels, chemical feedstock and lignin-based polymers. New genomic and metagenomic approaches can identify novel enzymes that will allow, for example, the degradation of lignocellulose and the discovery and development of biocatalysts for improving production efficiencies and reducing environmental impacts such as carbon emissions. However, in addition to these technical hurdles that must be overcome, the transition to more environmentally sound biomass-based industrial systems will depend on legitimization processes to overcome commercial, organizational and social uncertainties, and will affect various industrial sectors differently. This paper presents preliminary insights from the Genome Canada funded project Harnessing Microbial Diversity for Sustainable Use of Forest Biomass Resources, which explores such genomic and metagenomic approaches for improved biomass efficiencies. As part of the study, we examine commercialization processes, public policy issues and secondary stakeholder concerns of this technology to better understand how such technologies may be successfully diffused. We discuss the implications for industry sectors and other stakeholders affected by the development of this technology.

TB-07 Technology Marketing - 1
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Beluga
Chair(s) Anne-Sisko Patana; Aalto University

TB-07.1 [A] ENERGY WIZ Spray-on PV for Solar Windows: The Marketing Plan

Parisa Ghafoori; Portland State University, United States
Karen Dasmarinas; Portland State University, United States
Nasir Sheikh; Portland State University, United States
Jayanth Siddappa; Portland State University, United States
Duygu Ucar; Portland State University, United States

The report showcases Energy Wiz's marketing strategies for "Spray-On Plastic Window" for US non-residential market, and addresses some of the potential challenges and how to overcome some of those challenges faced by Energy Wiz with its Spray-on Window product. The competitive assessment was done to determine the potential competitors and what are the key features of our product that could be advantageous in the market. This study showed us that Energy Wiz's Spray-On Plastic Windows had several features which could lead to market success and domination. Some of the important ones are: a) double charger, meaning, during the day electricity can be produced from the sunlight and during the night or less sunnier days, the internal lights used in the building will enable them to recharge, b) suited for glazed windows, c) transparency, and d) manufacturing and installation process does not require facilities for high heat and vacuum.

TB-07.2 [R] The Relationship between Energy-smart Exhibition and Customer Complaint Behaviors for TIGIS Taiwan International Green Industry Show

Pei-Ming Lee; De Lin Institute of Technology, Taiwan

The green industry is one of the key components of economic growth in the future. Especially, the enterprise making use of the energy-smart exhibitions to display products was a new approach in the green industry. No empirical study explained the relationship between energy-smart exhibitions and customer complaint behaviors for the green industry in Taiwan. This paper investigates the relationship between an energy-smart exhibition and customer complaint behaviors. Two hundred and forty-seven matched data were analyzed to test the research hypotheses. The finding showed the positive relationship between energy-smart exhibitions and customer complaint behaviors. Finally, implications of these findings and suggestions for future research will be discussed.

TB-08 Technology Management in Services - 2
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Parksville
Chair(s) Abrar Haider; University of South Australia

TB-08.1 [R] A Framework of IT Based Competencies for Professional Accountants in Small- and Medium-sized Accounting Practices

Ku Maisurah Ku Bahador; University of South Australia (UNISA), Australia
Abrar Haider; University of South Australia (UNISA), Australia

Due to the dynamic nature of information and communication technologies, there is a need to redefine the skill and competency set for the accounting profession. The International Federation of Accountants acknowledges that there is an increasing concern about the level of competencies accountants possess in the use of information technologies, and whether they are prepared to meet the challenges of the contemporary business world. In Malaysian paradigm, accountants are trained by universities, polytechnic institutions and the Malaysian Institute of Accountants. However, there are no common grounds among these institutions about what information technology related skills, competencies or expertise are required throughout the life cycle of an accountant's occupancy. As a result, each of these institutions incorporates generic information technology skills rather than specific skills in their curriculum. This research seeks to identify the competency set for contemporary accounting professionals, emphasizing those in small to medium accounting practices. This is due to their nature of dynamism, customer oriented and project based. This research thus makes a significant contribution to academic and professional bodies, as well as to the industry, by providing a theoretical base for developing information technology related competencies for knowledge workers in general and professional accountants in particular.

TB-08.2 [R] Organizational Issues and Their Impact on the Performance of Service Desk Staff Members in Providing Quality Service

Rupert Botha; University of Pretoria, South Africa
Awie C Leonard; University of Pretoria, South Africa

When implementing and maintaining information systems, companies do not always realize what impact it has on end users of such systems and particularly with regard to the performance of service desk staff members. It is for example important to understand the frustrations and concerns of end users and clients in this regard. Mcbride [26] states, "Although new information systems are acquired and implemented, the core centre of the IT sector has moved towards service provision and service improvement." In this paper we investigate how organizational issues impact on the supportive role of service desks operations, which is of course dependent on the availability and smooth running of supportive information systems. Six in-depth case studies were analyzed, and a conceptual framework is proposed that not only explains the role and impact of organizational issues on the performance of service desks, but also serves as guideline for managing these issues in relationship to the performance of service desks in general.

TB-08.3 [R] The Shift from After-sales Service to Design Servicing Competence: A Study of the Manufacture of Sanitary Ware and Their Integration of Sustainable Technologies

Yu Morishita; The University of Tokyo, Japan
Manjusha Thorpe; University of Cambridge, United Kingdom
Satoshi Yoshida; Advanced Institute of Industrial Technology, Japan

In the area of product manufacturing, the traditional procedure of after-sales service has remained isolated to post-sales product assessment. However, with the recent awareness toward a paradigm of sustainable technologies, much of the competitive query is informed by the operational information of users and its localized environmental context. The two

have become a pressing insight to build knowledge for providing sustainable solutions. In order to establish a company's competence, once product-oriented companies must now account for uncertain contextual environments and use-based information, and the integration of these factors into technological capabilities and service they provide. The study follows a manufacturing company that has incorporated such knowledge-building processes by advancing its feedback technique, integrating a design servicing process into its business structure. The process of transforming contextual information into a parameter for its technological services is analyzed here. The paper analyzes how the feedback/information from the operational period of the artifacts were managed a) in the manufacturing and technology sector, and b) as spatial information in the servicing sector of the company. In order to position the boundary of information/technology management within a product-environment relationship, the paper documents technological advancements that are more responsive to environment-driven, contemporary user demands.

TB-09 PANEL: Research Funding Sources for Engineering and Technology Management Research
Tuesday, 7/31/2012, 10:30-12:00
Room: Port Hardy
Panelist(s) Tugrul Daim; Portland State University

This panel will explore funding sources for research in engineering and technology management.

TB-10 Technology Forecasting - 2
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Port McNeill
Chair(s) Scott W Cunningham; Delft University of Technology

TB-10.1 [R] Evolution of Computer Networks: A Theory of Technological Paradigm, Trajectory, and Regime

Jonathan C Ho; Yuan Ze University, Taiwan

Shifts in technological paradigms usually bring critical impacts to existing products, companies and societies. Although the Schumpeterian economists have well discussed the destructive impact of technological change of this type, systematic analysis of paradigmatic change in technology surely help technology managers in allocating research resources. This study develops an analytical model based on the theory of technological paradigm, trajectory, and regime. Along with the process research methodology, the model is applied to the evolution of networks in the computer and related industries. Starting with the very early ARPAnet to the NSFnet and to the Internet, the analysis identifies the drivers of changes happening to products, industries, and markets. Theoretic propositions are projected based on the case research result.

TB-10.2 [A] Customized technology readiness - Introducing the application-specific Technology Readiness Model

Antonino Ardilio; Fraunhofer Institute for Industrial Engineering, Germany
Joachim Warschat; Fraunhofer Institute for Industrial Engineering , Germany
Dieter Spath; Fraunhofer Institute for Industrial Engineering, Germany

Enterprises, as technology users, implement specific technologies into their applications to fulfill market-requested functions. To meet the exacerbating market needs, one of the primary duties of technology forecasting within enterprises is to identify relevant technologies, to determine their maturity, to predict their future development and thereafter to estimate their suitability within the enterprise application. To measure the maturity of a technology, models like NASA's Technology Readiness Levels or other technology lifecycle models (like Gartner's Hype-Cycle, etc.) are in use. These models lack applicability within the above mentioned tasks, as the maturity is analyzed and visualized as a whole for each technology. However, enterprises need an estimation of technology maturity based on the very specific requirement-profile of their application. For example, a three-year lifecycle display technology corresponds to the lifecycle of a mobile phone (in this case the technology is mature), whereas for a 15-year lifecycle car, the same technology is very immature. This paper introduces an approach on how to determine and map the application-specific maturity of technology by decomposing both the application and the technology into its provided resp. requested functions and performance- resp. requirements-profile as well as the dynamical mapping of the single technology performance criteria. Furthermore, this paper gives an outlook on how this model could be used to predict the future development of technology. Within a use case in the area of OLED-technology, the application specific technology readiness-model will be demonstrated and discussed.

TB-11 Collaborations in Technology Management - 1
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Port Alberni
Chair(s) Simon P Philbin; Imperial College London

TB-11.1 [R] Emerging Need for External Forces Coordination in Regional Business

Hiroaki Itakura; Kagawa University, Japan

This paper will look at an emerging need for external forces that can coordinate the network for all the participating players in regional business. These are analyzed using the concept of super-industrialization, which includes external and internal forces.

TB-11.2 [R] Exploring the Role of Collaboration Capability in ENPD Team of Notebook Industry in Taiwan

Chien-Chiang Lin; Shih Hsin University, Taiwan
Chien Liang Kuo; Chinese Cultural University, Taiwan
Guan Wen Hung; Shih Hsin University, Taiwan

Environmental protection is considered one of the hottest issues. Following the implementation of three directives of the European Union, including the Waste Electrical and Electronic Equipment Directive (WEEE), Restriction of Hazardous Substances Directive (RoHS), and Energy Using products (EuP), practitioners are expected to take responsive actions to stay in the market and remain competitive. Taiwanese notebook companies, as major manufacturers in the world, are advised to integrate green concepts into the process of new product development to alleviate the burden to the earth. The paper aims to explore the role of collaboration capability in the process of environmental new product development (ENPD). Members of product development teams from different companies in the notebook industry were interviewed. Documentary analysis, in-depth interview, and content analysis were used to collect and analyze data. The results indicated that practitioners do pay more and more attention to the idea of ENPD; however, the authors also found that the concepts of life cycle assessment (LCA) and environmental management system (EMS) are still in their early stages that need to be integrated in formal business processes. Supplier management and green procurement are main approaches utilized by companies investigated in the current study. It is also noticed that original equipment manufacturer (OEM) and original design manufacturer (ODM) companies adopt different approaches to become environmentally friendly.

TB-11.3 [R] A Collaborative Technology Management Approach toward a Competitive Advantage in the Caribbean Manufacturing Sector

Ambika Koonj Beharry; University of the West Indies, Trinidad and Tobago
Kit Fai Pun; University of the West Indies, Trinidad and Tobago
Marcia Nathai-Balkissoon; University of the West Indies, Trinidad and Tobago

Development in the Caribbean has historically depended upon the exploitation of natural resources from contributing sectors such as energy, agriculture and tourism. Recent dynamics including depleting non-renewable reserves, destructive climatic phenomenon and global economic factors highlight the urgent need for Caribbean economies to shift their revenue-generating base to more resilient sectors. Against the backdrop of economies of scale, the initial findings of a recent study of the innovation and technology acquisition practices of firms in the Caribbean support the need for a collaborative approach toward

technology management (TM). This paper presents a research initiative on the development and adoption of collaborative TM efforts among Caribbean manufacturing firms with emphasis on the management of their technological assets. A conceptual collaborative TM framework is proposed. It is anticipated that the outcomes of this investigation would be of value to 1) the manufacturing practitioners who strive for gaining a competitive advantage with collaboration and 2) the researchers who conduct further empirical inquiries into the collaborative TM capabilities among manufacturing firms in the Caribbean.

TB-12 Patent Analysis - 3
Tuesday, 7/31/2012, 10:30 - 12:00
Room: Azure
Chair(s) Martin G Moehrle; Universit t Bremen

TB-12.1 [R] Assessing the Values of Global Patents

Hsin-Ning Su; GITM, National Chung Hsing University, Taiwan
Pei-Chun Lee; TIM, National ChengChi University, Taiwan
Carey Ming-Li Chen; S&T Policy Research and Information Center, Taiwan
Chun-Hao Chiu; ITM, National Chung Hsing University, Taiwan

This study seeks to assess the value of global patents in terms of probability of occurrence of patent litigation in each country. To obtain the purposes, two following research steps are adopted. The first step is litigation probability modeling. A holistic-scale analysis on both 31,992 litigated patents and 3,878,852 non-litigated patents issued between 1976 and 2010 by USPTO are conducted to understand the differences between the two types of patents in terms of different variables. It is found that there are statistically significant differences for the two types of patents in 11 variables. The second step is applying the obtained litigation probability model to patents owned by different countries to quantitatively calculate averaged probability of litigation for each patent in different countries. The contributions of this study are not only providing the model of predicting litigation probability, but also providing a novel way of patent valuation as well as facilitating global assessment on patent valuation.

TB-12.2 [A] Predicting the Potential Industrial Fields of Technological Spin-offs by Using IPC in Patent Analysis

Hajime Sasaki; The University of Tokyo, Japan
Yuya Kajikawa; The University of Tokyo, Japan
Ichiro Sakata; The University of Tokyo, Japan
Vitavin Ittipanuvat; The University of Tokyo, Japan

R&D projects sometimes generate technological seeds which have application potentiality in unintended fields. Examples can be seen in defense, aerospace and nuclear power industries. In these industries, huge amounts of public investment are continuously spent on long-term and advanced technology where a high technological level is required and achieved. Even in the case where the projects seem to fail, technological and economical spin-off effects are expected by utilizing collateral technologies. However, there were a few empirical studies to quantitatively assess the extent of technological spin-offs. And it is less effort to detect and predict the fields where technological spin-offs will occur in the future. The purpose of this paper is to detect technological fields that have plausible and diverse applications in other industries by using bibliometrics and network analyses of patent publications. We observed transition of technology transfer between fields with time-series analysis of co-occurrence of International Patent Classification (IPC) codes among patents. The results suggest a possibility to utilize our approach so that we can detect the potential technological and industrial fields where breakthroughs by innovative seeds in other fields can open a new direction for those fields.

TB-12.3 [R] An Exploratory Study of Patent Litigation Behavior: Evidence from the Smartphone Industry

Yu-shu Peng; National Dong-Hwa University, Taiwan
I-Chung Liang; National Dong-Hwa University , Taiwan

This study aims at providing a framework to delineate the patent litigation behaviors based on the resource-based view, transaction cost economics, and the view of competitive dynamics. Empirical data were collected from the smartphone industry during the period from 2003 to 2011. Propositions are raised to illustrate how high-tech firms launch patent litigation attacks, including what focused patents are, whom firms are motivated to attack, when to initiate an attack, and where to file the lawsuit. We first conclude that a patent with higher value would be more likely to cause litigation. Second, the firm with a dominant design is more likely to be attacked by the incumbents through patent litigation while enjoying greater performance, and the defendant usually initiates a countersuit against their competitors with their own patents. Third, the more important stake of the patents in dispute, the more likely the plaintiff will choose the courts skilled in dealing with the complexities of patent law and the technology at issue, and the more likely the patentee will file patent litigations in district court and the International Trade Commission at the same time. The study not only contributes to the patent theory, but also benefits both firms from developing and developed countries in formulating offensive and/or defensive patent litigation strategies.

TD-01 Innovation Management - 4
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Pavilion Ballroom A
Chair(s) Christian Marxt; University of Liechtenstein

TD-01.1 [R] Innovation Behavior of Technology-Based SME

Markus Spiegel ; University of Liechtenstein, Liechtenstein
Christian Marxt; University of Liechtenstein, Liechtenstein

The ability to continually innovate is widely recognized as one of the core capabilities for technology-based SME. Although the companies see the importance of innovation (product/service, process, business model), they often struggle to tap into market opportunities, new trends and emerging technologies. One reason could be the innovation set up and behavior of SMEs. This paper identifies in the literature innovation building blocks to help understand crucial innovation behavior. These building blocks were then tested in a survey, to which 57 manufacturing and technology-based SMEs responded. The results indicate that there are tremendous opportunities for SMEs to strengthen their innovation capability in four different areas. These areas include the application of a more pro-active and strategic approach to innovation, a more formal approach for the innovation process, widening the innovation space through different types of innovation, and the consideration of new cooperation partners. The results also show a way to a necessary adaptation of existing innovation models for SMEs.

TD-01.2 [R] Bridging Theory and Practice: Toward a Unified Framework of Innovation

Dov Dvir; Ben Gurion University of the Negev, Israel
Aaron J Shenhar; Rutgers Business School, United States

While the innovation literature has introduced over the years many conceptual frameworks for classifying innovations, there is yet little agreement among researchers on a unified framework for studying innovation. More troubling is the fact that most theoretical frameworks of innovations have had little impact on the way organizations conduct their innovation processes in practice. In addition, only few studies have connected the innovation process with the methodology used for turning ideas into useful products or services, namely project management. This conceptual paper offers a unified framework of innovation and demonstrates its value on real-life cases of innovation. The framework is an integration of well-known innovation frameworks with a project classification framework, adding the market and technological uncertainty dimensions. The unified framework enables dealing with one of the most important aspects of innovation, closing the uncertainty gap existing at the onset of the innovation process.

TD-01.3 [R] The Role of Integration Mechanism in Open Innovation Team: An Exploratory Study on Cross-Field Student Team Contests

Cheng Pa Lin; National Cheng Kung University , Taiwan
Shu-Hui Chen; National Cheng Kung University, Taiwan

Open innovation has received considerable attention in the practical business domain, as it can help companies to increase their abilities to produce either incremental or radical innovations. Due to the open nature of this approach, there is a lack of formal structure and thus a need for an integration mechanism to motivate the participants to collaborate productively. This study examines such constructs as team vision, commitment, and self-efficacy, which might drive cross-field teammates to contribute their efforts to innovation projects. The aim is to explore how the participants' varied abilities can be integrated in open innovation student teams. A questionnaire survey of 159 respondents was conducted using purposive sampling focusing on six major open innovation contests in Taiwan. The results show that team vision, commitment, and self-efficacy only partially mediate the integration mechanism that can be used to integrate the team members' varied abilities in order to achieve more innovative outcomes.

TD-01.4 [R] The Impact of Lean Design Practices on an Organizations Radical Innovation Capability: An Empirical Study

Hongyi Chen; University of Minnesota Duluth, United States
Ryan Taylor; University of Minnesota Duluth, United States

Since lean management concepts focus on low risk, short-term gradual improvement of existing processes and products with an emphasis on eliminating any and all waste in the system, applying lean to an organization often implies difficulties in promoting innovations that involve high risks and dramatic changes. In this article, we investigate the impact of lean design practices on an organization's radical innovation capability through a survey study. Results suggest that the stressed importance of standardization in lean design has a negative effect on an organization's radical innovation capability. A negative correlation between the emphasis of design being compatible with the existing manufacturing process and the organization's radical innovation capability is also suggested. Part integration, on the other hand, positively contributes to an organization's radical innovation capability.

TD-02 Technology Management in the Energy Sector - 3
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Pavilion Ballroom B
Chair(s) Toufic Mezher; Masdar Institute

TD-02.1 [R] Impact of Feed-in Tariff Policy on Global Photovoltaic Business: Expected Solar Cell for Reconstruction after Great East Japan Earthquake

Yukihiko Nakata; Ritsumeikan Asia Pacific University, Japan

Renewable energy is strongly expected after Great East Japan Earthquake. However, the cost of electricity produced by the renewable energy is higher than that of grid power, which is generated by fossil fuels. Thus, government policy is very effective to enhance the renewable energy. Feed-in tariff (FiT) policy, in which electricity generated by renewable energy is bought by the electric utilities at above market prices, is very effective to enhance the renewable energy. Germany and Spain have introduced the FiT to the renewable energy, especially photovoltaic (PV) energy and enhanced the PV business and installation. But, the FiT caused serious problems, such as increase of electricity price and recession of PV business. The impacts of FiT on European PV business were analyzed. In addition, Japan Diet passed the FiT in August 26, 2011 and it will become effective from July 1st, 2012. The FiT assessment committee has presented the FiT proposal in April, 2012. It almost accepted the industrial demand. Therefore, the FiT will expand Japanese domestic PV market and business. The renewable energy project in the disaster area has begun and will contribute to the electric power supply and the economic recovery by creating the solar cell industry.

TD-02.2 [R] Evaluating Government Policy on Accelerating the Use of LED Lighting Products Using System Dynamics Modeling in Taiwan

Chiung-Wen Hsu; Feng Chia University, Taiwan
Pao-Long Chang; Feng Chia University, Taiwan
Yen-Hsun Shih; Feng Chia University, Taiwan

In response to the environmental impact of climate change, carbon emissions reduction has become a common global goal. This goal has led to the formulation of policies and measures to meet carbon reduction targets in various countries. Therefore, the assessment of the effects of energy conservation and the reduction of carbon emissions are important for the promotion of policies and measures for carbon reduction. Using system dynamics modeling, this study evaluates the effects of reduced carbon emissions when switching to LED lighting. Unlike conventional light sources that save energy, LED lighting products reduce carbon emissions and have longer lives. In Taiwan, the promotion of such products will help achieve its carbon reduction target. However, because LED lighting products are more expensive than conventional lighting products, their use by the public remains limited. The government has therefore adopted certain policies to increase the usage of LED lighting products. This study uses a system dynamics model to simulate the consumption of LED lighting products in Taiwan and thus assess the effectiveness of government policy. The simulation results show that the government's promotion policies effectively increase domestic LED lighting usage and thereby help reduce carbon emissions. The Taiwanese government invested approximately NT$1,781.06 million during 2006~2011 to promote LED lighting applications through public procurement and research grants. During the same period, the accumulated use of LED lighting products increased by 24.3 percent, and thus, the average policy effectiveness was 0.42 lm/NT$ and NT$40.3 for each kilogram of carbon emissions reduced. We thus find that the higher the investment into procurement policy, the greater the effectiveness of increasing LED lighting products' usage and decreasing carbon emissions.

TD-02.3 [R] Value Stream Maps for Industrial Energy Efficiency

Cem Keskin; Istanbul Technical University, Turkey
Gulgun Kayakutlu; Istanbul Technical University, Turkey

Lean thinking is an engineering approach to avoid non-value adding tasks or processes in manufacturing. Energy is used by manufacturing companies for direct production processes, space conditioning and facility support. Most of the lean analysis of energy studies is multivariable statistics application focused on energy use in processes. This paper aims to reduce energy utilization by the small and medium manufacturing companies by implementing energy based value stream mapping. Value stream mapping is a graphical technique that allows one to detect the level of value added by a process. This study adopts the value stream mapping technique to detect the level of energy use at each step of different processes, either in production or in facility support. The determined energy utilization level is validated in accordance with the outside temperature, production volume and the amount of solar effect on the facility. This will allow the discovery of energy saving opportunities. The suggested model can be used not only for diagnostic purposes but also for energy budgeting and savings measures. A case study application is given to demonstrate the energy-value stream maps (E-VSM).

TD-03 TUTORIAL: A Hands-On Introduction to Technology Forecasting using Data Envelopment Analysis
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Pavilion Ballroom C
Speaker(s) Timothy Anderson; Portland State University
Dong-Joon Lim; Portland State University

Over the years, technology forecasting using data envelopment analysis (TFDEA) has been used in a wide range of applications. This includes predicting release dates for new products and setting future design targets. Applications include fighter jets, microprocessors, flat panel displays, passenger aircraft, wireless telecommunications protocols, digital cameras, and others. A barrier to TFDEA adoption has been the lack of available tools. Recently developed software will be demonstrated and attendees will be given copies. If you bring your own laptop, you can do the installation and then follow along with us.

TD-04 R&D Management - 4
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Pavilion Ballroom D
Chair(s) Tugrul U Daim; Portland State University

TD-04.1 [R] Research Program Assessment from Research and Social Impacts

Yuriko Sawatani; Japan Science and Technology Agency (JST), Japan
Yuko Fujigaki; The University Tokyo, Japan

Research Institute of Science and Technology for Society (RISTEX) [14] started R&D programs focusing on the creation of social technologies, science and technology for social systems. This paper summarizes the mid-term assessment results of the completed R&D programs at RISTEX. The assessment of the R&D program has two levels of assessments, i.e. a research project's level and a R&D program level assessment. Each R&D program at RISTEX includes more than one research project. One of characteristics of RISTEX R&D programs is the existence of the management system, which stimulates interactions between research projects and the management team aiming at the project success. The R&D program assessment investigates how the management system works to meet the R&D program goals. Our current assessment shows that the research maturity, such as existing academic societies, affects the research project selection as well as the portfolio management. When the research maturity is low, then a R&D program tends to focus on social issues. As the result, the research project portfolio is managed from problem-solving viewpoints. Even though the research maturity is low, activities to link research projects led by the management system have a good potential to influence positively to create strategic research themes from the bottom-up research projects. In a future study, we will look at the management system at RISTEX and whether it works positively for the research theme creation and social impacts.

TD-04.2 [A] Creating a Prioritized Regional Energy Efficiency Research Agenda

Joshua Binus; Bonneville Power Administration, United States
Ryan Fedie; Bonneville Power Administration, United States
Tugrul Daim; Portland State University, United States

The Bonneville Power Administration (BPA) Office of Technology Innovation and Energy Efficiency Department has recently undertaken an initiative to create a regional energy efficiency technology roadmap for the Pacific Northwest. The goal of the roadmap is to create a research agenda for the Northwest that will provide direction and continuity for the collective efforts engaging commercially available, near-commercially available, and deeper R&D technology needs. BPAs Office of Technology Innovation has been using roadmaps to guide its research agenda since the mid-2000s. Technology roadmaps are a one-page graphical representation that BPA uses to draw bright lines between business challenges and the products or solutions needed to solve those challenges. The research agenda is then set by the gaps identified during the process. When it came time to refresh the existing energy efficiency roadmap, BPA invited the region to participate in the creation of a new roadmap. Having the region participate in the creation of the roadmap will create great value for the Pacific Northwest by linking strategy to product plans and technology plans; enabling regional coordinated technology planning; focusing on longer-term, goal-oriented planning; and improving communication and ownership of plans. The resulting roadmap covers residential, commercial, and industrial. Technology areas like variable capacity heat pumps for commercial buildings have their own dedicated roadmaps.

TD-04.3 [R] R&D Strategy for Building Effective Entry Barrier

Yuichi Fukuda; Tohoku University, Japan
Akio Nagahira; Tohoku University, Japan

As Michael Porter described (Porter, 1980), entry barriers can be reduced due to the expiration of basic patent rights. Therefore, many companies try to build effective entry barriers by creating effective patent portfolios in order to deter new entrants from plunging into existing and/or emerging markets. The aim of this study is two-fold. First, we focus on the research framework by taking the perspective of the patent life cycle (PLC) model, which has been sophisticated by the underlying specification that is the evolution of the dominant design introduced by Abernathy and Utterback (1978). Second, we reveal the effective cooperation between R&D strategy and patent strategy in order to build a continuous entry barrier. The conclusions of our study are as follows: First, two or more derived products with similarities to an existing product structure were developed concurrently by the same company during the growth stage of the existing product so as not to allow a time period without patent rights. The results of the development were used with the existing product. Second, it was necessary for an existing inventor and a new inventor to take part in the derivation product development simultaneously in order to utilize the results of new product development with the existing product. Third, according to the PLC analysis, the effective cooperation between R&D and patent division was crucial in both "the piezoelectric elements" and "the diesel particulate filter."

TD-05 Technology Assessment and Evaluation - 2
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Orca
Chair(s) Steven T Walsh; University of New Mexico

TD-05.1 [A] Assessing Materials Innovation with Technical-economic Cost Models

Kourosh Malek; National Research Council of Canada, Canada
Elicia Maine; Simon Fraser University, Canada
Titichai Navessin; Blueprime Technology Consulting, Canada

There is an increasing need within energy, resource, and manufacturing industries to assess the relative competitive potential of new chemical processes, materials, and technology. Techno-economic cost modeling allows for a new process, often still at the pilot or R&D stage, to be compared to incumbent processes along relevant parameters. Technological constraints and R&D objectives are incorporated into the analysis. The viability of the process for specific applications can be assessed and strategic decisions on production scale-up are informed. Thus, techno-economic cost modeling is an invaluable, direction-steering tool for process-based innovation. We discuss how applying techno-economic cost modeling in the context of a technology innovation can greatly assist in optimising efforts and investment. TCM provides cost and performance boundaries that assist in prioritizing R&D efforts. As a case study, we describe a Technical-Economic Cost model for Polymer Electrolyte Fuel Cells (PEFCs). The model is fine-tuned to a range of materials, compositions and fabrication processes in order to inform the materials design in view of ease of fabrication, cost, integration and performance of new generation of fuel cell components.

TD-05.2 [R] Techno-Economic Analysis of Hydrogen Production Using FBMR Technology

Lee D O'Donnell; Simon Fraser University, Canada
Elicia Maine; Simon Fraser University, Canada

Alternative methods of hydrogen production are of interest if they offer improvements in cost, efficiency, flexibility, and/or impact on the environment. The feasibility of commercializing fluidized bed membrane reactor (FBMR) methods of hydrogen production is assessed through techno-economic cost modeling (TCM). A sensitivity analysis is then presented to evaluate the impact of changes in market conditions of input materials, commodity pricing, and location will affect the cost of hydrogen using this form of production.

TD-05.3 [R] Technology and Its Value at the Bottom of the Pyramid

Claudia N Jimenez; Universidad Nacional de Colombia, Colombia
Oscar F Castellanos; Universidad Nacional de Colombia, Colombia

At different stages of development, technology can contribute to satisfying the requirements of specific markets. This paper is based on the concept of Bottom of the Pyramid proposed by Prahalad, where four thousand million poor people are located, and the traditional wel-

fare approach has not brought effective solutions. It is necessary to find an alternative solution to actively involve the poorest socio-economic group, by means of innovation, access and availability of goods and services oriented to them. This paper aims to analyze technologies that allow manufacturing of products for the Bottom of the Pyramid, establishing whether there are differences compared with other technologies. As technology valuation is a key function of technology management, a proposal is made about the valuation of those technologies, according with their stage at the technological life cycle; this proposal is supported on biological elements and oriented toward the complementation of the valuation topic by considering widely characteristics of technologies and their context. It is concluded that technologies at the Bottom of the Pyramid are specific and require a particular management that includes particular processes and methods of technological valuation, trying a better inclusion of knowledge integrated to technologies.

TD-06 Emerging Technologies - 4
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Finback
Chair(s) Akkanad M Isaac; Governors State University

TD-06.1 [R] Detecting Research Fronts Using Different Types of Weighted Citation Networks

Katsuhide Fujita; The University of Tokyo, Japan
Yuya Kajikawa; The University of Tokyo, Japan
Junichiro Mori; The University of Tokyo, Japan
Ichiro Sakata; The University of Tokyo, Japan

In this paper, we investigate the performance of types of weighted citation networks for detecting emerging research fronts by a comparative study. Some types of citation networks, such as direct citation, co-citation and bibliographic citation, were tested in some research domains like complex networks. In this paper, some types of citation networks were constructed for each research domain, and the papers in those domains were divided into clusters to detect the research front. Additionally, we employ some measures for evaluating the research fronts to weighted citation networks. For instance, average publication years and similarities of keywords are effective measures to detect research fronts. By introducing these measures as weights of citation networks to the citation network, we can detect research fronts and promising fields compared with the non-weighted citation networks. We perform a comparative study to investigate the performance of types of weighted citation networks for detecting emerging research fields. Especially, we evaluate the performance of each type of weighted citation network in detecting a research front by using the following measures of papers in the cluster: visibility, measured by normalized cluster size, speed, topological relevance, and density.

TD-06.2 [R] The Assessment and Management of a Kuhnian Paradigm Shift for the Successful Application of Breakthrough Technologies

Dietmar H Winzker; University of Pretoria, South Africa
Leon Pretorius; University of Pretoria, South Africa

There are many examples of technology projects or processes which failed or were delayed by years due to professionals holding onto to a universally accepted paradigm which had now been superseded based on new insights and developments. Although a universally accepted scientific theory or technology may in hindsight be obviously flawed, it is usually extremely difficult to promote and get acceptance of the breakthrough technology based on a new paradigm. A conservative attitude under such circumstances may have its merits initially, but delays in progress of revolutionary technologies are wasteful and possibly even irresponsible. The type of technology paradigm shift under consideration in the context of this paper is comparable to a Kuhnian scientific revolution (Thomas Kuhn). However, it is surmised that an emerging revolutionary technology requires a very similar approach to scientific paradigm shifts as these too are often initially ridiculed, ignored and rejected, which can push the technology discipline into crisis. Managing emerging technologies which can lead to a breakthrough technology such as in nano-, bio-, medical and engineering technologies require a special and a long, persistent scientifically and morally correct approach, if new technology based paradigm shifts must find universal acceptance. The task contains many challenges and uncertainties but will eventually be overcome by the passage of time, strategic thinking and rigorous and broad academic investigation. Research shows that such universal paradigm shifts could be accelerated by the application of certain fundamentals and sound management practices. It is thus considered essential for practitioners in emerging technologies to be aware and enabled to manage such situations, as rare as their occurrence may be in their specific discipline. An exploratory research method is followed in this paper using bibliometric data where it is appropriate to address some relationships between technology processes and paradigm shifts.

TD-06.3 [R] Customer Understanding and Communication in New Technology and Research Services: An Empirical Study from Life Science Companies

Kirsi K Polvinen; Aalto University, Finland
Anne-Sisko Patana; Aalto University, Finland
Laura Kanto; Aalto University, Finland
Jussi Pihlajamaa; Aalto University, Finland
Pekka Berg; Aalto University, Finland

This paper explores customer understanding and communication between drug developing biotechnology companies as customers and technology and research services providing companies in business-to-business (b-to-b) context. New services are needed when research is increasingly outsourced from pharmaceutical companies to service providers. Challenges in the development of customer understanding and communication are highlighted in the paper, taking different phases of drug development process and pharmaceutical company's size into consideration. Qualitative face-to-face interviews and literature review were used as research methods. Two service provider representatives and four representatives from small- or medium-sized drug developing biotechnology companies were involved in the study. This paper reveals that deeper partnership-like relationships could be possible, especially in the early phases of the drug development process, if communication works well and trust is created. Discussions related to offering and customer needs are not always clear enough, and communication about the meaning of the results is often deficient. All this would be extremely important while fruitful communication deepens the customer relationship, creates trust and enables long-term relationships. Further study is needed, especially about promoting and preventing factors for creation of trust and open communication.

TD-07 Technology Marketing - 2
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Beluga
Chair(s) J. Michael Munson; Santa Clara University

TD-07.1 [R] Software Product Line Market Repositioning: The Power of Functional Groups

Samuel A Ajila; Carleton University, Canada

This is a longitudinal study of change process as it applies to software product line evolution. The objective is to study and describe changes in a software product line that occurred after the top management team of a supplier of hardware and software for telecommunication equipment decided to change the target market for its software intensive telecommunication products as a result of market decline. This company has a proven record of innovation and technological breakthroughs and has offices in Europe, North America, Africa, and Asia. The study is divided into three phases. The next phase in this study is to look at the relationships between functional groups and to try and answer the question: Does the power of functional groups closest to the customer increase during sales declines? The analysis of the data available to us shows that functional groups that were closer to the customers increase their relative size; groups located in remote sites decrease in size faster than the groups with similar skills located at the company's headquarters; and groups that were more involved in developing products and have specialized skills decreased in

relative size. Our final analysis shows that the power of functional groups that interact most frequently with customers increases while the power of functional groups that interact the least with customers decreases.

TD-07.2 [R] Factors Influencing the Purchase Intention of Online Group Buying in Taiwan

Yi-Chih Lee; Ching Yun University, Taiwan
Wei-Li Wu; Ching Yun University, Taiwan

Online group buying is a popular e-business in Taiwan and represents a trend that has seen incredible growth throughout 2011. The Market Intelligence and Consulting Institute (MIC) reported that Taiwan's online group buying market spent 170 million New Taiwan Dollars (NTD) in January 2011. Each average spend was 300NTD and the discounted price could be up to 66 percent. This study looks at the consumer traits, trust and internet usage to investigate the behavioral influences on online group buying. Data was collected from 132 buyers in an online group buying marketplace in Taiwan. The results reveal that consumers with different trust and internet usage have different purchase intentions.

TD-07.3 [R] Why Don't Satisfied Consumers Show Reuse Behavior? The Context of Online Games

Fang-Mei Tseng; Yuan Ze University , Taiwan
Chiu-Yen Wang; Yuan Ze University, Taiwan

Empirical studies have consistently identified consumer satisfaction as a key antecedent to reuse behavior. Business has focused on consumer satisfaction as a way to improve consumer loyalty. However, it remains unknown why there are so many satisfied consumers who do not show reuse behavior. Therefore, the present study examined the potential factors moderating the association between consumer satisfaction and reuse behavior. A literature review and focus groups were used to explore moderating variables, and hierarchical regression analysis was used to test their influence. The results showed that the relationship between consumer satisfaction and actual reuse behavior is contingent upon the moderating effects of customer involvement and corporate activities. In particular, the relationship between consumer satisfaction and actual reuse behavior is more sensitive when customer involvement is lower.

TD-08 Technology Management in Services - 3
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Parksville
Chair(s) Louwrence D Erasmus; University of Pretoria

TD-08.1 [R] Technology Management and the Performance of Small and Medium Enterprises in the Consulting Engineering Industry in South Africa

Andre van der Walt; University of Pretoria, South Africa
Andre J Buys; University of Pretoria, South Africa

This paper reports on a research study focusing on the influence of innovation and strategic tools in the performance of small and medium enterprises in the consulting engineering industry in South Africa. The study consisted of a Delphi survey aimed at providing clarity on the following two aspects. Firstly, the variables best defining performance in this industry were ranked by a panel of experts. Secondly, by applying this common understanding of performance, the factors influencing the performance in the industry were ranked in terms of importance. Aspects such as engineering expertise, resource availability, innovation and strategic management tool usage were specifically included in the factors considered. This was done to gain a better understanding of the deemed importance of these technology management aspects in this industry.

TD-08.2 [R] The Effects of Market and Service-Orientation on the Success of Solution Providers in the German Manufacturing Sector

Kai-Ingo Voigt; University of Erlangen-Nuremberg, Germany
Andreas Wassmus; University of Erlangen-Nuremberg, Germany
Christian V Baccarella; University of Erlangen-Nuremberg, Germany
Sebastian Engel; University of Erlangen-Nuremberg, Germany

As a central aspect of the marketing concept is market orientation. However, the concept has been criticized, e.g. by pointing out that market orientation mainly concentrates on customer-focused activities, rather than on competitor-focused activities, what indicates towards an individualized product with high customer involvement. Especially in the manufacturing industry individualization in regard of a combination of products and services offers a huge differentiation factor. There has been a debate about the need for a shift from a product-centric view towards a service-dominant perspective. Hence, the concept of market-orientation has to be evaluated against this background. In addition, the authors argue that service-orientation has to be integrated in the concept, because of the growing importance especially for so-called solution provides with a focus on product/service-combinations. This study analyzes 173 companies in the German manufacturing industry to measure the effects of market- and service-orientation. In addition, we widened the well-known scale of Narver and Slater [57] including service-orientation. The results show that some aspects of market orientation can explain success of services. However, service-orientation seems not to have an effect on the success of new products, whereas implicit success factors of services a highly effected.

TD-09 New Product Development - 1
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Port Hardy
Chair(s) Antonie J Jetter; Portland State University

TD-09.1 [R] Scenario Based Development of Robust Product Architectures

Günther Schuh; RWTH Aachen University, Germany
Michael Schiffer; RWTH Aachen University, Germany
Jens Arnoscht; RWTH Aachen University, Germany

Today many companies develop modular product architectures to face the challenge of maintaining a high degree of differentiation whilst reducing costs through economies of scale. To achieve the latter, the number of variants and product generations based on one architecture has increased significantly. This brings new challenges to the development process, especially when handling emerging technologies in dynamic markets. Expected changes in future product generations have to be anticipated when designing the architecture to cope with increased architecture lifetimes and minimize modification efforts. A recent survey states that a high robustness of planning is a success factor when designing modular product architectures. Nevertheless, most firms do not use the required tools in the early design stages to increase this robustness. Current research approaches for designing modular product architectures are mainly based on static requirements and thereby also neglect the dynamics of the market. This paper presents a process model utilizing scenario planning in the design process of modular product architectures to minimize the modification efforts during the lifetime of a product architecture. The impact of the anticipated changes on the architecture is designed using a network analysis approach to identify critical architecture elements.

TD-09.2 [R] Fuzzy Cognitive Maps to Implement Corporate Social Responsibility in Product Planning: A Novel Approach

Richard Sperry; Portland State University, United States
Antonie J Jetter; Portland State University, United States

Product development can support proactive corporate social responsibility (CSR) strategies by changing product features, materials, and processes in order to reduce or even eliminate negative environmental and social impacts. However, the CSR literature provides little practical guidance for new product development, but promotes general principles for responding to environmental and social issues. One of these guiding principles is the concept of stakeholder engagement, but to date, few practical approaches for integrating stakeholder views and needs into product development exist. To address this gap, the paper discusses the use of fuzzy cognitive map modeling. The method, which has been

applied in participatory stakeholder studies and in product development before, but never in conjunction, helps product planners to understand and assess stakeholder needs and to select product concepts that respond to them. It thus allows organizations to remain true to their CSR strategies.

TD-09.3 [R] Exploring New Product Development Decisions and Risk Tolerance in Complex Environments

Kyle Oyama; University of Virginia, United States

Managing the search for innovative new products is commonly regarded as a key source of competitive advantage, especially in complex new product development (NPD) environments. At the same time, Kauffman's NK model of complexity has gained growing acceptance in the management science literature as a means to model complex decision processes, such as NPD, in which there are conflicting constraints that often lead organizations to arrive at locally optimal decisions. Previous articles employing the NK model have assumed 1) that organizations can explore possible innovations with perfect knowledge (at no cost) before committing resources to an implementation and 2) that organizations only implement changes that result in higher levels of fitness. Little is known about how relaxing these somewhat unrealistic assumptions may affect the search for innovative new products. This article begins a systematic exploration of how varying degrees of risk tolerance affect overall performance of the innovation search process. The primary contributions of this paper are 1) to cast and synthesize the challenge of innovation management in the context of complexity science, 2) to introduce a model of innovation search, incorporating risk tolerance and cost-performance tradeoff measures, and 3) to report results observed from the model and discuss possible implications for the management of innovation.

TD-09.4 [A] Dynamic Thinking Process Model of High-Tech New Material Product Development

Hideki Hayashida; Osaka University , Japan
Hiroshi Katayama-Yoshida; Osaka University, Japan

This paper is a part of our attempt to build an information dynamic process model for high-tech new material product development and new business development. New material product developments in chemical companies are indispensable to keep sustainable competitiveness globally. New materials are used to embody new high-tech technology. With regard to innovation management as new material product development, the funnel model is in use as a new business development project process management tool in firms and organizations. However, it is difficult for management to understand new product development project leaders (NBDPL)/ innovators thoughts. For this reason, management might not have enough support at the appropriate timing for innovators and what they really support. We investigated to explain the dynamic process of innovator's thoughts from product concept to be launched a new business. During the product development process, innovators keep a regular hexahedron perspective mental tool model, technology, market, cost, intellectual property, human resource, and design. Although main focus thinking is different according to the proceeding project development stage, it is found that NBDPL/innovators keep the hexahedron model that always is recognized toward project commercialization.

TD-10 Telecommunication Industry
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Port McNeill
Chair(s) Moonjung Choi; KISTEP

TD-10.1 [R] Case Study: Assessing and Evaluating the Readiness of the ICT Infrastructure to Provide E-Government Services at a Local Government Level in South Africa

Matome D Monyepao; University of Pretoria, South Africa
Richard V Weeks; University of Pretoria, South Africa

This case study seeks to understand the challenges experienced by municipalities in providing e-government services. It essentially entails a literature study and a narrative inquiry, to provide insight into and knowledge of e-government services delivery at a local government level. The study focuses on existing research evidence and on the latest developments within e-government studies, to reveal the challenges experienced in local government service delivery. The case study assessed and evaluated the readiness of ICT infrastructure to provide e-government services through local government in South Africa, and focused on all the municipalities in Gauteng Province. The case study has revealed that municipalities lack the drive to provide e-government services; there is no policy that drives e-government services. The results also show that there is no comprehensive strategic plan to provide e-government services in the municipalities. The view of most municipalities is that e-government services are a luxury. Most of the municipalities still use traditional, manual methods to provide services to the communities. The research echoes the conclusions of Moon that the lack of technical personnel and inadequate financial capacity are seen to be major barriers to the development of e-government in many municipalities.

TD-10.2 [A] Using Nagios as a Groundwork for Developing a Better Network Monitoring System

Chavee Issariyapat; NECTEC, Thailand
Panita Pongpaibool; NECTEC, Thailand
Sophon Mongkolluksamee; NECTEC, Thailand

Due to the complexity of networks and the inadequacy of existing open-source software features, network administrators usually have to integrate several tools to build up the monitoring environments that meet their requirements. Nagios is one of those tools that has been widely used by experienced network administrators. Because of the flexible modular architecture, Nagios allows users to develop custom modules to enhance the system functionality in many different ways. In this paper, we propose the conceptual design of the seamless integration of Nagios as a core of the new feature-rich monitoring system. Our new system is integrated with a more interactive and friendly user interface, while providing much more in-depth information about the network. Most importantly, all of this can be achieved without modifying any single line of Nagios source code.

TD-10.3 [R] Data MVNO's Cost-based Pricing in Korea

Byung Woon Kim; UST / ETRI, Korea, South
Chang Yeol Ko; KICII, Korea, South
Sun A Kang; Chungnam National University, Korea, South

This study defines the prepaid MVNO type that applies the 3G telecommunication facilities and Article 38, Telecommunications Business Act (wholesale provisioning of the telecommunication service, also known as the MVNO Act). In addition, the cost of 3G telecommunication facilities will be separated into voice cost and data cost, before calculating the data cost. The cost-based wholesale data price will be calculated for each prepaid MVNO type, and policy implications will be presented. The Korea Communications Commission newly enacted the MVNO Act in 2010, which regulates the wholesale price of voice calls by the retail-minus method. As a result, MVNO is very limited in the diverse and innovative business model such as convergence services, enterprises utilization of mobile communication, and MtoM. This study will provide useful data for policy-makers preparing policies regarding data cost, wholesale price, interconnection, MVNO, mVoIP, prepay, and network neutrality, as well as for enterprises that seek to participate in various business models.

TD-10.4 [R] Spectrum Pricing Model for Mobile Telecommunications Services in Korea

Jungeun Ku; ETRI, Korea, South
Sang-Woo Lee; ETRI, Korea, South

In this paper, we propose the spectrum pricing model based on the notion of marginal value and estimate the spectrum value for 800 MHz spectrum bandwidths for the cellular Korean mobile telecommunications markets in Korea. The goal of this study is to develop a spectrum pricing model for estimating the spectrum price for the Korean spectrum situation and then to obtain spectrum pricing for 800 MHz bands as a case study. The study developed a new valuation approach that is suited for the Korean telecommunication situa-

tion and estimated the spectrum value of the 800 MHz spectrum. The research implication is that the spectrum value of 800 MHz is approximately US $285 billion, which is higher than is generally thought when spectrum usage fees are considered: approximately US $1 trillion. The second implication is that the result of spectrum value in 800 MHz is similar to the 900MHz result that was estimated by Ofcom in 2005. Although a market mechanism is likely to promote the increased efficiency of spectrum management, implementing a market mechanism is not a simple issue. By implementing one, other economic and non-economic effects result. These effects were not considered in this paper and still need to be studied comprehensively. Implications and avenues for future research are discussed at the conclusion of this paper.

TD-11 Collaborations in Technology Management - 2
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Port Alberni
Chair(s) Robert Dryden; Portland State University

TD-11.1 [R] Tacit Knowledge Transfer through Co-activation: A Case Study of Design and Support by an Electronics Manufacturing Service Firm

Yoshihisa Segawa; Sanmina-SCI Systems Japan, Ltd., Japan
Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan

This paper examines tacit knowledge transfer for competitive advantage. In a usual outsourcing business from the customer to the electronics manufacturing service (EMS) firm, only explicit knowledge is exchanged and know-how is transferred from the customer to the EMS firm. However, in the case of the successful EMS firm, there was a case that the tacit knowledge including know-how was reversely transferred from the firm to the customer. Requirements of the customer stimulate inactive tacit knowledge of the firm from the production engineering (PE) points of view, which leads to the suggestion to be made to the customer. This activates the related tacit knowledge on the customer side and yields improved design by the customer to match the PE to maximize quality and productivity in volume production in the EMS firm. In this case, two kinds of tacit knowledge existing in both parties are activated separately by exchange of explicit knowledge. This co-activation process practically achieves tacit knowledge transfer. Tacit knowledge activated and transferred through this co-activation mechanism complements the gap of knowledge existing between the design of new products on the customer side and PE on the firm side, and can be a source of competitive advantage for the both parties.

TD-11.2 [R] Exploring Critical Factors of Developing Cross Sectoral Intermediaries of Regional Innovation Systems: A Case Study of Central Taiwan Industrial Cluster

Bih-Huang Jin; Tung Hai University, Taiwan
Chien-Tzu Tsai; Feng Chia University, Taiwan
Chun-Mao Chan; Tunghai University, Taiwan
Chih-Yun Wu; Tung Hai University, Taiwan

Taiwan has been recognized worldwide for its outstanding industrial clusters. According to the Global Competitiveness Report published by the World Economic Forum, Taiwan has topped the world in terms of the index of state of cluster development for several years. The famous clusters in Taiwan include the electronics clusters in the northern Taiwan, precision machinery clusters in the central Taiwan, and optoelectronics clusters in the Tanzi-county. The different sectoral actors in clusters may interact through various intermediate platforms to foster their innovation. Inter-organizational collaboration within the same industry has been widely discussed in the past research; however, little attention was paid on the intermediation for interdisciplinary collaboration. This paper investigates the critical factors of developing a cross domain intermediary that can help industries to construct the interdisciplinary innovation platform. Based on the classification from literature reviews, the critical factors for effective innovation intermediaries in the sectoral systems are collected. And then the European and American experiences extracted from past research, together with field studies of Taiwan's industrial clusters, help to form a comprehensive framework to point out how the interdisciplinary intermediaries can foster the regional innovation. This study also provides some advice for successful interactions between actors in the regional innovation systems. The current result could be useful for researchers and practitioners to enhance their understanding of innovation intermediaries and to construct a better mechanism for the regional innovation.

TD-11.3 [R] A Comprehensive Evaluation of Determinants in Collaborative R&D Partner Selection of Small Businesses in Taiwan

Yu-Lien Tai; Industrial Technology Research Institute, Taiwan
Junzo Watada; Waseda University, Japan
Hsiu Hsien Su; Industrial Technology Research Institute, Taiwan

Despite the increasing number of firms committed to R&D strategic alliances over the past few decades, a large number of alliances have failed because of the incompatibility of the partners. The purpose of this study is to evaluate comprehensively the determinants, particularly for small- and medium-sized enterprises (SMEs) that affect collaborative R&D partner selection. In this study, a two-stage Fuzzy multi-criteria decision making approach (FMCDM), combined with the Fuzzy Delphi Method (FDM) and Fuzzy Analytical Hierarchical Processing (FAHP) was adopted. Two sets of experts were chosen from the SME Technology-Intensive Clustering Assistance (TICA) project to participate in the research study. In this study, we discovered that two contributions to the selection of collaborative R&D partners among SMEs lead to the successful formation of R&D alliances. First, we provide a framework for solving the problem of multiple-criteria decision making in the process of selecting collaborative R&D partners among small firms. Second, we comprehensively evaluate the determinants that influence the success of the collaborative R&D partner selection process (particularly for SMEs) in the future.

TD-12 Intellectual Property - 2
Tuesday, 7/31/2012, 14:00 - 15:30
Room: Azure
Chair(s) Sul Kassicieh; University of New Mexico

TD-12.1 [R] Technology Licensing under Coopetition

Minsuk Suh; Hanyang University, Korea, South

Technology license markets play important roles as the intermediaries which connect technology licensors and licensees in the fast-changing and technology-oriented business environment. We consider a technology licensing problem by focusing on the competition and the cooperation under license contract between a technology licensor and multiple licensees. By agreeing on the license contract, both parties put themselves into a competition while licensees pay license fees for the licensor's technology. We model the coopetition where the licensor competes and cooperates with licensees under the license contract. We show that the coopetition between licensor and licensees leads to a unique Nash equilibrium in pricing game. We consider market conditions under which the technology licensing is attractive to both parties. We find that the market size growth plays a cardinal role in attracting both licensor and licensees to the technology licensing and that there exist the conditions under which the licensor decides not to practice the technology for its own business.

TD-12.2 [R] Exploring the Key Success Factors for Partner Selection of Intellectual Property Services Industry

Cheng-Wei Chang; National Chung-Hsing University, Taiwan
Ta-Jung Lu; National Chung-Hsing University, Taiwan

Intellectual property rights (IPRs), which used to be an unfamiliar element for businesses, have gradually become an important operation. Firms are increasingly looking beyond their intellectual property (IP) and legal departments for patent intermediaries to manage their key IP issues. Even for small and medium sized enterprises (SMEs), IP management plays a crucial role. However, SMEs are run on limited resources and the management of IP assets is a complex task, and few managers have the expertise as it generally requires a combination of legal, technical and business knowledge. In response to this situation, an IP

service industry has emerged in recent years. However, there were cognitive and service gap between service provider and customer. The purpose of this paper is to explore the key success factors (KSFs) critical to the IP service industry. First, factors affecting the success of IP service providers have been found. Second, the factors were verified by interviews with practitioners of IP service provider. Then, a questionnaire was designed and sent to the IP service customers. The results show that technology understanding, the technical professional staff, practical experience on IPRs infringement litigation, understanding the market traits of industries, accurate interpretation of market trends, provide real-time IP information, provide IP deployment strategy and provide customized IP services are the top eight KSFs demanded by the customers. The KSFs from customer perspective identified by this study will help IP service providers to enhance their competitive advantage and can be used as potential directions to offer customer-oriented services.

TD-12.3 [R] Intellectual Property Audit for Efficient Intellectual Property Management of an Organisation

Gouri A Gargate; IIT Bombay, India
Karuna Jain; IITBombay, India

Intellectual property (IP), as a key intellectual asset of an organization, empowers the organization to collect the complete value of its intellectual input. In this era of rapidly changing IP regimes, it is the need of time to identify and efficiently utilize intellectual assets owned by an organization. Hence it has now become a prerequisite for organizations to develop the expertise and capability not only to create IP through R&D, but also to manage the same. Intellectual property management (IPM) is a multifaceted discipline concerned with IP generation, protection, and exploitation catering to fast-changing market demands across the globe. This basically deals with the policy formulation, designing the strategies for acquiring, protecting and exploiting the technology developed. The first step to develop an effective IPM system is IP audit. A systematic approach of IP audit assesses overall intangibles generated, maintained and exploited by an organization. Therefore, a thoughtful and methodical approach for IP audit is the need. The objective of this paper is to develop an approach for conducting IP audit. The paper proposes effective ways of enlisting huge and varied intangible properties owned by an organization. This will help the organization to strengthen the IPM. The nature of the research is exploratory. The method adapted for study is a combination of literature survey, expert opinion and case study.

TE-01 Technology Planning - 1
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Pavilion Ballroom A
Chair(s) Steven Walsh; University of New Mexico

TE-01.1 [R] Serviceability Based Investment to Power System

Junzo Watada; Waseda University, Japan

Recently, power-supply failures have caused major social losses. Therefore, power-supply systems need to be discussed from various points of view. The objective of this study is to present a concept of serviceability in investment to a power system. In this study, the serviceability is interpreted from the reliability and risks of units, which are evaluated with a variance-covariance matrix, and the effects and expenses of replacement are analyzed. The mean-variance analysis is formulated as a mathematical program with the following two objectives: 1) to maximize the serviceability, that is, minimize the risk and 2) to maximize the expected return. Finally, a structural learning model of a mutual connection neural network is proposed to solve these problems defined by mixed-integer quadratic programming, and employed in the mean-variance analysis after proving its convergence. Our method is applied to a power system network in a certain urban area. This method enables us to select results more effectively and enhance decision making. In other words, decision-makers can select the investment rate and serviceability of each ward within a given total budget.

TE-01.2 [A] Characteristics of 4th Korean Technology Foresight

Moonjung Choi; KISTEP, Korea, South
Han-Lim Choi; KISTEP, Korea, South
Heyoung Yang; KISTEP, Korea, South
Hyun Yim; KISTEP, Korea, South

Korea is conducting the fourth technology foresight (TF) in the prospect of future Korean society up to the year 2035. The 4th TF is characterized by several features. Network analysis was used to discover the future issues and the new frame was developed to find the future needs. The future technologies were decided in the consideration of S&T development as well as the future needs. Delphi survey was performed about more than 600 future technologies to examine realization time, strategic importance, realization measures, etc. The result of Delphi survey was analyzed from various perspectives including S&T fields, social issues such as environmental pollution, etc. In addition, strategically important future technologies were selected by using portfolio analysis and scenario about future places such as home, hospital, rural areas, etc., was written. The result of TF will be used for establishing S&T Basic Plan.

TE-01.3 [R] Technological Foresight Model for the Identification of Business Opportunities (TEFMIBO)

Marlon G Romero Rivera; Tecnológico de Monterrey, Mexico
David Guemes-Castorena ; Tecnologico de Monterrey, Mexico
Amado Villarreal-Gonzalez; ITESM EGAP, Mexico

The objective of this study is to provide a support tool for managers to craft a decision to route the future of their business. As an initial part of this paper we propose two studies: 1) trends analysis and 2) change drivers' identification; these let us know exactly what the relevant trends are in areas where we want to venture that may affect the business activities. All this information is put into a Delphi process with the help of experts in order to find the common denominator of where the future is going; afterwards, with this information we can build events and scenarios for the business opportunities. Then, a diagnostic of the study area, sector or organization through the dynamic diagnostic methods is performed. Once the opportunities have been identified, a strategic analysis that allows decision making to prioritize and define the activities or projects that may be achievable in the future is done, and the result of the process is a portfolio of business opportunities projects fully defined and ready to be planned with a roadmap where the complete path is drawn. The process allows the managers to consistently organize their development processes targeted to real business opportunities.

TE-02 Technology Management in the Energy Sector - 4
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Pavilion Ballroom B
Chair(s) Ryan T Fedie; Bonneville Power Administration

TE-02.1 [R] Differences in Adoption Factors of Photovoltaic Power Systems between Businesses and Families in Taiwan

Chiung-Wen Hsu; Feng Chia University, Taiwan
Pao-Long Chang; Feng Chia University, Taiwan
Ya-Chun Chou; Feng Chia University, Taiwan

In response to environmental issues plaguing humankind today, countries all over the world are in the process of actively and continuously implementing many policy measures to promote applications of renewable energy. Among these, solar photovoltaic power is currently the most commonly applied renewable energy technology all over the world. Therefore, the key factors driving the installation of solar photovoltaic power generating systems have become important subjects for consideration while drafting policies. The main purpose of this study is to construct a model comprising the key factors involved in the adoption of a photovoltaic power generating system for businesses and families in Taiwan. We used a specially devised questionnaire for data collection, and chose users who have installed such a system as assessment respondents. The adoption factors contained four aspects product, environmental, installation, and government and there were 13 factors in total, including system costs, installation space, feed-in tariff prices, laws and regulations, etc. We con-

ducted a pairwise comparison and assessment of the importance of each factor for 10 businesses and 10 families that had adopted the photovoltaic power generating system. After quantifying it, we calculated the relative weight and ranked them in order to assess the priority among the key factors. The results showed that the key prioritized adoption factors were different between businesses and families. For instance, laws and regulations were a priority factor for businesses. However, for family users, this factor ranked last in their list of global weights. For families, system cost was a crucial factor, but it did not appear within the top five adoption factors for businesses. This led us to propose a set of suggestions customized for these two sets of users aimed towards promoting the application of the technology on a large scale throughout Taiwan.

TE-02.2 [R] Analyzing the Emerging Offshore Wind Power Market Technologies

Matti Karvonen; Lappeenranta University of Technology, Finland
Matti Lehtovaara; Lappeenranta University of Technology, Finland
Rahul Kapoor; Lappeenranta University of Technology, Finland
Tuomo Kässi; Lappeenranta University of Technology, Finland
Juha Pyrhönen; Lappeenranta University of Technology, Finland

The complex interaction between science and technology provide a great need to forecast emerging technologies and tools for strategic R&D management. In the case of emerging technologies, science and patent indicators have been used on the forecasting studies. This paper aims to analyze the development of wind energy technologies. Research material is based on the patents and financial data of the leading offshore wind industry actors. In this paper, we firstly define the most interesting wind energy technologies based on a literature review, expert analysis, and patent data. The future of selected technologies is further analyzed utilizing the patent citation data from the four leading actors in the offshore wind energy markets. The preliminary results of the analysis reveal quite a big difference in the patenting activity between the actors. The results reveal that the emerging industry is in the growing stage of the evolution.

TE-02.3 [A] Structuring Key Support Measures for Taiwan's Renewable Energy Development Policy

Yu-Jing Chiu; Chung Yuan Christian University, Taiwan
Chung-Wei Li; Chung Yuan Christian University, Taiwan

Most fields that are related to the management of technology experience uncertainty, and this is especially true in the planning phase of the policy related to the development of emerging technologies. In planning the policy for such a major development, committees must take into account all of the main support measures. In Taiwan, thermal and nuclear power generation are the main sources of power. However, Taiwan lacks natural resources and must import most of the coal and natural gas it uses to generate power from foreign sources. The Taiwanese government plans to develop a renewable energy industry, but, if too many support measures are considered, the policy will not be feasible. In fact, most of the support measures demonstrate interactive relationships, and it is very important to know the structure of these support measures so that the appropriate research can be planned and conducted. We reviewed and discussed this issue with experts in the Department of Energy, and, based on their input, we decided to use social network analysis (SNA) and the maximum mean de-entropy (MMDE) algorithm to achieve this purpose in this paper. We sought to use the interrelationships between the support measures to plan the policy for the development of renewable energy in Taiwan. It is our hope that the structure will be useful in planning feasible alternatives and that our method can be used for other policy-planning purposes.

TE-03 Sustainability - 2
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Pavilion Ballroom C
Chair(s) Chien-Chiang Lin; Shih Hsin University

TE-03.1 [R] Sustainability in Technology-Driven Business Environments: A Company-Level Approach

Bernd P Platzek; University of Pretoria, Germany
Leon Pretorius; University of Pretoria, South Africa
Dietmar H Winzker; University of Pretoria, South Africa

A vital entrepreneurial learning organization (VELO) has to 1) collect and interpret meaningful information from the business environment, 2) take entrepreneurial decisions in established and new businesses, and 3) design the organizational architecture to pursue business opportunities. A systems approach was developed for a VELO and is presented in this paper. The VELO has to perform these three basic entrepreneurial tasks in interaction with a dynamic and complex global business environment. This requires exploring the future, predicting technology developments and preparing for the unknown. Developing visions of the future and linking the foresight to entrepreneurial decision-making is a big challenge in today's global economy. Global sustainable development is a widely accepted vision in today's world. Despite of the practical problems, this vision gives future direction for emerging technologies and changes in social, economic and ecological dimensions. The view on the global challenge of a sustainable development shows enterprises' opportunities to achieve and sustain vitality at the company-level: The VELO can contribute to a global sustainable development via innovation in new and established businesses to maintain their own competitiveness, reputation and economic substance. The paper describes global and company-level perspectives on sustainability and business opportunities as well as the interaction between the VELO and the global business environment. The research method is exploratory using literature data and Vester's sensitivity analysis methodology to present a set of variables and an influence matrix to describe the networking between the VELO and its environment as a total system.

TE-03.2 [R] Barriers and Drivers in Creating Greener Plastic Toys: A Technology Management Methodology

Maibritt Falk Jensen; AU Herning, Denmark
Helle Liltorp; AU Herning, Denmark
Torben Tambo; Aarhus University, Denmark

Given materials scarcity and drive for greener consumer products, marketers strive for redesigning products and realigning supply chains to accomplish these challenges. Plastic toys impose a complicated challenge as entertainment value, product safety, durability, globalization, cost, and environmental concerns all meet at the designer's desk. Idealistic eco-oriented frameworks such as cradle-to-cradle (C2C) and design-for-disassembly (D4D) suggest inspiration for technical developers and material specialists. This study employs a mixed qualitative and quantitative method to analyze the adequacy and completeness of the product portfolio at bill-of-material level in parallel to field test of disassembly characteristics. Among the findings are that globalized manufacturing might lead to different and conflicting product properties in respect to end-life management. Interesting findings furthermore point to potential shortcomings in reverse logistics, a tendency to down-cycle valuable products more than necessary, and a risk of loss of control of reclaimed products in the downstream supply chain. The study suggests an eco-design-inspired framework for improving the marketers' understanding and planning of greening of the product portfolio based on management of the individual technologies of creative design, mold design, polymers, and supply chain. The study is conducted within plastic toys, but results are applicable to a wide range of durable consumer products.

TE-03.3 [R] A Research of Process Innovation with a Focus on Sustainable Hygienic Tissue Paper Production Case

Ali Sertac Yilmaz; Bogazici University, Turkey
Nuri Basoglu; Bogazici University, Turkey

Hygienic tissue paper category refers to a wide range of products of which each one is formed with various processes from the first step of production through delivery to the end-user. This paper focuses on possible process and mini-product development innovations acknowledging foremost end-user insights along with improving environmental qual-

ity standards and production technologies. Resulting from changing perceptions and the tendency towards environmental and sustainable approaches, in particular in production processes, it is known that end-user insight and innovation have gained more significance. The main purpose of this paper is to analyze how these technological and sustainability innovations can be reflected in product development and production processes. Technological and strategic details of achieving innovation, sustainability and high consumer satisfaction in hygienic tissue paper products will be further investigated with the analysis conducted by the data comprised from experienced managers. Questionnaires are applied to the participants in order to investigate the correlation between innovation and sustainability concept. Results will be used to canvass market needs, end-user insight and whether present products satisfy these demands in order to investigate possible processes. This paper researches sustainability, innovation and all related topics of one of the most important hygienic tissue paper producers in Turkey.

TE-03.4 [R] Strategic 5Ps and Their IT Based Service Business Model for Corporate Sustainability

Daisuke Sugiyama; JAIST, Japan
Kunio Shirahada; JAIST, Japan
Michitaka Kosaka; JAIST, Japan

This paper proposes a sustainable service-oriented business model focusing on social capital. In a highly servitized economy, companies need to transform their businesses to more service-centric ones and create social capital with customers to sustain their businesses. We focus on two businesses (a perception support service and a food and beverage service) that make relationships with customers closer through service value co-creation. As a result of longitudinal case studies about their service business strategies, we found the following five strategic elements for corporate sustainability: (i) product: the physical elements that provide functional values to customers; (ii) place: the environmental elements, such as shops, buildings, and equipment, that facilitate contact points with customers; (iii) people: the human elements that improve value-in-use by co-creation with customers; (iv) perspective: the worldview that organically integrates corporate internal and external resources; and (v) program: the service processes that build and promote social capital between customers and employees. This paper proposes the sustainable service-oriented business model based on IT that combines the five elements effectively and also considers compatibility with manufacturing companies.

TE-04 Decision Making - 2

Tuesday, 7/31/2012, 16:00 - 17:30
Room: Pavilion Ballroom D
Chair(s) Bing Wang; Beijing University of Posts & Telecommunications

TE-04.1 [R] Emergence of Web Technology: An Implementation of Web Accessibility Design in Organizations

Christophe Perrenoud; Portland State University, United States
Kenny Phan; Portland State University, United States

This paper introduces an awareness of web accessibility for an organization's end user needs. The functionality of the Internet must be implemented to accommodate audiences with disabilities and disseminate the attributes of web technology used to meet the Americans with Disabilities Act (ADA) Restoration Act of 1998 and the 21st Century and Video Accessibility Act passed by President Obama in 2008. An evaluation of the roles of the emerging web technology has been investigated for web accessibility, but this paper will explore further how web technology functions can enhance accessibility for audiences with disabilities. Multiple web technologies are identified to aid audiences with disabilities. Several attributes related to web accessibility are also identified. Finally, this paper presents a framework for how to select the appropriate web technology to aid audiences with disabilities.

TE-04.2 [A] Choosing Career Paths: The Outputs of VTASI Teams

C. M Chang; State University of New York at Buffalo, United States

Young people in high schools and colleges make critical decisions regarding what to study and which career path to pursue. For various reasons, many of them end up switching to other majors. Such changes are wasteful in time and resources and they produce emotional and economical stresses. Literature is full of references which outline the view of professional adults (e.g., researchers, teachers, governmental personnel, and others) regarding factors affecting such changes. Not much is known how this career selection and switching problem is seen by young people who had just gone through such a process and how this selection process could be further improved in their views. At State University of New York at Buffalo, we engaged 52 graduate students during the academic year 2010 - 2011 to brainstorm this problem. The students formed 10 virtual teams with anonymity and structured interactions (VTASIs). In these teams, participants remain anonymous, follow a modified Delphi brain-storming process, communicate with one another asynchronously via electronic means, apply a set of DeepThink idea generation strategies to think creatively, and conduct multiple rounds of structured interactions, under the guidance of a knowledgeable team leader, to produce increasingly novel ideas. The DeepThink idea generation strategies rely on nine sets of inquisitive questions to induce inquiry from a variety of perspectives. Both the DeepThink methodologies and the major characteristics of VTASI teams had been reported elsewhere [1]. This study is noteworthy in that all participants have recently gone through the process of selecting their respective career paths and are thus intimately familiar with the project topic at hand. Because many of them decided to study different engineering disciplines and came from diverse cultural backgrounds, their outputs are insightful. Key approaches to facilitate the selection of career paths are presented. The advantages of applying VTASI teams to generate new ideas for any project are summarized. Conclusions are offered.

TE-04.3 [R] Design of a Decision Support System for Site Selection Using Fuzzy AHP: A Case Study of Solar Power Plant in North Eastern Parts of Thailand

Athakorn Kengpol; King Mongkut's Univ. of Technology North Bangkok, Thailand
Piya Rontlaong; King Mongkut's Univ. of Technology North Bangkok, Thailand
Markku Tuominen; Lappeenranta University of Technology, Finland

The objectives of this research are to propose the new guideline to identify potential solar power plant and to develop a decision support system for solar power plant site selection. The method is intended to combine both qualitative and quantitative variables based upon environmental friendly in life cycle thinking which fuzzy analytic hierarchy process (fuzzy AHP) model is applied. This approach is used to consolidate the environmental aspects as well as social needs in electrical demand systematically. According to the case study of a solar power plant site selection in Thailand, it has shown that a number of quantitative and qualitative criteria are needed to be realized before it can be analyzed in the fuzzy AHP model. The contribution of this research lies in the development of a new approach that is flexible and applicable to the decision maker, in guiding for solar power plant site selection under stakeholder needs based upon quantitative and qualitative criteria while achieving desirable functions and minimizing cost, time and environmental impact. The advantage of this research is that a decision maker is able to optimize functional criteria and to give the significant weight priority as needed.

TE-04.4 [R] Decision Making in Ethical Dilemma

Baqer M Alali; Mustang Engineering, Saudi Arabia
M. Mazhar A Ul Haq ; SCADO company, Saudi Arabia
Ahmad A Al-Rebh; SABIC comapny, Saudi Arabia
Muidh Al-Qahtani; King Fahed University of Petroeum and Minerals, Saudi Arabia
Thamer Al-Qurashi; SABIC Company, Saudi Arabia

Growing needs to achieve excellence in decision making under ethical dilemma has provoked the researchers to struggle and propose various models for handling such tricky and sensitive situations. The focus of this report is made on the understanding of ethics, ethical dilemma and its effects on decision making. Various models proposed by several research-

ers are reviewed to understand the necessary steps in assessing the ethical dilemma and decision making. The report has reviewed six models and proposed a contingent model (framework) for ethical decision making.

TE-05 Information Management - 1
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Orca
Chair(s) Alisa Kongthon; National Electronics & Computer Technology Center

TE-05.1 [A] Heterogeneous Project Scheduling for Optimal Six-sigma Cost Reduction Using Linear Programing

Adam M Bobek; Portland State University, United States
Chris Imondi; Portland State University, United States
Tom Shott; Portland State University, United States
Mehdi Toobaei; Portland State University, United States

This paper presents a linear programming (LP) model for a multi-mode resource-constrained project scheduling problem (MRCPSP) in a manufacturing environment. Heterogeneously skilled employees with varying availability were scheduled for Six-Sigma cost reduction projects. Using typical projects from the local manufacturing division of a major diversified food manufacture (which motivated this research), a labor assignment problem using the work-time-project concept is formulated and solved using integer programming optimization procedures. The setting represents a multiple-project environment where projects are separate and independent, but require the same renewable resource mix for their completion. Projects require assignment of both supervisor and engineering staff with the requisite skills. The projects are scheduled to achieve the greatest cost reduction across all areas. The paper demonstrates how the output of the model can be used to identify bottlenecks (or critical resource skills), and also demonstrates how cross-training the critical individuals can increase throughput. The results established that the division could not achieve its cost reduction goals with the assigned resources. Though our algorithm was applied to a manufacturing environment, our optimization algorithm has the potential to be utilized for other heterogeneous staffing scheduling such as health care or services.

TE-05.2 [R] The Role of Twitter During a Natural Disaster: Case Study of 2011 Thai Flood

Alisa Kongthon; National Electronics & Computer Technology Center, Thailand
Choochart Haruechaiyasak; National Electronics & Computer Technology Center, Thailand
Jaruwat Pailai; Thammasat University, Thailand
Sarawoot Kongyoung; National Electronics & Computer Technology Center, Thailand

With the emergence of Web 2.0, social media became a key platform that allowed people to interact and share information. Unlike traditional internet media, the Web 2.0 platform facilitates not only users' ability to access information, but also their ability to comment on information already existing in the web sphere, and to publish or republish information. Over the last few years, users of social media have played an increasing role in the dissemination of emergency and disaster information. In this paper, we conduct a case study exploring how Thai people used social media such as Twitter in response to one of the country's worst disasters in recent history: the 2011 Thai Flood. By analyzing these user-generated messages we may assist local communities in obtaining up-to-date information; emergency rescuers in providing assistance according to the needs of the populace in a timely manner; or government agencies in analyzing and developing methods to use similar information to better centralize, coordinate, manage and plan disaster relief both during and after the event.

TE-05.3 [R] Soft Issues for Construction Site Safety Emerging Technologies: Some Reflections Upon the SightSafety System

Zainab Riaz; National University of Science & Technology, Pakistan
David Edwards; Birmingham City University, UK , United Kingdom
Tony Thorpe; Loughborough University, United Kingdom

During the last decade a number of advanced information and communication technology (ICT) solutions have been developed to assist in the management of business processes and working environments. Radio frequency identification device (RFID) tagging technology and mobile computing are two such technologies which have been adopted for use in hybrid systems because they can monitor and manage industrial health, safety and welfare activities. Set within a construction plant and machinery context, this research paper presents some critical reflections for addressing soft issues pertaining to customer-focused site safety applications. The objective is to embed soft issues within the very design of emerging technology applications for a proactive health and safety management system. While emerging disruptive technologies have opened a pavilion for growth and innovation for site safety, the optimum diffusion of these technologies has clearly reiterated the need for soft factors to be addressed at a broader perspective. This research thus endeavors to address industrial site safety risks by rendering critical reflections of the soft issues capitalized through scenario planning. Soft factors present an area that requires further in-depth research in the domain of social informatics, ergonomics and industrial psychology. These critical reflections reside in the domain of system effectiveness, proactive nature of the system, practicality of the system, system usability and financial feasibility.

TE-06 Technology Transfer - 2
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Finback
Chair(s) Kai-Ying Chan; University of Pretoria

TE-06.1 [R] Exploring the Nonlinear Relationships between Learning Traits and Knowledge Transfer in Outsourcing Alliances

Wei-Li Wu; Ching Yun University, Taiwan
Yi-Chih Lee; Ching Yun University, Taiwan

This study applies artificial neural networks and multivariate adaptive regression splines to explore the nonlinear relationships between suppliers learning traits and knowledge transfer in international outsourcing alliances. Especially, there are five learning traits included in this study; they are organizational learning intent, employee learning intent, self-learning commitment, manufacturing ability and integrated database. Through a dataset of 206 suppliers, this study reveals that organizational learning intent, employee learning intent, self-learning commitment and integrated database have nonlinearly and positive influences on knowledge transfer, while manufacturing ability has a nonlinearly negative influence on knowledge transfer. Therefore, suppliers eager to learn could enhance their performance of knowledge transfer by paying more attention to their learning traits.

TE-06.2 [R] Inter-Organizational Cooperation in Regional Innovation Systems: A Catalyst of Transactive Memory Systems

Bih-Huang Jin; TungHai University, Taiwan
Chin-Jou Huang; TungHai University, Taiwan
Chih-Yun Wu; TungHai University, Taiwan
Chien-Tzu Tsai; FengChia University, Taiwan

Transactive memory systems (TMS) is widely used to explain how members in the organization rely on each other in a knowledge network and how they use their professional knowledge and skills to achieve mutual goals. Lewis (2003) provides a conceptual framework to draw a whole picture of TMS, comprising three parts: 1) specialized and differentiated team knowledge (specialization), 2) trust level between members and their reliance on each other's knowledge (credibility), and 3) smooth, organized, and coordinated task processes (coordination). However, past studies focused on the group level inside the organization, and little work has been done on the organization level; this mechanism is applied to an inter-organizational situation in this current study. We attempt to explore if TMS may exert an influence on the performance of inter-organizational cooperation in regional innovation systems (RIS) to capture how members' collaboration may work in RIS.

Data is collected from the industries in central Taiwan, which is a developing RIS, including electronic, mechanical, and medical industries. The main purpose of the current study is to reveal the implicit mechanism of inter-organizational cooperation. The results show that TMS is indeed a catalyst of organizational level collaboration; in other words, TMS is positively related to the performance. This research provides a new perspective to evaluate industrial cooperation, and the difference between the effects of these three dimensions is further discussed as well.

TE-06.3 [R] Construction of the International S&T Resources Monitoring System

Yun Liu; Beijing Institute of Technology, China
Xiao-Li Wang; Zhongyuan University of Technology, China
Wen-Ping Wang; Beijing Institue of Technology, China
Xuan-Ting Ye; Beijing Institue of Technology, China
Wei Fan; Beijing Institue of Technology, China

Based on the systematic research in contents, methods and technology of the international S&T resources, the article established the visual monitoring and service system of international S&T resources, proposed the three "first-classes" concept of international S&T resources. For different types of international science and technology information databases, by use of scientometrics, data mining, visual technology and other methods, we have designed and built a set of effective resource monitoring framework for international S&T resources, which provided the information support for the grasp of international distribution of technology resources, searching for a high level of international coopera-tive partners and more effective use of international S&T resources.

TE-07 Technology Management in the Health Sector - 2
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Beluga
Chair(s) Futaba Kaneyasu; The University of Tokyo

TE-07.1 [R] Toward a Framework of the Process of Open Innovation: Case of Acclarent in the Medical Device Industry

Hua-Hsin Wan; San Jose State Univeresity, United States
Xiaohong "Iris" Quan; San Jose State University, United States

Using a case study of Acclarent, a medical device company, this paper proposes a framework to further illustrate how the process of open innovation is implemented in the medical device industry. We examined five elements in the mechanism of the open innovation process. The lesson learned from Acclarent's case is that the success of a medical device start-up depends on how well the company can effectively manage the flow of knowledge to satisfy unmet needs, while integrating its in-depth knowledge of FDA regulations and third-party payer's reimbursement policies into the product innovation process.

TE-07.2 [R] Investigating Cultural, Technological, and Media Factors Which Affect Acceptance of Organ Donation in Taiwan

Mavis Tsai; Shih Hsin University, Taiwan
Zong-Yu Shi; Shih Hsin University, Taiwan

Organ donation in Taiwan, while being promoted for over 20 years, has not been embraced by the majority. This is due to many reasons including the concept of "keeping the full body after death," which is deeply rooted in Taiwanese culture and religions. Rarely studied is the innovation diffusion of the health science of organ donation-related technologies, policies and issues. This paper discusses the relevant factors surrounding acceptance of organ donation based on observing the main influences from cultural, technological and media perspectives. The researcher launched an online survey, gathering a sample of 1,118 valid responses to surmise interviewees' knowledge, attitudes and acceptance regarding organ donation and related issues of cultural, family, technologies and media campaigns. In addition, the researchers did face-to-face in-depth interviewing of experts, doctors in relevant fields, relatives of the organ donors and recipients. As found in the research results, there are many factors which can affect the acceptance of organ donation such as interviewees' knowledge of organ donation-related science and technologies, media usage, level of exposure to organ donation campaign messages as well as their family relationships, altruistic behavior, innovative personalities, and attitudes regarding organ donation and traditional Chinese culture.

TE-07.3 [R] Qualitative Evaluation of the Finnish Life Science Innovation System with Comparison to the San Francisco Bay Area

Anne-Sisko Patana; Aalto University, Finland
Matti Pihlajamaa; Aalto University, Finland
Kirsi Polvinen; Aalto University, Finland
Tamara Carleton; Stanford University, United States
Laura Kanto; Aalto University, Finland

The life science sector is among the fastest growing knowledge fields characterized by a high rate of radical innovations. However, it does not have a long history as a distinct industrial sector. It is strongly regulated, and its products usually have long development cycles. Further challenges arise from the inherent uncertainty linked to biological processes and knowledge gaps in available scientific information. Policy actions play a major role in the emergence and growth of the business. In this paper, we examine the dynamics and functionality of sectoral innovation systems (SIS) in the life sciences industry in Finland. We contrast observations on Finnish industry to those in the San Francisco Bay Area, where biotechnology and the life science industry are more concentrated than in the rest of the US. A total of 33 qualitative face-to-face interviews with senior managers and decision-makers were conducted for this study. This research paper describes the various actors, networks, institutions, and functions related to SIS. We have detected several inducement and blocking mechanisms for business primarily in Finland and suggest some policy implications for further review. Limited commercial experience, scarce venture capital, and weak global networks pose challenges for Finland's emerging life science industry.

TE-07.4 [R] Gaps between Assistive Technologies and Dementia Care

Taro Sugihara; Japan Advanced Institute of Science and Technology, Japan
Tsutomu Fujinami; Japan Advanced Institute of Science and Technology, Japan
Robert Phaal; University of Cambridge, United Kingdom
Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan

A growing number of people are now entering the elderly age category in Japan; this raises the likelihood of more persons with dementia, as the probability of becoming cognitively impaired increases with age. There is an increasing need for caregivers who are well trained and experienced and who can pay special attention to the needs of people with dementia. Technology can play an important role in helping such people and their caregivers. A lack of mutual understanding between caregivers and researchers regarding the appropriate uses of assistive technologies is another problem. We have described the relationship between information and communication technology (ICT), especially assistive technologies, and social issues as a first step towards developing a technology roadmap.

TE-08 Technology Management in Services - 4
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Parksville
Chair(s) Richard V Weeks; University of Pretoria

TE-08.1 [R] Roadmapping the Service Transition: Insights for Technology Organizations

Robert R Harmon; Portland State University, United States
Gregory L Laird; Datalink Corporation, United States

Product technology firms are under increasing pressure to adopt service-oriented business models to target new opportunities for increased sales growth and profitability. But, there are always risks involved in transitioning to a service-dominant strategy. Service-oriented business models span across functional areas and require new skills, designs, resources,

cultural change, approaches to customer value creation, and innovative strategies. Because of these risks, many organizations are slow to adopt the service model and may become discouraged during the transition or even abandon it. This paper will explore the service-transition process for high-technology product firm and use a technology-roadmapping approach to illustrate the strategy dimensions and issues encountered. A set of business model parameters for the service transition is presented.

TE-08.2 [R] Knowledge Map of Service Innovation

Pei-Chun Lee; STPI, National Applied Research Laboratories, Taiwan
Hsing-Ning Su; National Chung Hsing University, Taiwan

Service innovation for the purpose of raising service quality and service productivity has been moving toward the center of business transformation in the knowledge-based economy. To accelerate the growth of service innovation, an overall picture of how service innovation has been developed should be provided to contribute to this field. To obtain the above research purpose, this study proposes a way of mapping service innovation research structure by quantitatively analyzing service innovation research papers retrieved from the Web of Science database. A total of 224 papers are retrieved in this study and 160 papers which contain keywords are chosen for research structure visualization. Service innovation research networks are quantitatively investigated by combining network theory and keyword co-occurrence. Contour maps of service innovation are also created on the basis of networks for visualization.

TE-08.3 [R] Servitization: The People or Human Dimension of Services Management

Louwrence D Erasmus; University of Pretoria, South Africa
Richard Weeks; University of Pretoria, South Africa

Manufacturing organizations are increasingly implementing a servitization strategy to gain a competitive advantage and improve the organization's income stream. The purpose of this paper is to analyze the human or people dimension of management of the servitization process. The research study constitutes a literature review and a narrative enquiry. The literature study was multi-disciplinary in nature and directed at gaining an insight into the human or people related aspects of servitization management. The narrative enquiry entailed interviews conducted with executives and managers at a South African institution that had implemented a servitization strategy to learn from their first-hand experience. Three fundamental research study findings are the need for culture, management paradigms and skills realignment. The traditional culture transformation approach to align culture to strategy is found to be flawed. Services inherently involve people and the human aspects involved are complex in nature. Suggested is the need for a complex adaptive systems approach in managing the realignment process, which fundamentally differs from the linear deterministic approaches often adopted.

TE-09 New Product Development - 2
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Port Hardy
Chair(s) Jasper L Steyn; University of Pretoria

TE-09.1 [R] Technology Selection and Forecasting at the Fuzzy Front End with the Use of Social Media

Tero H Peltola; CITER / Tampere University of Technology, Finland
Saku J Mäkinen; CITER / Tampere University of Technology, Finland

In this paper, we investigate the possibility of using social media technologies to select and forecast the viability of early-stage technological ideas at the fuzzy front-end (FFE) of the product development process. During the FFE, market needs, wants, and preferences are seldom clear, especially when considering radical new technologies. For a company seeking clarity on the preferences in its selection of ideas at the FFE, communicating with markets is essential. Additionally, the importance of cross-functional communication at the FFE is emphasized in current literature. Technological and market uncertainties push and pull multiple stakeholders in the formation of heterogeneous views on the customer's needs, and social media technologies may be used in finding a shared vision amongst these divergent views. The main research question is whether the adoption of social media technologies will result in a shared, convergent vision, or is social media usage more likely to generate scattered visions during the initial phase of the new product development. The paper presents a propositional framework arguing social media technologies' contributions to FFE performance. We argue that the FFE phase is expected to receive a beneficial impact from social media adoption as the business potential can be analyzed from various sources already in the early stages.

TE-09.2 [R] The Technology Sourcing Effect on Value of New Product Innovation

Shih Chieh Fang; National Cheng Kung University, Taiwan
Wen-Chun Li; National Cheng Kung University, Taiwan

New product innovations (NPI) continuously are vital for organizational sustained competitive advantage. Due to the nature of R&D intensity and multidisciplinary in the high-technology industry, it is difficult to develop new products by a single firm. Firms rely on external technological resources necessarily through several ways to maintain their pipeline of products, e.g., merger and acquisition (M&A), strategic alliance, or licensing. Previous studies have discussed the magnitude of market response when an innovation disclosed, but rare research deal with the technology origins of the NPI. This current study fulfills the gap between knowledge sourcing and value of new product innovation. In this current study, we attempt to interpret the performance of new product innovation by two distinct effects which are derived from technology sourcing modes: the value creation effect and the value appropriability effect. Value creation effect derived from studies of organization learning and suggests that the integration of technology sourcing will enhance value of NPI and firm performance. By contrast, following the perspective of property rights, lacking of power to control the ownership of technology will undermine the appropriability of firm and eventually decrease value of NPI.

TE-09.3 [R] Integration of Lead Users in the Sporting Goods Industry: Potentials of Virtual Customer Integration

Markus Ernst; University of Erlangen-Nuremberg, Germany
Kai-Ingo Voigt; University of Erlangen-Nuremberg, Germany
Sina Neumann; University of Erlangen-Nuremberg, Germany

The framework conditions of the sporting goods industry have changed in recent years. Besides the increasing individualization of products, the life-style orientation of customers is of rising importance. In order to assure competitive advantage in future markets it is very important being the first to identify crucial trends. In this context, customers are an important source of innovation. Based on the concept of open innovation, we reflect the role of lead users in the innovation process and identify potentials of virtual customer integration through the use of web-based applications. Based on our conducted study in the sporting goods industry we are able to show that the benefit of integrating lead user based impulses into the innovation process is basically confirmed. Furthermore, the study shows that employees are often acting as lead users and that first tendencies towards a systematic implementation of lead user specific, web-based communities are visible. On the other hand, our study identifies that sometimes lead user integration is used in a very unstructured and irregular way. This leads to an insufficient realization of the identified potentials. Finally we conduct practical guidance for companies to improve their innovation activities through a web-based integration of lead users.

TE-09.4 [R] Contract Research as a Part of New Product Development

Moritz von Zimmermann; University of Erlangen-Nuremberg, Germany
Sebastian Engel; University of Erlangen-Nuremberg, Germany
Christian Baccarella; University of Erlangen-Nuremberg, Germany
Kai-Ingo Voigt; University of Erlangen-Nuremberg, Germany

Due to shortened product lifecycles and a growing complexity of technologies, companies increasingly cooperate with external partners to optimize their R&D process. To expand their own R&D effort on new technologies, companies can use external resources from partners like universities. Due to their extensive resources and high scientific expertise, universities have proved ideal partners for contract research. This cooperation intensified with amendments such as the US Bayh-Dole Act in 1980 and similar changes in Germany in 2002. Although university-industry technology transfer has been investigated in detail the last two decades, little is known about integrating universities as an external partner into a company's new product development process. In our study, we upgrade Cooper's well-proven stage-gate process to include different forms of university research. We present a way to establish prolonged interaction from preliminary idea screening to market launch. Our theoretical model was tested and modified in three in-depth case studies and offers the basis for future research in different industries since we kept it in a general form. It is of great relevance to companies dealing with emerging technologies because their knowledge often originates from university research, and they cooperate with university scientists on a regular basis.

TE-10 Manufacturing Management - 1
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Port McNeill
Chair(s) Siri-on Setamanit; Chulalongkorn University

TE-10.1 [R] Implementing Cellular Manufacturing in a Make-to-Order Manufacturing System: A South African Case Study

David J Kruger; University of South Africa, South Africa

Make-to-order was formerly the single most utilized approach to produce high variety, low volume products. The result was that only the affluent buyer could afford the products. Mass production played a part in the accessibility to products but contributed to the loss of uniqueness of the products. With the introduction of mass customization, uniqueness and accessibility were addressed. South African manufacturers are facing growing international competition from low labor cost countries. Lean manufacturing is seen as an instrument to increase competitiveness through continuous improvement. According to numerous research papers, less than 0.5 percent of an organization's process operations are value adding. The majority of operations could be classified as waste. The paper addresses smaller production lot sizes and pioneering manufacturing approaches to increase competitiveness. The paper studies the design of a lean manufacturing approach in a make-to-order production system subjected to a considerable range of product types and with high-level of demand uncertainty. A production system utilizing cellular manufacturing and line balancing were developed. Cellular manufacturing with a supermarket of parts is well suited for application in make-to-order manufacturing systems. A number of the seven wastes identified will be addressed.

TE-10.2 [R] Characterizing the Product-Process Architecture of Competitive Firms: A Case Study of a Japanese Manufacturing Firm

Manjusha Thorpe; University of Cambridge, United Kingdom
Satoshi Yoshida; Advanced Institute of Industrial Technology, Japan
Yu Morishita; The University of Tokyo, Japan

This research paper explores the product-process architecture characterizing the manufacture of competitive products by Japanese firms. Furthermore, the research focuses on manufacturing that is carried out by Japanese firms and is based on modular product-process architecture. This research focus is selected because it represents an atypical scenario; Japanese manufacturing tends to be competitive when based on integral product-process architecture. The research was conducted using a case study of TOTO, a Japanese firm that is a leader in the manufacture of toilet units. In recent years the integral product-process architecture of TOTO has shifted towards a modular architecture. At the same time, TOTO has also achieved a competitive position and has manufactured toilet units with world-class performance. When examining the characteristics of TOTO's product-process architecture in closer detail, it appears that TOTO retained integral architecture for two of its manufacturing stages: product inspection and product testing. The stages of product inspection and product testing are considered pivotal in achieving TOTO's competiveness. In particular, the human involvement and ongoing optimization measures resulting from these stages provide a unique quality advantage, which cannot be duplicated by other manufacturers. TOTO has adopted a product-process architecture that while predominantly modular, involves inspection and testing stages that are based on integral architecture. Characterization of an architecture which is linked with competitiveness was carried out for the single case of TOTO. This is a limitation of the research and there is scope for increasing the number of cases investigated and covering a range of firms, industries and technologies. This information on architecture types can elucidate the product-process architecture associated with competitive performance for various scenarios, including the development of emerging technologies.

TE-10.3 [R] Development of a Compliance Framework for Safety Management Practices in Manufacturing Companies in Trinidad and Tobago: An Agenda and Some Findings

Marcia Nathai-Balkissoon; The University of the West Indies, Trinidad and Tobago
Kit F Pun; The University of the West Indies, Trinidad and Tobago
Ambika Koonj Beharry; The University of the West Indies, Trinidad and Tobago

The Occupational Safety and Health Act (OSH Act) of Trinidad and Tobago (T&T) was assented to in 2004 and amended in 2006. Due to limited resources, the T&T OSH Authority and Agency (OSHA) has largely limited its OSH Act enablement/enforcement efforts to the construction sector, and the manufacturing sector has not been sufficiently enabled to comply. Meanwhile, the thrust for manufacturing sector expansion and productivity improvement continues to place greater demands on these organizations' safety systems. Therefore, this paper presents an agenda and some findings of research that aims 1) to survey T&T's manufacturers to establish whether compliant safety management systems (SMS) exist, and to identify significant shortcomings, and 2) to develop an SMS Compliance Framework which T&T's manufacturers would use to enhance their SMS and evaluate their safety performance. Trial implementation of the SMS Compliance Framework would be done at two invited manufacturing facilities, with the aim of improving the frameworks applicability in T&T. Beyond application within manufacturing companies, the research findings could assist OSHA's efforts to enable/enforce the OSH Act within the manufacturing sector, and there may be potential extensions in the Caribbean Community (CARICOM) region.

TE-11 Collaborations in Technology Management - 3
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Port Alberni
Chair(s) W. A Spivey; UTSA

TE-11.1 [R] Resource-based View of University-Industry Research Collaboration

Simon P Philbin; Imperial College London, United Kingdom

University-industry research collaboration offers both parties involved recognized benefits. Universities can secure funding for students and researchers, whereas companies can gain access to science and technology to incorporate in improved products. The performance of such collaborations can be closely related to the resources available to the collaborating organizations. Therefore, this paper will examine how university-industry research collaborations can be developed and managed through applying the key concepts of the resource-based view of strategy. The research method is composed of two stages. The first stage involved a series of 32 structured interviews with representatives from companies and the academic sector, which sought to ascertain the resources required for successful university-industry collaborations. Qualitative assessment of the resources according to either being tangible, intangible or human related identified the capabilities required to underpin collaborations between universities and companies. The second stage involved a case study

application of these capabilities to a major university-industry research program. The case study investigation involved reflective analysis of how the resources and capabilities were configured and deployed during the development and management phases of the program. This allows generation of a set of practitioner oriented recommendations for establishing university-industry collaborations.

TE-11.2 [A] How to Promote the University and Industry Collaboration in the Region?

Deok S Yim; International Innopolis Research Center, Korea, South
Young C Seong; Gyeonggi Research Institute, Korea, South
Seung Lee; Gyeonggi Inst. of Science & Technology Promotion, Korea, South
Jong B Lim; Gyeonggi Inst. of Science & Technology Promotion, Korea, South

The industry, university and research institute (IUR) collaboration in the innovation process is emphasized. To promote such collaboration, government makes many kinds of policies and put lots of efforts. However, it is true that the level of collaboration is not satisfactory. Especially, the IUR collaboration in the region is more difficult because of the lack of regional resources and programs. In this presentation, success factors of university and industry collaboration are identified and Korean experiences are analyzed. Finally, it is suggested to make the policy with the consideration of cultural factors.

TE-11.3 [R] Achieving Ambidexterity through Balancing Exploration and Exploitation with Interorganizational Collaboration

Jong Seon Lee; KAIST, Korea, South
Zong-Tae Bae; KAIST, Korea, South

There has been argument regarding the issues that firms need to balance exploration and exploitation in order to achieve superior performance. This study examines which leads to better performance, to balance exploration and exploitation or to emphasize one of them. Also, this study scrutinizes how different types of interorganizational collaboration affect firm performance according to the firm's strategic orientation. To test the hypothesis, this study analyzes data on Korean manufacturing firms collected in the Korean Innovation Survey. The result shows that strategic orientation, which refers to a firm's orientation from exploitation to exploration, has an inverted U-shaped relationship with firm performance. This relationship is negatively moderated by explorative collaboration. These findings suggest that balancing exploration and exploitation is beneficial for firm performance, and explorative collaboration is more helpful for firms weighted toward exploitation.

TE-12 Patent Analysis - 4
Tuesday, 7/31/2012, 16:00 - 17:30
Room: Azure
Chair(s) Vitavin Ittipanuvat; The University of Tokyo

TE-12.1 [R] Software-Based Patent Analysis: How to Leverage a Text-Mining Tool

Yvonne Siwczyk; Fraunhofer IAO, Germany
Joachim Warschat; Fraunhofer IAO, Germany
Dieter Spath ; Fraunhofer IAO , Germany

Within the early phases of technology management processes, patents are often used as a source of inspiration for new ideas. Patents contain detailed technical information about a technical problem and the preferred technical solution. This information can be used, for example, to assess the state of the art or as a basis to identify possible gaps in a technology field. But often it is a very time consuming process to analyze the information provided by patents because huge amounts of patents have to be considered. Therefore, special text-mining tools are used to help in extracting the desired information in a short time. One common text-mining tool that is appropriate to assist the information extraction from patents is Luxid. In the following a special approach to retrieve problems and solutions from patents that are needed to conduct a White Spot Analysis by using Luxid is presented. The main advantage of this approach is that the user need not read whole patent documents but is able to retrieve the relevant parts of the text in a short time for further analysis steps.

TE-12.2 [R] The Dynamics between Forward Citations and Price of Singleton Patents

Shyam Sreekumaran Nair; Indian Institute of Science, India
Mary Mathew; Indian Institute of Science, India

In recent years, business practitioners are seen valuing patents on the basis of the market price that the patent can attract. Researchers have also looked into various patent latent variables and firm variables that influence the price of a patent. Forward citations of a patent are shown to play a role in determining price. Using patent auction price data (of Ocean Tomo now ICAP patent brokerage), we delve deeper into of the role of forward citations. The successfully sold 167 singleton patents form the sample of our study. We found that, it is mainly the right tail of the citation distribution that explains the high prices of the patents falling on the right tail of the price distribution. There is consistency in the literature on the positive correlation between patent prices and forward citations. In this paper, we go deeper to understand this linear relationship through case studies. Case studies of patents with high and low citations are described in this paper to understand why some patents attracted high prices. We look into the role of additional patent latent variables like age, technology discipline, class and breadth of the patent in influencing citations that a patent receives.

WA-00 PLENARY - 3

DATE: WEDNESDAY, 8/01/2012
TIME: 08:30 - 10:00
ROOM: PAVILION BALLROOM
CHAIR: TBD

WA-00.1 [K] The Crucial Importance of Form and Function ? Jobs, Newton and Leonardo

Bulent Atalay; Scientist, Artist and Author, United States

Bulent Atalay, physicist, artist and author, compares the modus operandi of Leonardo da Vinci, Steve Jobs and Isaac Newton, underscoring the ways these three extraordinarily gifted individuals altered forever the way we see the world. This is a talk about how science and art can complement each other. But it is also about maximizing creativity by cross-fertilizing diverse disciplines. "Universal genius" Leonardo was the ultimate master of integrating art and science. In our own time Steve Jobs made it a practice to marry the best of form and function, indeed, better than anyone else had done since the Renaissance genius Leonardo. Finally, Isaac Newton, the greatest scientist-mathematician ever, who personally had little use for art, succeeded in irreversibly marrying mathematics and natural law (science). This cross-fertilization came in his monumental book, Principia, that fueled the Industrial Revolution, and signaled the beginning of the Enlightenment. For inventing the open-ended intellectual system ? modern science ? Newton has to be regarded as the architect of the modern age.

WB-01 Innovation Management - 5
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Pavilion Ballroom A
Chair(s) Christian Marxt; University of Liechtenstein

WB-01.1 [A] Alcohol Chemistry Innovation: Rhodia's Enabling Ethanol Technologies in the Brazilian Solvents Industry

Paulo Tromboni de Souza Nascimento; Universidade de São Paulo, Brazil
Abraham Sin Oih Yu; Universidade de São Paulo, Brazil
Alceu Salles Camargo Junior; Universidade de São Paulo, Brazil

Marcelo Meirelles de Souza Freitas; Universidade de São Paulo, Brazil
Rodolfo Leandro de Faria Olivo; Universidade de São Paulo, Brazil

The production of special solvents, like acetates, is largely dependent on petrochemical raw materials. Nevertheless, as early as 1940s, a special route was developed in Brazil to produce acetate-based solvents using ethanol as raw material. This route competes directly with the petrochemical route and uses sugarcane ethanol. The pioneer developer of this technology in 1942 was Rhodia, which still keeps the market leadership for the ethanol-based solvent market in Brazil. This presentation discusses some key aspects of Rhodia's technology strategy. The research method used is the case study, since the company's history provides unique insights. The results show that enabling technologies were responsible for the ethanol route technological and economic feasibility and suggests that social and institutional factors can cause relevant impact on this industry's dominant technologies.

WB-01.2 [R] Innovation Performance of Chinese High-Tech Firms and Its Determinants: An Empirical Study Based on Quantile Regression

Yuchen Zhang; Tongji University, China
Xianpeng Lu; Tongji University, China

Using panel data from enterprises in Shanghai Zhangjiang Hi-Tech Park and with quantile regression model, this paper empirically investigates various relevant factors that impact the innovation performance of high tech enterprises. Having compared these elements with OLS regression results, we have found the discriminate impact of factors such as enterprise scale, R&D expenditure, net assets debts ratio and technical efficiency at different quantile performance points. As the macro economy and industrial environment vary in different years, we add ownership structure as control variable, through which may get a better understanding of what roles market mechanisms can play in the innovation performance. Given that firms are heterogeneous and that performance rates distributions are heavy-tailed, it may be inappropriate to apply OLS regression method that focus on mean effect. To solve this problem, this paper uses quantile regression to establish an innovation performance model , aiming to investigate how different are the corresponding innovative output of firms, given a specification of the other conditioning factors, which would also enrich our comprehension of the elements affecting the performance of high tech firms. This paper also discusses policy implications of our result.

WB-01.3 [A] Product Innovation and Competence Development in a Brazilian Subsidiary

Abraham Sin Oih Yu; Universidade de São Paulo, Brazil
Alceu S Camargo Junior; Universidade de São Paulo, Brazil
Gustavo Frederico Ribeiro Peão; Universidade de São Paulo, Brazil
Luiz Antonio Bloem da Silveira Junior; Universidade de São Paulo, Brazil
Paulo Tromboni de Souza Nascimento; Universidade de São Paulo, Brazil

Nowadays, 90 percent of the year Brazilian output (and yearly sales), and around 33 percent of the country's fleet are already composed of flex-fuel cars. The first flex-fuel car launched in 2003 was a Volkswagen Gol model. Magneti Marellis Brazilian subsidiary was responsible for this electronic injection and ignition electronics sub-systems development. This study examines this development and its influence in first order competences acquisition and leverage and second-order competences creation and the business benefits from this process (Danneels, 2002). We conducted interviews with engineers and managers who had participated in the development project and compared them to relevant literature. Our results show that the engineering division department has since grown almost three times, and R&D has become an institutionalized activity in the Brazilian PowerTrain division, that reached the status of Global Technological Development Reference Center for renewable fuel technologies as a consequence of this new fuel injection and also due to the market share and costumers' number growth. The flex-fuel system has influenced the development of first-order competences (market and technological) in engineering and commercial teams and also created conditions to improve second-order competences in order to develop first-order competences that made possible innovations on flex-fuel injection platform as tetra-fuel and ethanol-cold injection systems.

WB-02 Technology Management in the Energy Sector - 5

Wednesday, 8/1/2012, 10:30 - 12:00
Room: Pavilion Ballroom B
Chair(s) Simon P Philbin; Imperial College London

WB-02.1 [R] Hybrid Closed-loop Renewable Energy Systems: El Hierro as a Model Case for Discrete Power Systems

Cory Hallam; University of Texas at San Antonio , United States
Luis Alarco; University of Texas at San Antonio, Spain
Gordon Karau; University of Texas at San Antonio , United States
William T Flannery; University of Texas at San Antonio, United States
Anita Leffel; University of Texas at San Antonio, United States

This research investigates the application of hybrid closed-loop energy systems that combine multiple clean energy generation and storage technologies as an alternative to diesel fuel fired electrical generators. The El Hierro project in the Canary Islands, an Archipelago of Spain, represents the first major Megawatt-level energy project aimed at coupling continuous wind power generation with potential energy storage by pumping water to high elevation lakes. These are coupled to hydroelectric generators that can be used for load leveling, peak demand, and frequency control of the power supply to the island's grid. This first of a kind project is presented from technical, regulatory, and political perspective.

WB-02.2 [A] Renewable Energy Readiness Assessment for North African Countries

Diala Hawila; Masdar Institute, United Arab Emirates
Toufic Mezher; Masdar Institute, United Arab Emirates
Scott Kennedy; Masdar Institute, United Arab Emirates
Alam Modal; Masdar Institute, United Arab Emirates

If renewable energy technologies (RETs) are this century's breakthrough leading to a cleaner future with reduced burning of fossil fuels and emissions, and to the social, economic and political autonomy of countries that currently rely on oil exporting countries, then what is the world waiting for to fully adopt these technologies? Apart from the competitive prices of conventional energy, implementing any technology on the national level is a lengthy process that relies on the adopting country's capacity to draw a strategy and its capabilities to implement it. In light of the various initiatives proposed to turn North Africa into a renewable energy producer and extend its electricity supply to its neighboring European counties, such as the DESERTEC and the TRANSGREEN/Medgrid initiatives and the Mediterranean Solar Plan (MSP), the objective of this paper is to investigate North Africa regions' readiness to deploy large-scale RET projects. To do so, we need to first identify the critical factors that are important for the RE diffusion to assess the renewable energy readiness (RE-Readiness) of countries, namely Algeria, Egypt, Libya, Morocco, Tunisia, South Sudan, Sudan and Western Sahara. Such factors are defined and assessed in this paper along the three pillars: human capital, infrastructure and institutions. This assessment identifies the gaps found for the deployment of RETs in these countries and will serve as a first step towards proposing renewable energy diffusion strategies that will contribute to their environmental, social and economic development.

WB-02.3 [R] Diffusion of Solar Thermal in China's BoP Market

Jianghua Zhou; Graduate University of Chinese Academy of Sciences, China
Yunhuan Tong; Tsinghua University, China
Xielin Liu; Graduate University of Chinese Academy of Science, China
Shumin Qiu; Graduate University of Chinese Academy of Science, China

Solar-related technologies are considered effective solutions for two major challenges facing the developed economies, the need to improve the lives of the poorest billions of the global population and the threat of global warming. Instead of the solar voltaic technology, this paper studies the diffusion of solar thermal system in China's base-of-pyramid (BOP) markets. With the theoretical lens of innovation diffusion, the paper explores how the technology of solar thermal was diffused in rural China where lots of BoP groups lived. With

the methodology of case study, the paper analyzes the barriers of diffusing a solar thermal system in both urban and rural areas, and studies how solar firms in China promote the diffusion of such products with both technological and business model innovation. The paper finds out that synergic innovation between the technology and BoP-oriented business model is the key success factor for the innovation diffusion in BoP markets. The findings of the paper will provide implications for both BoP research and BoP practice of firms.

WB-03 Strategic Management of Technology - 1
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Pavilion Ballroom C
Chair(s) Michael M Menke; Value Creation Associates

WB-03.1 [R] A Portfolio of Research and Practice for Strategic Technology Management

Scott W Cunningham; Delft University of Technology, Netherlands
Wil Thissen; Delft University of Technology , Netherlands

The field of strategic technology management is converging out of several formerly distinct fields. Where once there were separate fields of strategic management, technology strategy and technology management, we are increasingly seeing an integrated perspective drawing from all three of these bodies of knowledge. This survey describes the emerging portfolio area of strategic technology management. The foundations of the field in terms of strategy, technology and management are briefly defined. Three useful perspectives from technology strategy, technology management and strategic management are described. The survey provides recommendations for practitioners drawn from the literature. A taxonomy of the subfields of the literature is provided. This survey then concludes with a synthesis, unanswered questions, and then a program of future research.

WB-03.2 [R] Drivers and Inhibitors to Value Creation: A Case Study

Fernando Garza; Kone Industrial Oy, Finland
Ozgur Dedehayir; Tampere University of Technology, Finland

A value network refers to a collection of interdependent firms that contribute to the creation of holistic value by producing components and sub-systems that come together to form a holistic technological system. Over time, the value created by the network is enhanced as specialized firms continuously improve the performance of their focal technologies. In this paper, we endeavor to understand the drivers of value network change, firstly by determining the types of factors that constrain the creation of value (both endogenous and exogenous to the network). To this end, we undertake a review of the literature and in turn conduct an illustrative case study to analyze the drivers and inhibitors to value creation in such networks. Our results show that technological imbalances among systemic components form prominent endogenous drivers of change, while changing demographics and customer preferences, introduction of new government regulations, and the advent of new technological innovations in other value networks form prominent exogenous change factors. We subsequently elaborate on the managerial implications of our findings for firms which are positioned in value networks.

WB-03.3 [A] Constructing Vision with Scenario Planning

Terry R Schumacher; Rose-Hulman Institute of Technology, United States

Strategic vision is often included as an important component of leadership. Yet there is relatively little guidance offered in the management literature on how to acquire vision. This paper describes practices that facilitate scenario planning so that it becomes a process for creating shared vision. Most of the work on scenarios addresses the mechanics of scenario construction. Those authors adopt a planning perspective and suggest scenario planning can benefit organizations by stimulating creative thinking about the future or improving forecasts. The scenarios-to-strategies (S2S) approach is presented, and scenario planning is considered from a communication perspective. Facilitation practices that enhance traditional scenario-building processes are presented which support the social processes of constructing shared vision. These operate on the layer of participants' cognitive processes, to integrate the different participants' views into a unified, shared framework that heightens understanding and commitment. Example scenario planning projects from two industries, electric utilities and software research, are summarized to demonstrate lessons learned that enhance the facilitation of scenarios as a group process.

WB-05 Information Management - 2
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Orca
Chair(s) Donald A Kennedy; Kennedy Technical Services Inc

WB-05.1 [A] Development Knowledge Growth Model and Requirements for the Development Management System in ICT Company

Tomonori Yamashita; Japan Advanced Institute of Science and Technology, Japan
Kunio Shirahada; Japan Advanced Institute of Science and Technology, Japan
Michitaka Kosaka; Japan Advanced Institute Science and Technology, Japan

In recent years, technologies of servers, networks, mobile communications, and other platforms supporting IT have advanced rapidly almost on a daily basis by the technology innovation and the diversification of the customer's demands. Accompanied by the demands for greater functionality and higher performance in these technologies, complexity and scope of product design have been increased in the product development phase compared with several years ago. However, in spite of the increases in sophistication and complexity, the market requires faster time-to-market and higher quality for those ICT products. To complete development within the period required by the market, engineers have to learn related new design methodologies or techniques. In other words, there should be plenty of knowledge in their design to be acquired, shared and utilized for development; also, there are some problems of sharing and utilizing in the development organization. The author researched development knowledge in the ICT development company that he belongs to, reports the current situation and problems which were found by the surveys and interviews with engineers, created a knowledge growth model in his company, and shows the requirements of a practical project development knowledge management system to assist their development productivity improvement.

WB-05.2 [R] Logistics & Supply Chains Management Tracking Networks: Data-Management System Integration/Interfacing Issues

Richard Addo-Tenkorang; University of Vaasa, Finland
Petri T Helo; University of Vaasa, Finland
AHM Shamsuzzoha; University of Vaasa, Finland
Mikael Ehrs; University of Vaasa, Finland
Duy Phuong; University of Vaasa, Finland

Industrial organizations are trying to discover strategies to achieve enterprise competitiveness to improve their flexibility and responsiveness by changing or finding efficient and effective methods, technologies and/or operational strategies that involve the implementation of supply chain management (SCM) strategy (ies) and information technology (IT). However, thorough and much practical research is yet to be conducted in the area of implementation of SCM and IT for effective and efficient data management and systems integration issues. Much as it is still pertinent, doing business over the internet is affordable and very convenient. This enables industrial enterprises to enlarge their view and also grants them an opportunity to easily select, and network with their supply chain (SC) partners. Thus, enhancing the core SCM values of business-to-business operations with information systems (IS) enables data-management workflow systems. The integral specifics of such data-management information systems make it suitable to be implemented within the industrial enterprise management system. Thus, the main part of this is the information-supported data management system inner SC and integrated interfaces. The independent inner systems are linked by the integrated interfaces into an enterprise SCM to manage the logistics tracking network business processes across the independent partners in the SC enterprise system. This paper presents a proposed Master Data Management system of a large ship building manufacturing company for their Logistic and SCM product tracking network by

using a design structure matrix (DSM) approach. This paper will also analyze the industrial based case study by addressing or discussing some of the system interfacing issue learned from the industrial based case study DSM approach experience.

WB-05.3 [A] Standardization of Electronic Commerce in the Cloud Environment and Its Future Evolution

Akihiro Fujii; Hosei University, Japan

With the rapid expansion of the Internet in the 1990s and thereafter, a type of EDI that takes advantage of the generally available Web services, or Web-EDI, has come into widespread use. However, insufficient standardization within the industries has led to the existence of multiple and dissimilar Web-EDI systems even in a single business sector, posing a problem that hinders the smooth flow of commercial transactions, i.e. the multi-screen phenomenon. Many enterprises that have introduced Web-EDI are faced with difficulties when trying to integrate it with their existing in-house system because there are various customer-specific EDIs. Cloud Computing has become the focus of attention in recent years because of its potential to invoke drastic changes both for the providers of enterprise information systems (IT vendors) and the users (enterprises at large). From the viewpoint of constructing and operating an EDI system, the utilization of the cloud environment helps reduce initial investment for IT system introduction and allows simpler co-existence of different EDI systems working in harmony. These characteristics raise the possibility of alleviating the multi-screen phenomenon, boosting the diffusion of EDI in many enterprises, especially in smaller ones. This paper is based on the research project conducted in NISTEP, the National Institute of Science and Technology Policy, the Ministry of Education, Sports, Science and Technology of the Japanese government (MEXT). The main implication of the study is the proposal for use-case buildings for the practice of cloud computing standards in collaborations with SMCs and universities.

WB-06 Technology Management Framework
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Finback
Chair(s) Timothy Anderson; Portland State University

WB-06.1 [A] Discovering the Professional Communities and Social Networks of Emerging Research Areas: Use of Technology Intelligence from Bibliometric and Text Mining Analysis

Nathasit Gerdsri; Mahidol University, Thailand
Alisa Kongthon; National Electronics & Computer Technology Center, Thailand
Sudatip Puengrusme; Mahidol University, Thailand

This study focuses on applying technology intelligence to discover the professional communities and social networks of the biomedical engineering (BME) field in Thailand. The BME field in Thailand is at the starting stage of development; therefore, the research communities and networks for collaboration among key experts have not been well established yet. This paper aims to identify BME sub-research areas that are currently focused on by BME experts in Thailand; identify the professional communities of researchers and practitioners related to BME from engineering and medical fields; and identify social networks of BME engineering teams in Thailand. The identification of these three aspects can support the development of potential collaboration among different groups of BME experts in Thailand in the future.

WB-06.2 [A] PICMET Empirically: Tracking 14 Management of Technology Topics

Alan L Porter; Search Technology, Inc., United States
David J Schoeneck; Search Technology, Inc., United States
Timothy R Anderson; Portland State University, United States

Tech mining can help ascertain what is happening in management of technology (MOT). Previous analyses of PICMET and IAMOT content helped identify the emergence of hot topics in the field and the leading research centers associated with those. The present profile helps assess research priorities and opportunities in MOT. This can help you position your work; identify leaders on particular topics, perhaps as potential collaborators; and anticipate topics of special promise to pursue.

WB-06.3 [R] A Hybrid Innovation Management Model for Emerging Technology: Bibliometrics, Qualitative Methodology, and Empirical Study

Ying Guo; Beijing Institute of Technology, China
Lu Huang; Beijing Institute of Technology, China
Alan L Porter; Georgia Institute of Technology, United States

Compared with traditional technologies, emerging technology presents some new features, e.g. uncertainty. Corresponding, technological innovation for emerging technologies faces many kinds of risks that dramatically affect their development paths .This paper illustrates how quantitative methods (science, technology & innovation (ST&I) information resources) and qualitative approaches (expert's input and technology assessment) could support the decision making through the different stages of technological innovation for the public or private sector in the emerging technology industry. It uses dye-sensitized solar cells (DSSCs) as a case example. The combination of qualitative and quantitative approaches should yield robust assessment and should facilitate communication of results. It is useful for technology managers and policy-makers to grasp the development process and prospects for a specific emerging technology to facilitate innovation management.

WB-07 Technology Adoption - 1
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Beluga
Chair(s) Fernando Palop; Technology University Valencia, UPV

WB-07.1 [R] New Source of Global Governance Supported by Technology: Comparative Analysis of the Adoption Process of the Sectoral Approach in the Global Iron and Steel Industry and Cement Industry

Kiyoyuki Honda; Japan Advanced Institute of Science and Technology, Japan
Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan

The so-called Sectoral Approach, tackling to prevent global warming by using each technology of each industry, has attracted attention as a major method of CO2 reduction. The adoption processes of steel and cement industry participating in Asia-Pacific Partnership (APP) that converted to Global Superior Energy Performance Partnership (GSEP) are compared. In the diffusion process of Sectoral Approach through the steel industry, the companies, located in developing countries being considered not to agree to form the regime which would impede their economic development, joined the agreement, with even the government endorsement. A similar phenomenon was also found in the cement industry. The reason of Sectoral Approach being taking root as a new international regime is the existence of multi-national companies in the developing countries. The understanding by traditional model implies importance of the governments role of developing and supporting market competition among private actors for making new global governance. However the phenomenon observed in the Sectoral Approach diffusion process, that accumulation of efforts by multi-national companies can influence government policies, suggests the possibilities of new mechanism of solving international problems, which is an opposite view with respect to the conventional understandings. In other words, the globalized companies could develop a new system of global governance, instead of each nations government. The above mechanism is a strong candidate as a source of future global governance.

WB-07.2 [A] Key Factors Influencing the Development of Orange Technology Game: An Exploratory Study on Orchid Planting Game

Ming-Hui Lin; NCKU, Taiwan
Shu-Hui Chen; NCKU, Taiwan

Orange Technology, a concept that originated in Taiwan, sets the goal to bring more happiness and promote mental wellness for the elderly. This study adopted a virtual orchid planting game symbolizing Orange Technology for a case study through explorative panel discussion followed by focus group interviews which separately included elderly and middle-aged people. This study aimed to find key factors influencing the development of the Or-

ange Technology Game (OTG) by introducing technology acceptance model (TAM) analysis. The results show that providing more recreational experiences (RE) and enhancing game induced self-efficacy (GISE) are two key factors, in which, memory improvement, social contact and self-learning are identified for RE, and perceived enjoyment, emotional stability and knowledge exchange are identified for GISE. Moreover, a hypothesis for seniors' TAM is proposed as that GISE will mediate RE to influence seniors' happiness and mental wellness along three identified dimensions of mental health care, social relationships and leisure satisfaction. In addition, middle-aged people showed more enthusiasm than elderly people for each dimension, such that Orange Technology game should shed light on these key factors to fulfill the needs of elder care.

WB-07.3 [R] Factors Affecting the Adoption of an Emerging Technology: The Diffusion of Wi-Fi Internet in Mexico

Humberto Merritt; National Polytechnic Institute (IPN), Mexico

According to the literature in the field of information technology (IT), those who are unable to get access to the Internet tend to lack the necessary skills for harnessing the so-called knowledge based economy. This situation is known as the digital divide. This problem has posed a major challenge for developing nations such as Mexico because of the rapid changes in the technology supporting the Internet, especially in wireless connections, which are rending obsolete the existing landline infrastructure. In this paper, we investigate the recent trends in the diffusion of Wi-Fi Internet in Mexico from a technology policy point of view. Available data suggest that a bottleneck in the Mexican legislation has discouraged private agents from supplying wireless Internet services, which in turn has affected the competitiveness of the Mexican telecommunications sector and, through this, of the Mexican economy at large.

WB-08 Competitiveness
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Parksville
Chair(s) Antonie J Jetter; Portland State University

WB-08.1 [R] Regional Innovation System and Economic Competitiveness: The Case of British Columbia

Marcelo A Machado; Kwantlen Polytechnic University, Canada

According to the World Economic Forum (WEF), Canada has the world's twelfth most competitive economy. Nevertheless, it is not presumptuous to think that the country is not achieving its full potential. Canada is somewhat an underperformer when it comes to innovation and business sophistication. To boost Canada's innovation performance is paramount to improve Canada's competitiveness and ultimately the maintenance of Canada amid the World's most developed economies. The main objective of this study is to investigate Canada's innovation capabilities focusing on a smaller unit of analysis, British Columbia. This paper includes a thorough literature review linking innovation, productivity, and economic competitiveness. Secondly, this study investigates the current status of innovation in British Columbia. Lastly, this study makes recommendations to be applied to British Columbia aimed at helping improve Canada's innovation performance.

WB-08.2 [R] Business Processes Capability and Performance: A South African Perspective

Andre Vermeulen; University of Johannesburg, South Africa
Jan-Harm C Pretorius; University of Johannesburg, South Africa
David J Kruger; University of South Africa, South Africa

Successful organizations depend on leadership, process optimization, and utilization of resources. Optimization is achievable through well-defined systems and supporting processes that guide organizations towards excellence. Organizations need to understand operational and individual business processes as well as the strategic impact on the supply network. Effective optimization impacts strategically on quality cost, revenue, investment, and capabilities. Business process capability measurements force organizational leaders, managers and employees to critically analyze existing business processes and determine gaps identifying existing performances and sub-optimal states. Many organizations in South Africa misunderstand business process capability and measure success on revenue and profits generated hiding inefficiencies that could be concealed by the profits. One of the contributing factors might be that some companies in South Africa lack international competitiveness, do not optimize their business processes nor align business processes and available resources to adhere to organizational goals and calls for radical redesign of business processes resulting from end-to-end fulfilling internal and external customer needs. The paper will show why organizations should base their competitiveness on a value chain and end-to-end business processes optimization rather than only profit.

WB-08.3 [R] Value Creation and Competitive Advantage

Sergio Garcilazo-Lagunes; Universidad Panamericana, Mexico

Using long-linked technology and its corresponding value chain configuration model as a starting point, this paper reviews and develops the value shop and value network models. We define primary activity categories, drivers of cost and value, and strategic positioning options. While long-linked technology delivers value by transforming inputs into products, intensive technology delivers value by resolving unique customer problems, and mediating technology delivers value by enabling exchanges between customers. By identifying alternative value creation technologies, value chain analysis is expanded into what we call a value configuration analysis approach to the diagnosis of competitive advantage.

WB-09 E-Business
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Port Hardy
Chair(s) Robert Harmon; Portland State University

WB-09.1 [A] Diffusion of e-Money and Industrial Structure Change in Japan

Midori Takao; The University of Tokyo, Japan
Yuya Kajikawa; The University of Tokyo, Japan
Yoshiyuki Takeda; Chiba Institute of Technology, Japan
Ichiro Sakata ; The University of Tokyo, Japan
Katsumori Matsushima; The University of Tokyo, Japan

This paper analyzes the factors to promote the diffusion of electronic money in Japan by focusing on the interfirm networks. We found that many firms with a variety of business domains including finance, vendor, retailer, transportation, and mobile phone carrier contribute to the development of the market. This development process has three stages. The first stage is trial where contact type IC cards are used. The second is commercialization of electronic money using contactless IC cards. The third is rapid and widespread dissemination of electronic money using contactless IC cards. Different actors play a crucial role at different stages. Moreover, a hub leader firm invited a newcomer to the network in each period. These collective actions enabled the rapid dissemination of electronic money in Japan. We discuss the intention and strategy of such hub leader firms.

WB-09.2 [R] Understanding the Effect of Third-Party Web Assurance Seals on Consumers' Trust from the Perspective of the Seal Providers

Shi-Ming Huang; National Chung Cheng University/ AIM-HI, Taiwan
Ling-Yi Chou; National Chung Cheng University/ AIM-HI, Taiwan
Dong-Her Shih; National Yunlin University of Science & Technology, Taiwan

Web assurance seals provide a business assurance service for e-commerce. Online vendors use web assurance seals to enhance consumers' perception of their trustworthiness. However, there are a few empirical studies examining the effect of web assurance seals on consumers trust from the perspective of seal providers. This study examines the seal provider's perceived security of assurance services by proposing a conceptual model, which delineates the determinants of the seal providers levels of perceived satisfaction and perceived trust. To empirically test the model, the partial least square method is applied to analyze the data collected from 189 respondents in Taiwan. Empirical results indicate

that perceived satisfaction of seal providers to web assurance services is positively related to their trust belief and intention to their own services. Empirical results also suggest that seal provider's expectations of their assurance services decreases with their perceived disconfirmation. Therefore, this study reveals that seal providers should pay attention to perceived disconfirmation and the expectations for web assurance seals when they develop new assurance services.

WB-09.3 [R] Smart Factory: e-business Perspective of Enhanced ERP in Aircraft Manufacturing Industry

Asif M Rashid; National University of Science & Technology, Pakistan
Zainab Riaz; National University of Science & Technology, Pakistan
Erkan Turan; Atilim University, Turkey
Volkan Haskilic; TAI, Turkey
Aziz Sunje; School of Economics & Business Uni of Sarajevo, Bosnia and Herzegowina
Nawar Khan; National University of Science & Technology, Pakistan

This paper applies scenario planning methods to identify strategic planning issues and aspects of ERP technology for competitive advantage, thereby giving researchers a new future research agenda for smart factories in view of the European vision of manufacturing excellence and in view of the global economic recession. Scenario planning techniques coupled with ERP road mapping are integrated for grand strategic planning of a future ERP framework. Scenario techniques were applied for holistic analysis of aircraft industry enhanced ERP road mapping. A novel approach was inscribed for scenario planning. Literature and research methods were integrated for strategic continuous and discontinuous perspectives of scenario planning for disruptive innovation in future factories of the aircraft industry.

WB-10 Manufacturing Management - 2
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Port McNeill
Chair(s) Janez Kopac ; University of Ljubljana

WB-10.1 [R] A System Dynamics Approach to Quality Improvement Programs in a Heavy Engineering Manufacturing Environment: A Case Study

Dirk Van Dyk; University of Pretoria, South Africa
Leon Pretorius; University of Pretoria, South Africa

Organizations are continually challenged to provide the best return on investment for their shareholders. This challenge has become increasingly more difficult through globalization of the market place. Companies quickly realized to stay competitive they have to introduce quality improvement programs. Many quality improvement programs such as quality circles, statistical process control (SPC), total quality management (TQM), six sigma, to name a few, developed in the manufacturing industry with the common goal, to improve the quality of the product or service. Typical causality is studied using one of the six sigma tools, a fish bone diagram, to relate cause and effect. This tool does not allow the user to study and understand feedback from other factors in the improvement process system, typically referred to as feedback causality. Generally, the understanding is poor of the dynamic behavior of the improvement process system with the soft issues, as factors of the system. System dynamics may improve this understanding. Quality improvement programs in a heavy engineering manufacturing environment are not researched to the same degree as quality improvement programs in an automotive manufacturing environment. The purpose of this paper is to share results from research done in a heavy engineering manufacturing environment. The organizing framework for this research is qualitative research, with a polar type case study focused on initiatives where there were dramatic successes or failures, with the expectation that their comparison would help identify those processes that prevent competence enhancing change. The methodology used in this research is a case study method. The purpose of this paper is specifically aimed at testing the theory developed by Repenning and Sterman for an automotive manufacturing environment in a heavy engineering manufacturing environment.

WB-10.2 [R] The Profile of Manufacturing Performance in Multinational Company of Emerging Country: Obstacles and Opportunities

Alvair Silveira Torres Jr.; Universidade de São Paulo , Brazil
Benedito Teodoro de Souza; Mercedes Benz do Brasil, Brazil
Alexandre Massote; Centro Universitário FEI, Brazil

Multinational companies need to achieve high performance in productivity and quality regardless of whether the plant is located in developed or emerging countries. And sometimes, the same kind of obstacles and opportunities are available on both sites, mainly when the technology is transferred from one place to the other. This paper researched 30 manufacturing cells from an automotive multinational company established in Brazil, identifying characteristics used in the operation of equipment under a lean production system and observing its efficiency. Additionally, the effectiveness of particular equipment was compared with a similar installation, in place at the company home country, manufacturing the same component, with the same quality requirements. The conclusion was that the solution in place in the emerging country presented better results than the solution in the home country, not aligned with common sense.

WB-10.3 [A] Measuring the Process Innovation of China's High-tech Manufacturing

Xin Liu; Tongji University, China
Song Chen; Tongji University, China

The study on process innovation has gained momentum in recent years. As for China, there are many special characteristics in its technological nature and market condition. In the early stage of development, China's manufacturing industries introduce mature technology directly and launch competition in the late stage of product life cycle. Consequently, process innovation has become a strategic priority. Data envelopment analysis (DEA) is used in this paper to measure the Malmquist productivity of process innovation and analyze the influencing factors of TFP in China's high-tech industry from 2000 to 2008. Result shows that there are great fluctuations of total factor productivity overall in hi-tech industry; efficiency of process innovation in China's high-tech industry mainly relies on technological progress rather than efficiency of resource allocation; Malmquist index of process innovation varies in different industries. The efficiency of process innovation in medical equipment and measuring instruments is relatively high, while the lowest efficiency is in the medicine industry. The article also makes recommendations on the improvement of non-effective units.

WB-11 Technology Diffusion - 1
Wednesday, 8/1/2012, 10:30 - 12:00
Room: Port Alberni
Chair(s) Fang-Mei Tseng; Yuan Ze University

WB-11.1 [R] Diffusions of Mobile Cellular Phones in Sub Sahara Africa

Chaiho Kim; Santa Clara University, United States

It is widely believed that mobile cellular phones will play critically important roles for economic developments of countries in Sub Sahara Africa. This paper examines the patterns of diffusion in mobile cellular phones of the Sub Sahara region as a whole and the individual countries in Sub Sahara Africa from several different perspectives: 1) its relative positions to that of fixed line phones have changed at different points in time, 2) the behavior of the ratios of the these two variables at different points in time, 3) growth patterns of mobile phone uses in individual countries in Sub Sahara Africa, 4) the observed usage patterns for the countries in the western and the southern Sub Sahara Africa compare to the countries in the central and the eastern Sub Sahara Africa, and 5) findings of the regression models with the usual explanatory variables such as GDP-PPP, fixed line phones per 100, literacy rates, and PC per 100 at different points in time during the study period covered in this paper.

WB-11.2 [R] Model of Innovation System in Public Research Institutions: The Cases of IMEC from Belgium and ITRI from Taiwan

Nobutaka Odake; Nagoya Institute of Technology, Japan

Norio Tokumaru; Nagoya Institute of Technology, Japan

Development and diffusion of new science and technology is the prime engine for improving the sophistication of industries and of economic growth. Different innovation systems have developed different approaches to this problem and have built upon varying combinations of public and private support for R&D over time. In this context, innomediaries (innovation intermediaries) play an important coordination and entrepreneurial role. This paper contains a comparative institutional analysis of the policy and business models of the IMEC (Belgium) and ITRI (Taiwan) which have not only a unique research environment and infrastructure but also provide distinctive services. They have systems or capabilities to grow by themselves by technology marketing and fundraising through formation of consortia and various kinds of contract research. The paper includes an investigation and discussion of the main features, management systems and ecosystems of these innomediaries. The study responds to the need to gain a better understanding of possible ways to strengthen the capacity of a regional economy to generate value from its science and technology base with the goal of innovative hub formation. The case studies presented in this paper provide significant lessons learned for the development of new innovation policy instruments of great potential benefit to regional economic development in developed countries.

WB-11.3 [R] Exploring the Structure of International Technology Diffusion

Hung-Chun Huang; National Chi Nan University, Taiwan
Hsin-Yu Shih; National Chi Nan University, Taiwan

Globalization has highlighted changes in socio-economic terms and is reshaping the world. The international diffusion of technology therefore becomes one of the most important topics of economics and technology policy research. However, comparing endogenous factors, exogenous factors are complexity and demonstrate as network phenomenon. The network phenomenon composes by neither solely nor independently unit. Countries in global networks demonstrate interdependence and are influenced by many others. Thus, this study utilizes social network analysis to investigate the structural configuration of international technology diffusion. This study provides macro perspective on diffusion structure research. The purpose of this study is to investigate the deep structure of international technology diffusion and structural differences between embodied and disembodied technology diffusion networks. This work also provides an understanding of the nature of globalization. The findings not only illustrate the pattern change of diffusion structure form cascade-like to radial-like, but also present the structural configuration of technologically advanced countries and the competitive positions of each country. The findings regarding the diffusion pattern changes and network position identifications can make policy implications for countries interested in exogenous effects for technological growth.

WB-11.4 [R] The Telecom's Sectoral System of Innovation and the Diffusion of Mobile Telephony in Nigeria

Gordon M Bubou; Niger Delta University, Nigeria
Emmanuel E Ejim-Eze; Niger Delta University, Nigeria
Festa N Okrigwe; Niger Delta University, Nigeria

Innovation and diffusion are said to usually emerge as a result of an interactive and collective process within a web of personal and institutional connections which evolve over time. The most influential frameworks for industrial analysis recently proposed by non-mainstream economists have been the sectoral system of innovation (SSI). The SSI model sheds light on the innovation process and competence building and focuses on system failures that are of special importance in the context of developing countries. Using the SSI model, this paper identifies the key actors in the sectoral innovation system, analyzing their roles and their interactions that have aided the diffusion of mobile telephony in a latecomer emerging economy like Nigeria. From a lowly 500,000 subscriber base in the pre-deregulation period, Nigeria now has over 95 million active telephone subscribers, making it the largest in the African continent. Going through the historical evolution of the growth of the telecommunications industry in Nigeria, the paper takes us through the pre-deregulation period, the immediate post-deregulation period and the current intense competition period. This study enhances the current knowledge within the area of technology adoption and diffusion in general and mobile telephony diffusion specifically in a latecomer emerging economy context.

WB-12 Convergence of Technologies

Wednesday, 8/1/2012, 10:30 - 12:00
Room: Azure
Chair(s) Charles M Weber; Portland State University

WB-12.1 [R] Semantic Analyses vs. IPC Co-Classification Analyses of Patents: Which One Better Serves to Anticipate Converging Industries?

Nina Preschitschek; University of Muenster, Germany
Helen Niemann; University of Bremen, Germany
Martin G Moehrle; University of Bremen, Germany
Jens Leker; University of Muenster, Germany

The convergence of industries exposes the involved firms to various challenges, e.g., changes in technological paradigms or even in entire value chains. In such a setting, a firm's response time becomes key for its future success. Hence, different approaches to anticipate convergence have been developed in the recent past. Building on the well-accepted notion that at least in research intense industries technology convergence precedes industry convergence, patents play an important role as precursors of new technological developments. So far, particularly IPC co-classification patent analyses have been successfully applied in different industry settings. However, these analyses are only applicable on a broader industry/technology level and are of a high quantitative value, but do not provide detailed information on the convergence process. Here, we aim at developing a concept to anticipate convergence even in small samples and simultaneously providing more detailed information on its origin and direction. To this end, we analyzed the semantic similarity of 326 US patents on phytosterols. In line with our argument that an increasing semantic similarity over time across patents of formerly different technology fields can be taken as an indicator for convergence, we could find evidence for convergence of the food, pharmaceutical and personal care sectors.

WB-12.2 [R] Opportunity Creation from the Confluence of Technologies

Elicia M Maine; Simon Fraser University, Canada
Viren Thaker; Simon Fraser University, Canada
J. Utterback; Massachusetts Institute of Technology, United States

A confluence of technologies evolves when more researchers begin to work at the intersection of two or more technology streams, and when products based on this intersection of technology begin to emerge. Thus, a confluence of technologies is characterized both by the bringing together of formerly disparate fields of knowledge and by the creation of new product markets. This paper reviews the literature that proposes that radical innovation and the emergence of new industries are more likely at the confluence of technology streams. From this literature we develop propositions about opportunity creation from the confluence of technology. We refine these propositions to apply specifically to a predominant confluence of technologies: that of nanotechnology and biotechnology.

WB-12.3 [R] The Structure of Bio-Information-Nano Technology Convergence from Firm's Perspective

Keun Hwan Kim; University of Science and Technology, Korea, South
We Shim; University of Science & Technology, Korea, South
Young-Ho Moon; Korea Institute of Science and Technology Infor, Korea, South
Kang-hoe Kim; Korea Institute of Science and Technology Infor, Korea, South
Jong-ku Son; Korea Institute of Science&Technology Information, Korea, South
Oh-Jin Kwon; Korea Institute of Science and Technology Infor, Korea, South

The phenomenon of convergence that significantly impacted economies and societies in the information technology era has continued to be combined with new technologies such as nanotechnology and biotechnology. Many countries have tried to seize the initiative in order to strengthen the future competitiveness, and it has become increasingly important for roles

of companies to expand applications of the new convergence. This study aims to contribute to the comprehension of managerial implications in all the new convergences fields: BIT, NIT, NBT, and BINT. From a company-based perspective, the study quantifies leading companies' degree of influence in each convergence field. However, the result shows that companies' influences are not mature enough to transfer the initiatives from in both the NBT and BINT convergence field. In addition, this study presents a perceivable framework for companies/institutions by identifying which technological fields the companies/institutions are influential in and what degrees of technological impact are shaped among them. As a result, this allows companies/institutions to recognize their environments squarely.

WD-01 Innovation Management - 6
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Pavilion Ballroom A
Chair(s) Laura Kanto; Aalto University

WD-01.1 [R] Competitiveness of Turkish Hidden Champions

Dilek Cetindamar; Sabanci University, Turkey
Hayri Kozanoglu; Marmara University, Turkey

Understanding the competitive power of small and medium sized firms in emerging economies is a challenging task. This paper aims to analyze internationally successful small and medium sized firms that are so-called hidden champions of emerging economies in the same way as they appear in advanced countries such as Germany and Austria. The analysis will shed some light on what makes these hidden champions so competitive in international markets. Knowing that developing country firms struggle to overcome the country-of-origin effects arising from the consumer perceptions on the country products/services, observing the successful practices might help to understand their strategies in overcoming these effects. The assessment of company practices in terms of competition is carried out by using a comprehensive model where the assessment of firm competitiveness is carried out through the outcome/performance of competition (i.e. output), assets/factors (i.e. input) and processes that turn the assets/factors into actual performance. The paper conducts a case study by concentrating in one emerging economy: Turkey. The in-depth analysis of 10 companies by using the firm competitiveness assessment model helps to identify some innovative ways of overcoming the country-of-origin effects. The paper ends with some managerial and policy implications.

WD-01.2 [A] Toward Building a National Innovation System in UAE

Yousif Al Abd; Masdar Institute, United Arab Emirates
Toufic Mezher; Masdar Institute, United Arab Emirates
Yasser Al Saleh; INSEAD Abu Dhabi, United Arab Emirates

United Arab Emirates (UAE) is one of the developing countries that depends on hydrocarbon products in supporting its economy; oil activities accounted for 49.38 percent of its total gross domestic product (GDP) in 2009. Therefore, Abu Dhabi (AD), the capital of the UAE, has a vision where in 2030 the country will decrease its dependency on fossil fuel to 36 percent in order to stabilize the economy. Through AD's strategy, a number of new industries have been planned to enter in order to diversify the economy. Some of the investments are believed to be very high-tech and innovation-driven industries such as the aerospace manufacturing industry. The aim of this paper is to analyze different countries' national systems of innovation, which have been selected based on literature where innovation is measured through a number of key performance indices (KPIs): R&D expenditures, number of research institutions, patents, number of engineers, new companies established, exports, etc. KPIs will be mapped from an innovation system perspective including the ones from UAE. Then a gap analysis will be conducted to determine where the country lags in terms of establishing a healthy national innovation system. A number of strategies will be suggested to enhance the UAE national innovation system.

WD-01.3 [A] Designing a Best-in-Class Value Creation Organization: The Front-half of the Equation, a Review of Current Best-practice

Michael M Menke; Value Creation Associates, United States

Portfolio management has a long history and good track record for making strategies operational and optimizing business value in functional areas such as R&D, technology, new product development, capital investment and IT. The methodologies for strategic alignment, project & program evaluation, decision & risk analysis and portfolio optimization are by now well established in these functions. Top management of an organization, however, has a higher level challenge: to ensure the best use of scarce resources in terms of return on investment and shareholder value creation at all levels of their organization, starting with their business groups, strategic business units and corporate functions. This presentation discusses how to design and implement a coordinated strategy execution and portfolio management process at the highest level of an enterprise and to link it consistently with established portfolio management processes at lower levels in the organization.

WD-02 Transportation Industry - 1
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Pavilion Ballroom B
Chair(s) Cornelis C van Waveren; University of Pretoria

WD-02.1 [A] International Partnerships and the Development of New Aircrafts: The Case of Embraer and the KC-390 Cargo Airplane Program

Jose Henrique S Damiani; Institute of Aeronautical Technology, Brazil

Embraer, the Brazilian Aeronautical Enterprise, was created in 1969 by the Brazilian government to manufacture the Bandeirante military transport aircraft, developed by the Aeronautical Technical Center (CTA) of the Brazilian Air Force. Since then, international partnerships were often employed to develop new aircrafts. At the time, the company was also commissioned to manufacture under license of Aermacchi the EMB 326 Xavante, a trainer and ground attack jet. By the late 1970s, new products included the AMX subsonic fighter, an Italian-Brazilian program, which allowed Embraer to reach a new technological and industrial status. During the crisis of the early 1990s, Embraer cancelled the CBA 123 Vector project, conducted in cooperation with the Argentinean government. In subsequent years, by launching new products for the defense market, and entering the executive aviation market, Embraer significantly increased its market share and revenues. To continue this expansion in the defense market, the company started the KC-390 Program, contracted to Embraer by the Brazilian Air Force. Several foreign companies are already participating in the program, and the paper will address strategic management issues associated with this participation, such as investments and risk sharing, as well as its implications to its technical and commercial success.

WD-02.2 [R] The Factor Analysis of a Sustainable Transportation System Development: The Case of Hong Kong Electric Vehicles

Wai Chi Wong; The Hong Kong Polytechnic University, Hong Kong
King Lun Choy; The Hong Kong Polytechnic University, Hong Kong

Hong Kong is an international commercial and service-oriented city with a well-developed infrastructure and very high population density. Like most of the urban cities in the world, Hong Kong also suffered the side effect of transportation, particularly the air pollution problem. The air pollution not only affects the tourism industry, but also creates health implication problems for Hong Kong's citizens, including the raising of public health care costs and loss of productivity. In view of the importance of economic growth and public health care concerns, the sustainable transportation concept shows a great potential value towards the current transport system. This paper indicates the factors analyzed about the implementation of a sustainable transportation system in Hong Kong. The analysis not only covers the evaluation of suitability of electric, hybrid and fuel cell vehicles according to Hong Kong driving atmosphere, but also evaluates the current policy development conducted by the Hong Kong Government. It is expected that the above findings can contribute the development of sustainable transportation systems.

WD-02.3 [R] A Flexible Scheme for the Bi-directional Logistics

Ying-Yen Chen; National Tsing Hua University, Taiwan
Hsiao-Fan Wang; National Tsing Hua University, Taiwan

As the reverse logistics and the closed-loop supply chain networks have been adopted by enterprises, the bi-directional logistics have also drawn much attention in the literature in the past two decades. Three current main schemes of the bi-directional logistics had shortages and shortcomings. Therefore, a new scheme named the flexible delivery and pickup problem with time windows is addressed in this study. It conquers those shortages and shortcomings and remains good application properties of the three former schemes. The problem is then formulated into a mixed binary integer programming model. Since it is NP-hard, a co-evolutionary genetic algorithm is proposed to get near optimal solutions of the problem. The computational results show that the developed method can provide better solutions in a comparatively shorter time.

WD-03 Strategic Management of Technology - 2
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Pavilion Ballroom C
Chair(s) Kumiko Miyazaki; Tokyo Institute of Technology

WD-03.1 [R] Developing Technology Platforms for an Emerging Economy: A Situational Analysis of South Africa

Shaheen Biseswar; Amazwe Consulting, South Africa
Ntokozo S Mthembu; Vaal University of Technology, South Africa
Michael O Kachienga; University of Pretoria, South Africa

Central to national economy is the development of a broad industrial base to add value to new enterprise development and manufacturing of innovative products and services for local and international markets. Modern industrialization is driven by technological entrepreneurship, cost-effective energy sourcing, competitive cost of technology deployment and accessibility of entrepreneurial financing for technological innovations and new technology start-ups. In aligning its economy with a global perspective, South Africa is developing an industrial strategy based on economically competitive technology platforms with a focus on addressing its economic and social imperatives. The goal of technology platforms is to facilitate horizontal broadening of manufacturing platforms while promoting vertical growth of strategic technologies where the country has competitive edge. The aim is to enhance national economic competitiveness through exploitation of technological innovation to solve prevalent economic and social burdens. This paper examines the South African innovation landscape in the context of technology platforms, the current initiatives, their deficiencies, enabling policy implications and suggests a framework for an industry-centric technology platform model based on international best practice. The understanding of these dynamics is important for policy makers, industry and academic players and is aligned with the country's drive and objectives to improve its standing on global competitiveness.

WD-03.2 [A] Technology Push for Engineering Market in a Developing Country

Rocio Cassaigne; CIATEQ Centro de Tecnologa Avanzada, Mexico
Francisco Antón; CIATQ, A.C., Mexico

A research center devoted to high technology engineering projects has to deal with collapsing markets in a developing country. Provided with well-qualified human resources, with above-average equipment, and a solid customer portfolio, the center focuses its mission on being a good support for the industry, increasing short- and medium-term benefits both for the center and the customer. By managing the technology from the starting point of product and processes design, providing tools and machinery design and prototypes, and supporting the manufacturing process, the group expects to make a highly positive impact on sensitive industrial sectors such as mechanical, telecommunications and electronic devices. The way to reach those goals started by a renewal of the organization chart, and a very strict technical competences inventory, in order to enhance the technical knowledge among the partners, but visualizing only high technology projects, as a strong pulling string for Mexican enterprises. Management of technology became the motto, and every concept or initiative launched was analyzed from the point of view of technology development, transfer, or as a base for future technological improvements. Wide country data, intellectual property figures and case studies are shown to demonstrate the pushing role of this research center in Mexico.

WD-03.3 [R] Mapping Business Models' Opportunities in Technological Space for Emerging Country Entrepreneurs

Ricardo Arechavala-Vargas; Universidad de Guadalajara, Mexico
Berta E Madrigal-Torres; Universidad de Guadalajara, Mexico
Bernardo Jaén-Jiménez; University of Guadalajara, Mexico

While it is true that science and technology resources are not as abundant in emerging countries as in industrialized economies, entrepreneurs in the former still have open for them a wide space in which to build technology-focused firms. Even though they do not have ready access to frontier R&D, the scientific and technological resources they can use open up a new set of opportunities. These opportunities may be found in areas unexploited by firms from developed economies; they may be defined by locally available raw materials or by new links in global supply chains that grow in complexity over time. We set forth a theoretical model that aims to map the links between technology-focused business models and internationalization processes for firms in emerging economies. This model is built on the basis of case studies conducted in Jalisco, Mexico, under the grounded theory approach. Theoretical issues are defined and built on the basis of recent findings in the field of business models and internationalization processes in the specialized literature. Since the applicability of these findings to firms from emerging economies is not straightforward, our paper explicitly discusses differences in the role of technology in competition among firms, both locally and internationally.

WD-04 Decision Making - 3
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Pavilion Ballroom D
Chair(s) Hongyi Chen; University of Minnesota Duluth

WD-04.1 [R] Selection of Panelists for a Delphi Survey on Emergency Preparedness and Management

Kimmo Laakso; Ahma Engineers Ltd., Finland

In emergency situations a group of individuals representing different organizations, for example authorities and companies, have to work together. They have to absorb a large amount of information about the disaster over a short period of time. In order to be able to make the right decisions, individuals need to understand each other even though they may be from different lines of business. In our research, the target is to stress the importance of a common language in emergency management. Our plan is to gather a group of experts to communicate with the Delphi method on possible differences in the terminology used in different lines of business. Experts from the authorities and from the business life as well as from voluntary rescue organizations will be invited onto our Delphi panel. The aim of this paper is to evaluate which kind of organizations and which kind of expertise would be the most valuable for our Delphi study, the objective of which is to improve the interoperability of organizations' management and communications systems in emergency situations.

WD-04.2 [R] Impacts of Destructive Factors on the Product Development Process: The Decision-Tree Models for Software Intensive Projects

Nermin Sokmen; Tubitak Bilgem BTE, Turkey
Sitki Gozlu; Istanbul Technical University, Turkey

During the development of software products, there are some factors impacting the process. Innovation level of the product, identification level of the requirements, competence level of the project manager, customer participation, and preliminary preparations are identified as important factors influencing the product development process. This study exposes the impacts of these destructive factors over the project performance utilizing chi-squared automatic interaction detection (CHAID) technique. The data set contains 75 pieces of proj-

ect information obtained from the finished software intensive projects. The performance of the product development process is measured with respect to time deviation rates of the project. The proposed models help researchers and practitioners to understand the probabilities of failure in software product development projects. The first model estimates project time deviation rate and its frequency of occurrence according to the identification level of requirements. The level of customer participation becomes important if product requirements are complete and accurate in the beginning of the project. The second model taking the competence level of the project manager as a reference shows that there are usually no significant delays for the groups possessing a perfect management experience. The preliminary preparations become important if the projects are not managed by professionals.

WD-04.3 [R] Bayesian Approach for Stochastic Models with Heteroscedasticity in the Analysis of the Return Volatility of a Commodity

Sandra C Oliveira; Univ. Estadual Paulista - UNESP, Brazil
Mauricio E Higuchi; Univ. Estadual Paulista - UNESP, Brazil
Diego G Angelico; Univ. Estadual Paulista - UNESP, Brazil

The analysis of volatility pattern of returns generated by commodities has important implications concerning the formulation of policies for the country's economic performance. The origin of volatility differs for different types of commodities. In the case of primary commodities, price volatility would arise mainly due to disturbances in supply, whereas for industrial raw materials, it would be the result of disturbances in demand. In the analysis of commodity markets can be seen that information, hedging, speculation and physical availability are factors that can influence their volatility. Moreover, increased volatility in commodity markets can justify the use of information-based processes for modeling the pattern of return volatility of these commodities. Since the context and the relevance of the ARCH family models in the solution of problems in economical and financial areas due to their applicability and interpretation (the relation between return and volatility) have been provided, the aim of this work is to compare the Bayesian estimates obtained for the parameters of AR-ARCH and ARCH models, taking into account normal distribution for the conditional distribution of the return series of coffee beans price. Informative prior distributions were suggested and posterior summaries were obtained by Monte Carlo Markov Chain simulation methods. Results show that, as a rule, the proposed Bayesian approach provides satisfactory estimates and that the AR-ARCH process adjusted better to the data.

WD-05 Knowledge Management - 3

Wednesday, 8/1/2012, 14:00 - 15:30
Room: Orca
Chair(s) James K Chen; Asia University

WD-05.1 [R] Knowledge Management in a Volunteer Community at the Time of Disaster

Kazunori Mizushima; JAIST, Japan
Taro Sugihara; JAIST, Japan
Yasuo Ikawa; JAIST, Japan

On March 11, 2011, a massive earthquake struck northeastern Japan and triggered the devastating tsunami and Fukushima nuclear disaster. A bunch of IT engineers collaborated and launched websites and web services to give the victims a hand just after the quake. One of the major websites was sinsai.info in which hundreds of volunteers participated. Even though the sinsai.info project was the loosely coupled volunteer community, it rapidly solved a lot of unanticipated problems which occurred one after another in the project. This paper aims to clarify the reason why people collaborated efficiently and solved the problems quickly even in the loosely coupled community. We analyze communication logs in the community from the aspect of knowledge management. We found the important role of communication in knowledge management.

WD-05.2 [A] Sourcing Intelligence: The Third Intelligence for Corporate Strategy in the Horizontal Specialization Era

Keisuke Inoue; Japan Advanced Institute of Science and Technology, Japan
Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan

Since the 1990s, fabless companies which have no manufacturing capability have emerged and grown in the electronics industry. Apple Inc., the most well-known fabless company, is considered to have enhanced its competitiveness with extraordinary marketing capability and excellent software technology focusing on customer usability. Its power of competitiveness, however, does not lie only in those capabilities. Apple has adopted cutting-edge devices from device suppliers to develop hardware products such as iPhone, which have captured consumers' minds. It has also selected the most capable EMS to stably manufacture millions of products each month. In dealing with device suppliers and EMS, Apple controls them. Its sourcing power is also Apple's critical capability. There have been many discussions about market intelligence (MI) since the 1970s, and technology intelligence (TI) since the 1980s. However, there has not been so much discussion about intelligence related to sourcing. This paper advocates sourcing intelligence (SI) as the third intelligence that supports sourcing power following MI and TI, and introduces its basic concept and examples of its practical use. Furthermore, the important role SI plays in corporate strategy is demonstrated.

WD-05.3 [R] Development of a Conceptual D-to-D (Default-to-Designed) Model of Knowledge Creation for Sustenance of Organizational Performance: A New Insight to Nonaka's Spiral for Knowledge Creation

Nagraj L Hiregoudar; K.C College of Engineering & IT, India
Sanjay V Kotabagi; BVB College of Engineering & Technology, India

The present day highly volatile global markets have rendered many of the established and time-tested management principles and concepts obsolete. To sustain and grow in competition, it has become imperative for organizations to undertake periodic experimentation with innovative ideas and concepts at every managerial and technological level of the organization. This is possible only through continuous creation and retention of required knowledge (K) that stems from the employees of the organization. The opportunity for application of innovative ideas by the K-workers at the workplace will contribute not only to the growth of personal knowledge of the employees but also lead to continuous growth of the organization. This research work strongly argues that knowledge creation takes place, if and only if, an individual is ready to create and share knowledge. Hence, it becomes imperative for an organization to create a designed individual who is free from all the barriers and generate the knowledge on a continuous basis in an explicit form. A new dimension is added by proposing a new way of classification of individuals in order to facilitate creation of knowledge, that is, default individuals and designed individuals and propose a new D-to-D (default-to-design) model for sustenance of organizational performance.

WD-05.4 [A] A Study on Applications of the Structural Equation Modeling to the Analysis of How the Influential Factors Affect the Chinese Citizen's Scientific Literacy and a Comparative Investigation

He Wei; China Research Institute for SciencePopularization, China
Lei Ren; China Research Institute for SciencePopularization, China
Zhang Chao; China Research Institute for SciencePopularization, China

This paper is based on data of China Civic Scientific literacy survey in 2010, using confirmatory factor analysis (CFA) to extract factors of engagement (public engagement of SP environment) and information (the information sources of S&T), using the structural equation modeling (SEM) to build the model of civic scientific literacy and its influential factors. It examines a quantitative description of how these influential factors affect the Chinese citizen's scientific literacy by using the structural equation model to test the reliability and validity and makes a comparative research with the work done by American researchers. It summarizes that different social context in the US and China result in different influential factors which affect civic scientific literacy. It has made an attentive effort to improve the level of Chinese citizen's scientific literacy and Chinese public understanding of science.

WD-06 Nanotechnology - 2

SESSIONS

Wednesday, 8/1/2012, 14:00 - 15:30
Room: Finback
Chair(s) Andre J Buys; University of Pretoria

WD-06.1 [R] Nanotechnology Opportunities: The Case of the Mediterranean Arch

Fernando Palop; Universitat Politecnica de Valencia, Spain
Scott W Cunningham; Delft University of Technology, Netherlands
Blanca de-Miguel-Molina; Universitat Politècnica de València, Spain

In this paper we characterize the regional innovation system of the Mediterranean Arch, an area reaching from Valencia, through Barcelona, and into the Occitania, culminating in the traditional industrial districts of Northern Italy. The region, while not part of Europe's high development "Blue Banana," is nonetheless increasingly becoming a high technology, research intensive cluster in Europe. The region, for instance, is increasingly becoming a leading area for academic research into nanotechnology and nanoscience. The technology concentration of the region may presage future economic advancement. The paper carefully characterizes the region using geographical queries. This paper further characterizes the region using science and technology indicators. We contrast the region with the international science base in order to sharply delineate regional sources of specialization. We identify and discuss the leading innovation actors. We use both input indicators, as well as output indicators, such as science and patent statistics. We adopt an innovation systems perspective, culminating in a critique of the perspective as well as recommendations and foresight for the region.

WD-06.2 [R] Exploring the Evolution of Nano Technology

Shiu-Wan Hung; National Central University, Taiwan
An-Pang Wang; National Central University, Taiwan
Chia-Chin Chang; National Defense University, Taiwan

Nanotechnology is currently one of the core technology fields that most countries worldwide have been positively devoted to. The development of nanotechnology has been regarded as the fourth industrial revolution. Schummer (2004) delineated that the policies concerning nanotechnology would present exponential growth after 2000. Therefore, clarifying the evolutionary structure of nanotechnology and identifying key technical trends are the main areas of concentration for nations and researchers who hope to seize the opportunities for development. Different from the previous studies, this study utilizes the perspective of social networks to examine the correlation between patented technologies and provide a more visual and understandable angle to observe the main trends of technology evolution. We obtained the details of 518 US patents in total, which were applied in 149 patent classifications and utilized the analysis of patent networks and analysis of the degree of network concentration, to understand the patent application and evolution of nanotechnology. Besides the trends of nanotechnology patent evolution, this study discovered that technical classifications, such as the chemistry of inorganic compounds and semiconductor device manufacturing process among the nanotechnology patents, have the potential for growth. Since the 1980s, these classifications began to have a stable number of patents and became the main stream of nanotechnology's patent development. In addition, the present study also discovered that US nanotechnology patents account for a large proportion of applications among the several main technical classifications, playing a leading role in nano research.

WD-06.3 [R] Early Commercialization Pattern Profiling: Nano-Enhanced Biosensors

Lu Huang; Beijing Institute of Technology, China
Ying Guo; Beijing Institute of Technology, China
Jan Youties; Georgia Institute of Technology, United States
Alan L Porter; Georgia Institute of Technology, United States

Recently, nano-enhanced biosensors (NBS) have attracted considerable attention. Not only their R&D status, but also their commercialization potentials hold appeal for corporations and government policy makers. We are studying company involvement in NBS R&D through publication and patent records to capture the early commercialization patterns. On the one hand, we compare the leading countries in profiling the cluster of commercial activities. We also explore future prospects by positing multiple innovation pathways for NBS. These help to elucidate promising targets, key players, pivotal technology developments on a critical path, and impediments. Taken together, these future-oriented technology analyses empower the management of emerging technologies.

WD-07 Technology Adoption - 2
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Beluga
Chair(s) Leon Pretorius; University of Pretoria

WD-07.1 [A] The Trends and Adoption Behaviors of Smart Phones in Taiwan: A Comparison between Persons Over 45 Years of Age and Youth Under 25

Mavis Tsai; Shih Hsin University, Taiwan

With the characteristics of neat and lightweight design, and the unlimited capabilities for sharing information, the mobile multimedia internet device (MMID) is technologically taking the world by storm. By using the smart phone as an example, this research examined ways in which innovation and generational factors affect the consumption and usage by middle-aged and younger cohorts. The middle-aged, defined here as those above 45 years of age, fall within the generation of those growing up under the politics of concentration of authority who, in their youth, had access to only a few controlled traditional media. In contrast to this middle-aged generation, the younger generation, those born after 1987, the year of the beginning of democracy in Taiwan, grew up in a democratic society and are familiar with all kinds of new media and technologies. In this research, the researchers interviewed consumers of smart phones from both the mature and the younger cohorts to compare their different consumption, usage and opinions regarding smart phones and the application. This application paper seeks to find the different consumption motivations, usage habits of both hardware and software, as well as preference of attributes and brands of smart phones between consumers from the middle and the younger generations.

WD-07.2 [R] Understanding User Perceptions of Real Time Service in Information Searching Process

Jung-Jung Chang; Hsing Wu Institute of Technology , Taiwan

Development of services is a demanding task and requires new perspectives as well as appropriate tools and techniques. The goal of this study is to gather information from web users to answer the questions of whether real-time reference services (Instant Messaging, IM) are beneficial to them and how valuable they are to fulfilling their task needs. The study was designed to elicit information about how Internet users were dealing with the rapidly changing technological environment, and how helpful they felt IM reference services were to them. The investigation uses the technology acceptance model (TAM) as the basic framework and extends it by the variable of perceived value (PV) which intends to extend understanding of the adoption of IM services. The sample consisted of three university libraries' patrons on the basis of convenience; 325 usable responses were obtained. This research found general support for TAM. Specifically, the findings show that perceived ease of use of IM services is the key factor for the patrons' attitudes about the IM service. Overall, the model explained 58 percent of the variance in behavior intention. Thus, the results show that the proposed model does satisfactorily explain the adoption of the IM service.

WD-07.3 [R] Exploring the Adoption of Smartphone Technology: Literature Review

Fahad Aldhaban; Portland State University, United States

Smartphone technology is evolving rapidly and it is influencing consumers' behaviors, their daily lifestyle, marketing, and business activities. User acceptance of Smartphone technology is a critical key factor to determine its success in today's raid changing technologies. Therefore, identifying and better understanding key factors that influence users' adoption

of Smartphone technology is extremely valuable for all stakeholders. The primary aim of this paper is to review the existing body of literature on subject related to adoption of Smartphone and to explore how it was studied, what methodologies were used and identify research gaps. The first section of this paper presents an introduction to Smartphone technology, adoption of new technology and information technology (IT) adoption theories. The second section presents literature from academics and practitioners on topics related to adoption of Smartphone technology. Third section presents discussion, research gaps, research proposed model and the conclusion.

WD-07.4 [R] Exploring Major Determinants of Mobile Learning Adoption

Kubilay M Özdogan; Bogaziçi University, Turkey
Nuri Basoglu; Bogaziçi University, Turkey
Gülcan Erçetin; Bogaziçi University, Turkey

From notebook computers to mobile phones, wireless devices have become popular in society and affordable for the majority of society. With rapidly improving Internet capabilities, the demand for mobility is spread to learning purposes. Mobile learning combines individualized learning with anytime and anywhere learning. It is possible for mobile learners to find and learn what they want to at a pace and place that suits them. M-learning applications provide benefits for mobile learners such as utilizing their spare time while traveling on a train or bus to finish their homework or study. The cost-effectiveness of m-learning is also important. Traditional classroom-based learning has a higher cost comparatively. MLARG is one of those m-learning applications which is designed to support people who learn a foreign language. The application provides course content and examinations in various media formats. The purpose of the research is to identify the independent and intermediary factors which contribute to the success and adoption of this application. The feedback on the application will be gathered from the students who use it for a period. At the end of the research, modifications to the content and design of the application will be proposed to improve the adoption and quality of service.

WD-08 Technology Transfer - 3
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Parksville
Chair(s) Kai-Ying Chan; University of Pretoria

WD-08.1 [A] Commercialization of Technologies out of US Universities

Jisun Kim; Portland State University, United States
Tugrul U Daim; Portland State University, United States
Tim Anderson; Portland State University, United States

U.S. academic research institutions spent public and private funds of $54 billion solely in 2009. This is a significant investment considering the recent harsh economic downturn. While there exists public acknowledgement of the importance of unremitting investment in R&D, U.S. research institutions still struggle to validate their performance and obtain reliable support from public and private stakeholders. Therefore, measuring their economic contribution based on a robust and realistic approach is critical to improve their practices and secure sustainable growth by attracting more interest from taxpayers. Therefore, this paper contributes to a new approach which integrated the steps of identification of time-lags in licensing, efficiency change analysis, and exploration of the influence of organizational characteristics on licensing performance. The study also includes an innovative approach to resolve issues with the super efficiency DEA model, including mathematical infeasibility and zero data considerations. The results, which are grounded on the comprehensive observations over multiple time durations, provide an insight into the licensing practices of US research institutions.

WD-08.2 [R] What are Potential Barriers to Prohibit Cross Border University-Industry Collaboration between India and Japan?

Kazuyuki Nieda; Tokyo Institute of Technology, Japan
Yoshitoshi Tanaka ; Tokyo Institute of Technology, Japan

There is a lot of past research on university-industry collaboration aiming at the creation of new industry. However, most research has been done within the scope of domestic collaboration within a specific country. With the importance of open innovation, it is expected to make cross border collaboration between university and industry. Each country has a different culture, historical background, level of technology, varying industries, laws and regulations, and political and economic systems, etc. Therefore, it is assumed that we should have different approaches and there exist different factors to promote cross border collaboration. This research focuses on the potential barriers existing between different countries, such as the quality of international human resources, the balance between university and industry, international legal function like patent law and its regulations, networking ability, etc. Through interviews of different stakeholders in different countries, some critical factors are extracted and the success factors to be proposed are identified, expecting further promotion of cross border collaboration and qualified technology transfer together with creating new cutting-edge global technology management.

WD-08.3 [R] Patenting in the UNAMs Research Centers Considering Its Knowledge Profile

Leonel Corona-Treviño; National University of Mexico UNAM, Mexico

One important actor in the conversion process of scientific knowledge into technology are university research centers (RC), which are engaged in scientific research (Sc), technology development (Tech), technical services (S), and teaching activities (t). The products of these activities are the publication of papers, graduation of people (mainly master's and PhDs), services and patents which are part of technology development and technology transfer to industry. The mix of those functional activities and products defines the RC's profile. The paper focuses on how patents are related with the Mexico National University (UNAM) RC's profile. The statistical analysis shows no direct effect of technology intensity with patenting. There is no sustained increase in UNAM patenting for the period 1975-2007, but two maximum peaks of applications appeared in 1989 and in 2002 which are triggered by a variety of internal and external events. One explanation of this pattern is Technology Transfer Offices at the UNAM, which have moved forward and backwards from centralized agency into a more flexible and diverse organization at research centers, showing a lack of a proactive university policy on patenting and technology transfer. An overlapping policy of the disciplinary UNAM RC's structure with entrepreneurial attitudes could provide a better dynamic for applied science and technology and will give a positive impact on technology transfer.

WD-09 Management of Technology Based Organization
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Port Hardy
Chair(s) Aifang Guo; Zhejiang Sci-Tech University

WD-09.1 [R] Critical Risk Factors in Business Model and IS Innovations of a Cloud-based Gaming Company: Case Evidence from Scandinavia

Nazmun Nahar; University of Jyvaskyla, Finland
Najmul Huda; Tallinn Technical University, Estonia
Jaak Tepandi; Tallinn Technical University, Estonia

Today's business environment is becoming increasingly dynamic, complex and competitive. Hence, those companies which will react and adjust to the environment as quickly as possible will survive in the competition. The business model allows a company to maximize its profits. The business model is reflected by the organization's information technology (IT) that must evolve dynamically with business, hence IT is seen as a strategic partner to the rest of the business. This study examines a set of critical risk factors that a Scandinavian social gaming cloud software company is currently encountering in innovating its business model and information systems (IS). This study is carried out by reviewing the literature on software and services business models, business model innovation, and IS innovation and utilizing a single case study. Through an in-depth empirical investigation, the critical risk factors are categorized according to their order of severity, explained how each of the identified factors created problems for business model and IS innovations, and provided strategies to alleviate such risks. The empirical findings may guide companies to identify the critical risk factors beforehand and take appropriate actions in order to avoid various

risks associated with business model and IS innovations. This study also suggests some future research directions.

WD-09.2 [R] Evaluation of Performance Management Systems for Knowledge Workers

Tom Shott; Portland State University, United States
Chris Imondi; Portland Statue University, United States
Ryan Fedie; Bonneville Power Administration, United States

Almost every company has a performance management system or conducts performance reviews with employees. However there is little research that demonstrates the performance management system is effective at modifying performance, especially as it relates to knowledge workers. This is especially important as the skills and functions of many jobs are mechanized or standardized and the number of knowledge workers who perform duties that are more difficult to measure increases. This paper provides a summary of the performance management system guidelines laid out in current literature for which we found had considerable consistency. The paper then explores the effectiveness of performance management systems for improving knowledge worker engagement and productivity. This paper provides a reference and set of case studies for management to use to better understand the process of performance management within their organization. The paper analyzes three technology companies and provides recommendations to managers for how they can work within the boundaries of their performance management system to conduct more effective performance reviews, create higher performing teams and improve the execution of company goals.

WD-09.3 [R] CIO and CTO Nexus: Empowering Organizations with IT Governance

Sureerat Saetang; University of South Australia, Australia
Abrar Haider; University of South Australia, Australia

Over the past few years, businesses have started focusing more on governance than simple management of their IT infrastructure. It could be argued that businesses are realizing that IT implementation, operation, and maintenance are strategic activities and that they must be aligned with the overall objectives of the organization. It is therefore important to account for the impacts of implementation, development, and maintenance of IT-related decisions regarding organizational goals, processes, people, and technology on a strategic level. However, in practice there is a lack of synergy between the roles of CIO and CTO, which results in divergent management, control, and performance management of IT infrastructure. This paper reports the findings from a case study and highlights that IT governance is not just only IT management but it also contributes to an enhanced operational planning/ management and strategic performance of the organization.

WD-09.4 [R] Implementing Quality Service-Oriented Architecture Initiative in Organisations

Muhammad Suhaizan Sulong; Universiti Teknikal Malaysia Melaka, Malaysia
Andy Koronios; University of South Australia, Australia
Jing Gao; University of South Australia, Australia
Azlianor Abdul-Aziz; Universiti Teknikal Malaysia Melaka, Malaysia

Today, many organizations are facing business changes but their current systems are unable to adapt such changes. The reason is that the current architecture is monolithic in style which causes difficulties, is costly and time consuming in response to changing business conditions. This is why organizations need to act on how to deal with this issue. A better way is to implement service-oriented architecture (SOA) initiative due to its benefits of achieving business agility. Although many organizations have succeeded in their SOA initiatives, many have failed. One of the reasons for this failure is lack of information quality (IQ). Poor IQ includes inaccurate, incomplete and outdated information. The study aims to look at how organizations can manage and approach the quality of information to success in such initiatives. By reviewing literature, we have derived four key phases to implement SOA initiative and have discovered IQ management that can improve this implementation of SOA initiative. From the review, a research framework is constructed that seeks to identify IQ issues perceived to SOA initiative implementation with associated IQ requirements and appropriate IQ guidelines. It will then enable to design a model of SOA initiative with IQ management that can facilitate organizations in implementing SOA successfully. Further study would show if IQ can be extended to SOA initiative and thus may contribute to both IQ and SOA area of study.

WD-10 Technology Management Education - 1
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Port McNeill
Chair(s) Antonie de Klerk; University of Pretoria

WD-10.1 [R] The Effect of Intrinsic Motivation on Success in a Technology Management Undergraduate Program

Guy H Downs; Eastern Michigan University, United States
Dorothy McAllen; Eastern Michigan University, United States

In this study we track the academic performance of 22 students in a Technology Management bachelor's program to look at the relationship that age, total number of semester credit hours, and time invariant factors that vary across observational units but do not vary across time have on academic performance. We find scant evidence for a significant relationship between either age or total number of credit hours on grade point average, but our regression analysis does suggest that time invariant factors of the sort mentioned earlier do play a significant role in academic performance. Lastly, we conduct a Hausman test to determine whether a fixed effects or random effects model is appropriate, and find that the fixed effects model is preferred; a conclusion that tells us that these time invariant factors are likely correlated to the other right-side variables (age, total number of credit hours) that we have included in the model.

WD-10.2 [R] Project-Based Learning and Conceptualizing E-Portfolio Assessment System in Science Based and Technology School

Punyapat Chanpet; King Mongkut's University of Technology Thonburi, Thailand
Komkrit Chomsuwan; King Mongkut's University of Technology Thonburi, Thailand

This paper is conceptualizing of electronic portfolio into project-based learning , the conceptual aim to design an assessment system in line with electronic portfolio relate to learning of students into processing of project-based learning context in science based and technology school. An e-portfolio is an organized compilation that demonstrates knowledge, skills, values, and/or achievements and that includes reflections or exegesis which articulate the relevance, credibility, and meaning of the artifacts presented. Electronic portfolios are a paradigm in constructivist e-learning. They are capable of involving students in deep learning while serving as a meaningful way for both students and faculty to engage in outcomes-based assessment. E-portfolios have been shown to be a valid way to document student progress, encourage greater student involvement in the learning process, showcase work samples, and provide learning outcomes' assessment and curriculum evaluation. Project based learning encourages independent and interdependent learning and a deeper understanding of the material rather than superficial coverage. It will give student practice in tackling project problems and defining of student gaps in understanding in the context of those problems. This conceptual bring processing design assessment system with E-portfolio create innovation artifact creatively that appropriate for students learning on project-based learning (PjBl), assessment system will implement evaluation and assessment skill and attribute appear with in project of student among learning authentic working as real life, solving , feedback, recording, showing, presentation, reporting, knowledge evaluation. All become tool assessment usage in school.

WD-10.3 [A] An Overview of the Human Capital Development Programme for Advanced Foundry Technology in South Africa

Palesa P Riba; University of Johannesburg, South Africa
Farouk Varachia; University of Johannesburg, South Africa

Palesa Riba; University of Johannesburg, South Africa

The Metal Casting Technology Station at the University of Johannesburg is an initiative of the Department of Science and Technology in South Africa and is managed through the Technology Innovation Agency. The stations primary mandates are technology transfer and capacity building in the metal casting industry. In 2011 the Department of Science and Technology introduced the Human Capital Development Programme in Advanced Foundry Technology to focus on innovation capability development in the localization of capital expenditure programmes such as Telkom and Eskom. Currently, South Africa does not have a consolidated research and training capability in this area. The Metal Casting Technology Station developed and implemented the Master's Research Programme in Human Capital Development in advanced foundry technology in cooperation with its international partner in Germany, the TU Bergakademie Freiberg. The purpose of the paper is to present the development and progress of the programme to date.

WD-11 Information Technology - 1
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Port Alberni
Chair(s) Oladiran O Abidakun; University of Pretoria

WD-11.1 [R] Strategic Management of Information Technology: An Investigation into It Alignment at a Tertiary Education Institution

Louwrence D Erasmus; University of Pretoria, South Africa
Seena Parappat; University of Pretoria, South Africa
Richard Weeks; University of Pretoria, South Africa

The information technology (IT) unit in effect provides an essential internal support service to the institution's business units. This research study investigates the concept of business/IT alignment within the environment of a tertiary education institution, specifically, to identify challenges experienced in achieving alignment and steps that can be taken to improve alignment. A conceptual model was developed to investigate the various factors impacting on business/IT alignment. This model suggests that an assessment of: the strategy formulation processes employed at the institution; the organizational culture at the institution; and the institution's alignment maturity using strategic alignment maturity criteria will enable the determination of factors inhibiting/enabling alignment. The findings revealed that achieving business/IT alignment is still a pervasive problem within the tertiary education sector, with a number of obstacles inhibiting alignment. Strategy formulation was found to be largely top-down with IT strategies having little input towards shaping organizational strategies. Aspects of the organizational culture, particularly relating to innovation, risk-taking and team-orientation needed to be improved in order to facilitate improved alignment. In addition, assessment of the educational institution in terms of alignment maturity criteria revealed areas for improvement particularly with regards to communications, competency, partnership and scope and architecture maturity.

WD-11.2 [A] Evaluating and Collecting Museum Visitor Behavior via RFID

La-or Kovavisaruch; NECTEC, Thailand
Virach Sornleardlumvanich; NECTEC, Thailand
Thatsanee Chalernporn; NECTEC, Thailand
Pobsit Kamolvej; Kasetsart Universityline, Thailand
Nitirat Iamrahong; Kasetsart Universityline, Thailand

Museums, particularly those which deal with historical artifacts, often determine their spatial organization by chronological era. Each display area attracts a certain set of clientele, each interested in unique artifacts from their corresponding period. Applying a guidance system combined with the Radio Frequency Identification (RFID) at the Chawsamphraya National Museum, Ayudhaya province, this system can help collect visitor data as they browse through the vicinity, such as day of visit, time of visit and area of visit. Coupled with basic personal profile taken before entrance, the data is summarized and analyzed to predict visitor behaviors. The analytical report can be used to develop Chawsamphraya National Museum's presentation in unpopular areas as well as predict daily visitor attendance, which in turn will help museum staff appropriately prepare their service requirements and maximize visitor satisfaction.

WD-11.3 [R] Using Internet Technology for Information Technology Popularization in Developing Country

Zhaohui Li; China Research Institute for Science Popularizatio, China
Fujun Ren; China Research Institute for Science Popularizatio, China

Nowadays, information technology is developing very quickly, new products using information technology are increasing, and people are increasingly benefitting from this change. But those people who benefit mostly lie in developed districts, and people who lie in developing and undeveloped districts seldom or never benefit from the development of information technology. They know little about new information technology and its products. That is not favororable for social development as a whole. To get rid of the digital divide which extends increasingly between developed districts and developing and undeveloped districts, Internet technology should be used to popularize information technology at large. According to 29th statistics of internet development, up to December 2011, there are 513 million net citizens, 356 million mobile net citizens and 136 million rural net citizens in China. The increased rate of net citizens who receive education below primary school and junior high school was beyond that of the overall citizens. Every people can surf the internet in their village in China. On the base, making use of popularization of information technology, people in developing and undeveloped districts can know the development of information technology in time, and increase their interest in information technology and its products, and grip some opportunity for person or region, and realize the economical and social and personal development finally.

WD-11.4 [R] Challenges in Managing ICT in Academic Institutions: An Action Research Experience

Dharmendra Yadav; Ansal Institute of technology, India
Shikha Gupta; Ansal Institute of Technology, India

Studies have shown that ICTs are general-purpose technologies that bring improvements in productivity and efficiency in organizations. However, the growth of the organizations using ICT poses challenges in terms of adopting, deploying and implementing the right kind of information security systems. Financial constraints impose limitations on deployment, implementation and managing ICT, specifically a secured IT infrastructure. The study is based on a higher education technical teaching institute focusing on implementing a robust secured ICT infrastructure with a limited budget. The study gives an insight into the challenges facing academic institutes in a developing country, namely India. A case-based approach is used to analyze the issues in managing the security in an academic environment with vast amounts of computing and open access provided to the user in hostel based campus. The case highlights the challenges faced by organizations while building and managing a secured IT system and also presents interesting challenges and attacks faced while the system requires openness and continuous sharing.

WD-12 Semiconductor Industry
Wednesday, 8/1/2012, 14:00 - 15:30
Room: Azure
Chair(s) Jonathan C Ho; Yuan Ze University

WD-12.1 [A] Managing Moore's Law: A Survival Guide for VLSI Circuit Manufacturers

Charles M Weber; Portland State University, United States
Jiting Yang; Portland State University, United States

A qualitative empirical study of the VLSI circuit manufacturing explores the challenges of pursuing Moore's law. The study finds that 1) leading-edge VLSI circuit manufacturing ventures tend to be highly profitable, but only if the manufacturer delivers a timely revolution in organizational performance; 2) fast followers are increasingly having difficulty recovering their investment; and 3) slow followers have the highest return on investment in the indus-

try. These findings question whether the pursuit of Moore's law is financially sustainable. The study also provides an analytical model of a VLSI circuit manufacturing process that helps managers make investment decisions through scenario planning.

WD-12.2 [A] Transitioning Semiconductor Foundry Business Model to Complete IC Manufacturing Turnkey Solution Provider

Martin A Vagues; Ultrasolar Technology, United States
Santosh Kumar; UltraSolar Technology, United States

This paper describes the transitioning of semiconductor foundries from pure-play manufacturing only to complete integrated circuit (IC) manufacturing turnkey solution provider. Today's model of semiconductor manufacturing is driven by design houses with dependency on packaging houses to define their package. Most of the packaging houses provide legacy packages to keep their operating cost low. So, value engineering for semiconductor manufacturing is slowly fading, giving rise to a gap that becomes mandatory for designers to think out of the box and provide higher density with multiple circuit functions, what is known today as the System Design. Going beyond system design, we must be able to get closer to the end of the food chain and select providers who are creative from an end product design. In the microelectronics industry, a semiconductor foundry provides cost-effective IC manufacturing technology and wafer fabrication services to fabless IC design companies. However, besides contracting wafer fabrication, fabless companies also require new product development (NPD) solutions including design collaboration, technology customization, device models, packaging solutions, and end product design. Therefore, the role of foundry has become extremely critical to drive NPD services and end-product solutions for customers. This paper describes the organization, functionality, and the role of foundries that must transition from pure-play wafer manufacturing to turnkey solution provider. Acquisition of these foundries and subcontractor manufacturers will be a huge part of the equation.

WE-01 Technology Management in Automotive Industry

Wednesday, 8/1/2012, 16:00 - 17:30
Room: Pavilion Ballroom A
Chair(s) Peter W Tse; City University of Hong Kong

WE-01.1 [R] On-road Mobile Phone Based Automobile Safety System with Emphasis on Engine Health Evaluation and Expert Advice

Peter W Tse; City University of Hong Kong, Hong Kong
Y.L. Tse; City University of Hong Kong, Hong Kong

There are numerous casualties caused by traffic accidents every year that result from malfunctioning of automobiles' components and human negligence. Undoubtedly, automobiles under frequent servicing are easily subjected to accidents once imminent defects have occurred when running on road. An automatic fault diagnosis system that can prevent accidents on a road but only require a reasonably low sensor price is highly demanded. To fulfill such a need, an innovative system was designed. It can be installed in a passenger car or a truck that is running on the road and provides instantaneous engine health evaluation and diagnosis. If the monitored car or truck has any sign of having any early defect, a proper remedy can be prepared by a remote maintenance center. With the latest technology in wireless communication, sensor data captured from the running car or truck can be transmitted to the maintenance center. With the help of a built-in expert system, instant fault diagnosis can be performed automatically in the designated PC server located at the remote center. Once a serious fault has been automatically identified, the center will send warnings to the driver's mobile phone to inform the driver about the damage and suggest a proper remedy. Moreover, tracking the running conditions of the car/truck via our built-in GPRS technology helps the maintenance center in conducting effective fleet management. In the future, this system not only prevents the occurrence of accidents that may cause catastrophe, but also minimize the improper consumption of expensive fuel through good fleet management.

WE-01.2 [A] Network Performance Impact on Supply Reliability in the Automobile Industry

Jakob E Beer; University of Stavanger, Norway
Terry Schumacher; Rose-Hulman Institute of Technology, United States
Jayantha P Liyanage; University of Stavanger, Norway

The automobile industry relies heavily on its global supply networks. Nevertheless, there is some reason to assume that some OEMs which suffered from frequent supply shortages in 2010 and 2011 could have performed better if they had reassessed the assumptions upon which they managed their suppliers. One of the outdated assumptions the car industry relies on (and one that is continuously enforced by supply chain management text book claims) is that OEMs deal with supply chains as opposed to complex networks with both vertical and lateral performance impacts. Based upon on-site research, interviews with OEMs and suppliers, and theoretical research in organizational theories, this paper concludes that considering the network characteristics of the automobile industry OEMs should reconsider their practice of standard production capacity flexibility in their supply management. It will be discussed how network effects and the resulting performance dynamics can make a difference in the supply performance of suppliers and thus should be taken into account.

WE-01.3 [R] A Study on Technological Learning Performance of Chinese Automobile Industry

Yuchen Zhang; Tongji University, China
Xianpeng Lu; Tongji University, China

The automobile industry in China has stepped into the stage of adopting and learning foreign technology since 1987. In the past 20 years, there appear three typical technological learning patterns in the automobile industry. First, local companies gain technology support from multinational companies through establishing joint ventures, with the aim of realizing technological learning through assembly manufacturing, e.g., Shanghai Volkswagen. Second, local companies develop professional R&D centers with multinational companies after establishing joint ventures with them, which provides support and guarantee for the production and operation of the joint ventures, e.g., Shanghai GM and PATAC. Third, with the development of self-owned brands, local companies attempt to completely merger multinational companies or buy out the whole technology, aiming to improve technological innovation capabilities through independent innovation and integrating innovation resources, e.g., SAIC Motor 's acquisition of Rover. This paper takes the quantity and quality of self-owned brand products, the promotion of technological innovation capabilities, and the intellectual property right of the enterprises as the main criteria, making a comparison of the three kinds of technology learning patterns, which aims to explore more effective technology learning models.

WE-02 Technology Management in the Energy Sector - 6

Wednesday, 8/1/2012, 16:00 - 17:30
Room: Pavilion Ballroom B
Chair(s) Cory Hallam; University of Texas at San Antonio

WE-02.1 [R] Cost Analysis for Durable Proton Exchange Membrane in PEM Fuel Cells

Ali Taleb; Simon Fraser University, Canada
Erik Kjeang; Simon Fraser University, Canada
Elicia Maine; Simon Fraser University, Canada

Proton exchange membranes (PEMs) are a major determinant of fuel cell lifetime. For automotive applications, standards call for high levels of operation stability are reportedly 5,500 hours for cars and over 20,000 hours for buses. In addition to durability, membranes should also meet a certain price target for fuel cells to be competitive with incumbent gasoline and diesel internal combustion engines. A techno-economic analysis has been performed to explore different membrane designs which are proposed to enhance durability. For this reason, a cost analysis platform has been created. The technical-economic cost model (TCM) developed depicts how the production cost per unit varies depending on the different fabrication methods, production rate limitations, material selection, labor distribution,

energy consumption, financial parameters and the target production volume. This platform enables the efficient exploration of each potential design solution and identification of the key factors for each design. By using such an approach in the design, research time and resources can be saved by prioritizing R&D and production scale-up options at an early stage. Using our cost analysis platform, we explored the effect of material cost on the overall production cost for PEMs based on NAFION; the effect of additive on the overall cost is minor, especially when the production process is unchanged. Comparing the results to existing market standards, we found that current industry standard assumptions are intended for conservative investment.

WE-02.2 [R] Manufacturing Cost Modeling for Flexible Organic Solar Cells

Vivien Lo; Simon Fraser University, Canada
Clint Landrock; Simon Fraser University, Canada
Bozena Kaminska; Simon Fraser University, Canada
Elicia Maine; Simon Fraser University, Canada

Solar energy is an abundant source of renewable energy. With increasing demand for energy generation to meet rising energy needs, there is immense interest in electricity generation from solar power using photovoltaic cells (PV). While conventional silicon PVs (Si-PVs) dominate the current solar PV market, wide adoption is limited mainly due to the high cost of silicon and related processing. In contrast, emerging technologies such as organic material based PVs can be fabricated as thin flexible sheets using conventional printing techniques and have the potential of saving significant materials and costs as well as reducing environmental impact. Despite having limitations in power conversion efficiencies, OPVs have the potential to displace traditional Si-PVs and enable new market applications, and it is therefore worthwhile to understand their production economics. This paper presents a technical-economic cost model (TCM) analysis based on three manufacturing processes defined by IDME Technologies Corporation (IDME). The TCM was used to investigate the manufacturing cost of scaling up production of OPVs to three different annual production volumes and to make recommendations for production scale-up. The findings suggest that an automated semi-continuous process is the most suitable manufacturing process for the widest range of production volumes in a cost-effective manner.

WE-03 Strategic Management of Technology - 3
Wednesday, 8/1/2012, 16:00 - 17:30Room: Pavilion Ballroom C
Chair(s) Antonie de Klerk; University of Pretoria

WE-03.1 [R] Tipping Points in Science: A Catastrophe Model of Scientific Change

Jan H Kwakkel; Delft University of Technology, Netherlands
Scott Cunningham; Delft University of Technology, Netherlands

In this paper we discuss the capabilities for scientific knowledge to demonstrate explosive growth in short periods of time. In one notable example, the field of engineering and technology management grew more rapidly in the four years after 1980 than it was expected to grow for the next 40. We provide 22 examples drawn widely from science, demonstrating that this phenomenon is pervasive throughout science. We propose a new model, based on the idea of folds from mathematical catastrophe theory, a phenomenon that is more popularly known as tipping points. This model is then fit using non-linear regression in the presence of Poisson noise. While the tipping point does not occur in all fields of science, in those cases where it does occur the resultant model overwhelmingly supports the idea of catastrophic growth within scientific knowledge. We describe the differential equations underlying the fold catastrophe and relate these equations to a process of communication and interaction. We relate this dynamic to other word-of-mouth models such as the Bass diffusion model. We further discuss why scientific, and to a lesser extent news, articles are subject to this behavior, while the same phenomenon is unlikely to occur when solely measuring the sales of a physical product. We provide evidence of the phenomenon in one brief sociological sketch of scientific activity. Finally, we discuss the relevance of the model in terms of innovation forecasting. In particular, we evaluate the possibility for ex ante anticipation of the bifurcation point.

WE-03.2 [R] Anticipating Organizational Technological Exploration and Exploitation Dynamics under Varying Knowledge Usage Rates

Saku J Makinen; Tampere University of Technology, Finland
Matti Vilkko; Tampere University of Technology, Finland

The central decision any organization must make is its balancing act of determining which markets to serve with what products and balancing between exploration-exploitation, i.e. whether to seek new technological knowledge to develop new offerings or whether to allocate scarce resources to established technological knowledge and serve current markets. This core strategic dimension can subsequently be dichotomized to a decision-making regarding exploitation versus exploration balance under the management of absorptive capacity in acquiring versus discarding new technological knowledge. We explore the dynamics of the balance of innovation output resulting from dichotomized strategic decisions in exploration and exploitation under the variable rate of external technological knowledge usage. We build a system dynamic model considering the process of absorptive capacity at the company level and additionally facilitate feedback loops in the process. We shed light on the dynamics of innovation creation from external technological knowledge acquisition when small initial changes in strategic decision making lead to substantial differences in company output. Our simulations illustrate in their basic form how various managerial decisions regarding exploration-exploitation dichotomies in line with the usage of acquired knowledge may influence the output of R&D.

WE-03.3 [R] Pricing Strategies of Monopoly Platform for Technology Transition in a Two-Sided Market

Dohoon Kim; Kyung Hee University, Korea, South

In this paper, we consider a single monopoly platform provider which operates both platforms: an old and a new platform. These two platforms connect the user group with the suppliers, thereby leveraging the indirect network externalities in a two-sided market. We also incorporate a cross-platform externality which represents a potential backward compatibility of the new platform, i.e., users joining the new platform can also enjoy the products and services provided by suppliers using the old platform. Users and suppliers are uniformly populated over [0, 1] interval as in the Hotelling model, and play a subscription game to choose (exactly) one platform. The platform determines the pricing profile for the supplier market, and users and suppliers respond to the pricing profile. Our basic analysis for static equilibrium shows that it is very unlikely that an interior equilibrium is stable. Furthermore, some specific types of boundary equilibriums, where at least one market side tips to a single platform, are stable under certain conditions. We also present a dynamic decision model of the platform provider, which tries to maneuver the markets toward a target state by controlling price profiles. Our analytical results from the optimal control theory assert that a bang-bang control with subsidization for a specific platform will eventually lead the market to the corresponding boundary equilibrium. Thus, the cross-platform externality plays an important role for a co-existence of competing platforms under a certain condition.

WE-03.4 [R] Finding Linkage between Technology and Social Issues: A Literature Based Discovery Approach

Vitavin Ittipanuvat; The University of Tokyo, Japan
Katsuhide Fujita; The University of Tokyo, Japan
Yuya Kajikawa; The University of Tokyo, Japan
Junichiro Mori; The University of Tokyo, Japan
Ichiro Sakata; The University of Tokyo, Japan

With social issues such as an aging society and sustainability becoming of greater concern than ever as we are heading towards the future society, decision makers in both the government and private sector need to identify and focus their efforts on promoting key technologies which have significant contributions to these increasingly complex social problems. However, such connections are not easy to trace, thus making this subject very difficult to be completely understood. Meanwhile, literature based discovery (LBD) has been widely

accepted as an effective approach to discover hidden connections from information within bibliographical databases but is still used mainly in medical databases. This paper investigates the possibility of a broader application of LBD to reveal the linkage between technology and social issues from science and social science citation databases. Robotics and gerontology were selected as an example dataset, and some lexical statistics were used to suggest important connecting terms. The result shows various contributions of robotics to healthcare and the well-being of elderly people such as surgery, hearing implants, and rehabilitation. This methodology could offer an alternative approach in creating an overview picture of how one technology contributes to a particular social issue and assists in forming policies to promote key technologies towards the future society.

WE-04 Decision Making - 4
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Pavilion Ballroom D
Chair(s) Dundar F Kocaoglu; Portland State University

WE-04.1 [R] A Case Study: Using Hierarchical Decision Model Voting in Theoretical Market Share Investigation

Bing Wang; Beijing University of Posts & Telecommunications, China

Traditional hierarchical decision model (HDM) methods mainly use the mean values to aggregate the opinions of the experts and get the rankings of candidates as the decision result. The HDMV (hierarchical decision model voting) method uses a voting method with the HDMs to facilitate the voters making decisions and get the voters proportion as the result. In the fiercely competitive business environment, the competitors want to know the customer's selection of a certain kind of production. Different persons have their own choices. These decisions result in the theoretical market share of the products or services. If the companies/organizations want to improve the market share, an investigation can be conducted by the way of HDMV. This research uses HDMV to evaluate the theoretical market share of three distance education schools in Beijing. We build a HDM with four criteria and three candidate options for the students to select from. The data is collected from the 40 students in Beijing. The results show the proportions of the students that will select different distance education schools. We also analyze the policies for the distance education schools by the analysis of the results and data.

WE-04.2 [A] Hierarchical Decision Modeling for Selection of a Graduate Institution

Alyaa Barzanji; Portland State University, United States
Parisa Ghafoori; Portland State University, United States
Chris Imondi; Portland State University, United States
Karen Dasmarinas; Portland State University, United States
Maribel Villanueva; Portland State University, United States

This paper demonstrates a decision making process for selecting the best graduate institution (in this case in the Northwest region) for international and domestic graduate students. The educational institutions reviewed will be limited to the public institutions located within the Northwest region. A brief overview of each institution considered as an alternative is provided. This report also explains how the hierarchical decision model (HDM) was set up with major and sub-criteria to prioritize the alternatives. Before using this tool, the criteria that are deemed important to the students must be selected. Fifteen experts responded to the instrument and their judgments were analyzed. The calculations were obtained using the pairwise comparison method (PCM) software, which calculates the inconsistency within a sample data. Then the institutional facts were researched and final utility weights were computed for each. Finally, the analysis and results will be presented along with future enhancements to this model.

WE-04.3 [A] Relative Importance Analysis of Inter-IS Audit Evaluation Standards

Boohyoung Lee; Kongju National University, Korea, South
Dundar F Kocaoglu; Portland State Univesity, United States
Dong-Joon Lim; Portland State University, United States

As a scale of the information system (IS) becomes larger and the level of dependence increases, it becomes more important to examine and prevent potential risk factors that would occur during the development or operation process. The Korean government introduced IS audit system in 2006 for stable development and efficient management. According to this law, every company that develops a program for any Korean government branch over $500,000 is required to be audited. This audit system consists of seven audit fields, 16 processes, 32 sub-areas, and 167 audit items. However, several problems have been raised that these criteria are unnecessarily fragmented, and some of them are being overlapped, thereby becoming inefficient as well as inconsistent. Therefore, this audit system needs to be evaluated as the user demand level improves and the software development environment changes rapidly. In this research, Korean IS audit items are prioritized using constant-sum method in order to identify their relative importance.

WE-04.4 [R] Using Delphi and AHP in ISDM

Hamid ALHajri; Omani National Army, Oman
Yacine Rezgui; Cardiff University, United Kingdom
Adam Marks; Embry Riddle Aeronautical University, United States
Ian Wilson; Cardiff University, United Kingdom

Studies concerned with the status of ISDM usage in many developing countries, including the factors that influence and motivate their use, current trends, difficulties, and barriers to adoption, are lacking. This paper examines these identified gaps in a developing country, namely Oman. The initial findings reveal that there is limited knowledge and understanding of the concept of ISDM amongst Omani information systems (IS) personnel. This is reflected in the quality of the software products being developed and released. However, the analyzed data also reveals a trend whereby a majority of Omani organizations are gradually moving towards increased ISDM adoption and deployment.

WE-05 Information Management - 3
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Orca
Chair(s) Richard Weeks; University of Pretoria

WE-05.1 [A] Influence of Employees' Emotions on Their Use of New Information Technology

Aifang Guo; Zhejiang Sci-Tech University, China
Lei Shao; Zhejiang Sci-Tech University, China
Zhe Zuo; Zhejiang Sci-Tech University, China

How to promote the use of new information technology (IT) among employees has become a major challenge for enterprises' informatization construction. Most of the extant studies on the adoption of IT are based on the cognitive theory. By contrast, little research has been engaged in exploring the effect of emotions on the IT use. The aim of this study is to explore the relationship between emotions and IT use. It analyzes how employees' four emotions (i.e., anger, anxiety, excitement and happiness) affect their use of IT. In addition, it considers the mediation effect of employees' four coping strategies (i.e., social support, avoidance; positive coping and approaching strategy) on the relationship between emotions and the use of IT. By deriving several theoretical sound and managerial useful propositions, this research advances knowledge in the relationship between emotions and IT use.

WE-05.2 [R] Learning from Users for a Better and Personalized Web Experience

Tarmo Robal; Tallinn University of Technology, Estonia
Ahto Kalja; Tallinn University of Technology, Estonia

The Internet has grown into a sophisticated set of resources providing an ever-increasing amount of information, leaving users to face information overload coupled with problems of successful information retrieval. Search engines can alleviate the problem to some extent; however, they are unsuitable for web sites' optimization and cannot tackle the problem of

recognizing user's interest domain and thus are unable to deliver personalized web experience. Adaptive personalized web on the other hand allows delivery of web pages accordingly to visitor's interest domains by taking advantage of systems recognizing user's intentions and modeling the users and their interest profiles. In this paper we concentrate on improving visitor's web experience by modeling an anonymous web user. The latter is the main distinction of our work compared to available related studies.

WE-05.3 [R] An Analysis of the Technological Intelligence Development Based on Bibliographic Database

Eugenio Lopez Ortega; National University of Mexico, Mexico
Tamara Alcantara; National University of Mexico, Mexico

Technological intelligence (TI), also known as technology surveillance, has had an important growth in the last 20 years. In order to analyze TI development, a database called SCIT-IT was structured. More than 1.200 documents related to technology intelligence (papers, books, reports) published from 1985 to 2009 were included in the database. Based on SCIT-IT reports, the paper analyzes the approaches and knowledge over different TI applications. Relevant authors and institutions related to each approach are identified. Further, different ideas about trends of technological intelligence are discussed and presented as the paper's main conclusions. It is possible to observe in the early years of the period 1985-2009 that technological intelligence was associated with information technology. Although this association still exists, several disciplines and applications have emerged such as knowledge management, text and data mining, innovation process, patent information and analysis.

WE-06 Project/Program Management - 2
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Finback
Chair(s) Hans J Thamhain; Bentley University

WE-06.1 [R] Leadership Effectiveness in Global Project Teams

Hans J Thamhain; Bentley University, United States

The challenges of managing culturally diverse and globally dispersed project teams are examined in a two-year field study of 27 technology-intensive product developments. The findings provide insight into paradigm shifts in the business environment that led to more open, agile management processes and team leadership. The paper suggests a framework for assessing leadership effectiveness together with the critical success factors for effectively leading teams in today's complex project environment.

WE-06.2 [R] Project Portfolio Management and Enterprise Resource Management: Merging Technologies?

Siebert J Benade; GSTM, University of Pretoria, South Africa
Corro van Waveren; GSTM, University of Pretoria, South Africa

Most enterprises are trying to expand their business, hence aiming to increase turnover and profit. The challenge is to win potentially profitable contracts and to create value to best serve the needs and expectation of customers and other stakeholders. A second challenge is to establish an on-going process of "capability and capacity expansion" in the enterprise to improve long-term sustainability. A third challenge companies face is to effectively and efficiently identify and utilize scarce and expensive enterprise resources to achieve these value creation and capability establishment objectives. Exploratory research is being done regarding project-based industries and process-based industries addressing the above-mentioned challenges. Enterprise-wide management approaches, processes, trends and tools are investigated. The "business process" with required resources plays a pivotal role in process-oriented industries, and a typical management approach followed is enterprise resources management (ERM) or similar with associated tools. In the project-oriented business the "project" and currently project portfolio management is used as a management approach supported by PPM tools. However, these two types of business are not purely process or project-based anymore, but are becoming a combination of project and process. This leads to challenging developments and could have a far-reaching effect on how businesses are perceived and managed and how tools are used.

WE-06.3 [R] Managing Complexity in Technology Intensive Projects

Waqar Haider; Center for Advanced Studies in Engineering, Pakistan
Abrar Haider; University of South Australia, Australia

As businesses operate in increasingly more complex environments, understanding complexity and its sources is becoming increasingly important. These sources range from internal organizational culture to the technical and social environment in which the business operates, to the competitive dynamics aimed at capturing and maximizing market share. The increasing unpredictability and complexity of unforeseen competitive consequences call for novel methods of planning, execution, and management of business. As organizations confront these changes and attempt to adapt to them, they find that management of technology intensive projects can no longer be viewed as a linear process of planned actions. In these projects, change agents self-organize to accomplish pre-determined goals based on the feedback and emerging circumstances, and to cope with future uncertainty. This process of self-organization results in organizational evolution and growth based on generative learning that facilitates continuous improvement through action-oriented learning. In doing so, this increased complexity results in complex adaptive systems increasingly evolving throughout the organization and creating unpredictable changes operating between stability and instability. This paper tackles the issue of complexity management in technology intensive projects. It particular, it focuses on elements of complexity; the role of project managers; and tools, techniques, and models for managing complexities in projects.

WE-07 Technology Adoption - 3
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Beluga
Chair(s) Andre J Buys; University of Pretoria

WE-07.1 [R] Exploring the Success Factors of Electronic Health Record Systems Adoption

Orhun M Kök; Bogazici University, Turkey
Nuri A Basoglu; Bogazici University, Turkey
Tugrul U Daim; Portland State University, United States

Technology is used in many areas in health services. Medical informatics is a discipline which focuses on the data storing, processing, information and knowledge management related to health care. Doctors have an important role in the adoption of health information systems in different areas. The main adoption factors have been analyzed through literature review and in-depth interviews.

WE-07.2 [A] The Analysis of Key Factors Affecting the Success of Technology Adoption in Healthcare Organizations in Thailand

Chonyacha Suebsin; Mahidol University, Thailand
Nathasit Gerdsri; Mahidol University, Thailand

This paper addresses the key issues impacting the adoption of new technology in healthcare organizations. Case studies of new technologies' implementation in four hospitals in Thailand are conducted through a series of in-depth interviews to determine the factors affecting the adoption process. The results present the key issues that influence adoption decisions and implementation processes. At the organization level, the findings contend that these hospitals primarily make decisions to adopt new technologies based on project-related costs. At the individual level, the processes are mostly found to be affected by human-related issues. Apart from the identification of key factors, the latter part of this paper also includes the mental framework of the adoption developed based on the technology acceptance model (TAM).

WE-07.3 [A] Adoption of Health Information Technologies

Nima A Behkami; Portland State University, United States
Tugrul U Daim; Portland State University, United States

The objective of this paper is to measure prevalence of HIT capabilities in Patient-Centered Medical Homes and their impact on delivery of care, with a focus on patient registries. The paper had the following research questions. How does payer mix affect level of registry implementation in medical home practices? What are the underlying structures of implementation barriers that medical home practices experience? How does level of registry implementation affect registry use in medical homes? What is the effect of registry use on clinic satisfaction in medical homes?

WE-08 Technology Transfer - 4
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Parksville
Chair(s) Mary Mathew; Indian Institute of Science

WE-08.1 [A] The Application of Lean Management Principles to Fields Other Than Manufacturing

Paul J Resetarits; Central Connecticut State University, United States

The Toyota production system was the foundation for the development of lean manufacturing. The founding principles were based on identifying and eliminating waste in the value stream. Over the past 20 years, many manufacturing organizations have undergone a lean transformation. The results of the lean transformation have had many benefits. Manufacturers have experienced increases in profitability and customer satisfaction as a result of reducing their lead times, improving product quality and eliminating waste. Benchmarking theory notes that many breakthrough improvements come from looking at similar processes performed by other businesses. This paper will examine how the success of lean management in the manufacturing sector has led other sectors to adopt the lean principles. The lean philosophy and its supporting tools and techniques are yielding great benefits to customers of many other businesses well beyond manufacturing. Specifically, this paper will document the successful implementation of lean in healthcare, government, information technology, and construction management. The benefits these organizations have derived through their lean activities and how others can follow their lead will be presented.

WE-08.2 [R] Technology Transfer in Adverse Conditions

Jose Luis Solleiro; National University of Mexico, Mexico
Rosario Castañòn; National University of Mexico, Mexico

University-company interface has been a research subject for several decades, and its importance for company competitiveness has become obvious. There are many experiences of university-industry interfacing, and industrialized countries have had the best results, partly due to the quality of their research, but also to their infrastructure, legal framework and management that allow them to develop these activities in a suitable environment. In Latin America, and particularly in Mexico, even though there are efforts to build academy-industry relationships, the results have not been so promising. Among other things, this is due to the lack of a supportive environment and institutional policies that endorse the projects under development, to the lack of researchers interested in cooperating, and to the lack of infrastructure. Based on practical experience in technology transfer, key aspects are needed to achieve successful interface in Mexico. They include: 1) clear institutional policies that encourage technology transfer activities; 2) activities related to generating value for these technologies; 3) a critical mass of high quality researchers to rely on; 4) an acceptable environment for enterprising; 5) a close relationship between business men and researchers; and 6) institutional flexibility.

WE-08.3 [A] The Compensation Policy Commercial, Industrial and Brazilian Air Force Technology and Its Benefits to the Brazilian Aerospace Park

Manuel A Fagundes Perez; Instituto Tecnologico de Aeronautica, Brazil

The Brazilian Government, particularly the Brazilian Air Force, has sought alternatives to the technological improvement and industrial aerospace. Among these has been widely practiced negotiating compensation (offset) from foreign suppliers as a condition for import of goods and services. The acquisition of the aerospace show was a great asset to the practice of compensation (offset), given the different characteristics compared to other sectors of the economy involving products of high added value and advanced technology. The main objective of this policy is to promote the growth of technological and quality levels of the Brazilian Aerospace Industrial Park, with the modernization of production methods and processes and implementation of new technologies. In this policy we can highlight the types of direct and indirect compensation arrangements for compensating transactions, licensed production, and co-production, under subcontract production, investment, technology transfer and countertrade. In this scenario, the Air Force is to work directly in the development of the country, obtaining foreign investment priority, activity aerospace, civil and military, with a view to development and technological modernization and Brazilian aerospace industry and, exceptionally, other areas of interest of the country, as the academic and medical research.

WE-09 New Product Development - 3
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Port Hardy
Chair(s) Ann-Marie Nienaber; University of Witten/Herdecke

WE-09.1 [R] Initiative in Teams in the Front End of Innovation: An Empirical Study about the Success of Structured and Unstructured Teams

Ann-Marie Nienaber; University of Witten/Herdecke, Germany
Gerhard Schewe; University of Munster, Germany
Verena Holtorf ; Henkel AG & Co. KGaA, Germany
Jens Leker; University of Münster, Germany

This paper contributes to the discussion on initiative in teams in the front end of innovation processes (innovative teams). In contrast to the general opinion presented in the literature, this study points out that unstructured innovative teams are able to show as much initiative in developing new ideas or in finding quick solutions as structured innovative teams. Therefore, we analyze the relationship between teamwork quality and team initiative in structured and unstructured innovative teams and, additionally, we focus on a climate of psychological safety. To examine this relationship, a collection of data was conducted among 135 team members from different departments in an international corporation. As has already been pointed out in literature, unstructuredness of team members has a negative effect on success, but we can demonstrate that this effect can be neutralized by a climate of psychological safety. All advantages of an unstructured team can be utilized such as being more creative or gaining unprecedented task solutions. Thus, it can be stated that unstructured teamwork combined with a climate of psychological safety developed by top management is the best way to be successful.

WE-09.2 [R] Adverse Factors of Knowledge Integration in a Product Development Organization After M&A: A Case Study of a Precision Device Manufacturer

Nobuhiro Horie; Japan Advanced Institute of Science and Technology, Japan
Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan

This study discusses knowledge integration in a product development organization after M&A. The goal is to contribute to establishment of a methodology that helps to accomplish the purpose of M&A. This study analyzes establishment of a new product development organization and its entry into a new market. This study indicates that knowledge integration is conducted in three phases: 1) knowledge of the acquiring company and the acquired company is assessed; 2) the product development organization is reorganized based on the assessment; and 3) knowledge is created in the process of product development in the new organization. This study indicates that one of the adverse factors against knowledge integration in product development organizations is differences of corporate cultures between the acquiring company and the acquired company. This problem will be resolved in the mid-term and long-term, since a new corporate culture will mature in the product development organization. If the acquiring company persists on its existing knowledge, it is difficult to develop new products suitable for the new market. Thus, another adverse factor against

knowledge integration is persistence in the knowledge not necessary for the new market. In order to prevent this, abandonment of such knowledge is conducted during reorganization of the product development organization.

WE-09.3 [R] Technology Acquisition and Product Development Performance in the Electronics Industry in South Africa

Kevin Schlorke; University of Pretoria, South Africa
Kai-Ying Chan; University of Pretoria, South Africa

Much research with regards to the choice of technology acquisition modes was done in developed countries, but not in developing and emerging economies such as South Africa. Moreover, research on the linkage between technology acquisition modes and product development performance is lacking in the literature. This empirical study investigates the linkage between these three groups of variables, namely: technology acquisition modes (ranging from purely internal to purely external and combinational in between), factors that affect the choice of the modes (14 were identified from the literature review), product development performance measures (the percent of products which met their revenue targets, the percent of products which met their product cost targets, the percent of products which met their launch date targets, the percent of products which met their product quality targets, and the percent of products which met their development cost targets). The units of analysis are the electronics engineering companies in South Africa. A framework was developed and data were collected using questionnaires. A total of 30 companies participated in this study. Correlations and regressions were performed to explore the linkages amongst these variables. Several statistically positive relationships were identified to support the hypotheses in the framework.

WE-10 Technology Management Education - 2
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Port McNeill
Chair(s) William T Flannery; University of Texas at San Antonio

WE-10.1 [R] Further Education in the Tool and Die Industry

Günther Schuh; RWTH Aachen University, Germany
Kristian Kuhlmann; RWTH Aachen University, Germany
Martin Pitsch; RWTH Aachen University, Germany

Modern tool technologies and know-how intensive processes are the basis for a successful positioning of tool and die companies in the global competition of tool making. In this competition for attractive orders, the tool and die industry in high wage countries has to create a knowledge advantage to preserve international competitiveness. Only by regularly qualifying and educating their employees in the fields of technology, economical principles and self-development can long-term advantage be achieved. Eight percent of the German tool and die makers have less than 20 employees. It is therefore difficult to offer their employees further education using existing education methods and programs. Due to restricted resources, the absence of highly skilled workers over a full period of two or three years is almost impossible. A solely theoretical education has moreover proven to have little return for the mostly practically oriented tooling experts. The tool and die industry needs further education which is independent from a fixed time frame and especially tailored to the needs and learning habits of the highly skilled workers. To address this need the RWTH Aachen University of Technology has created a flexible and modular structured master's program in tool and die engineering. The program is exclusively part time and contains 12 modules including the master's thesis. Since each semester contains two modules, the program can be passed in three and one half years. This program focuses entirely on the needs of the tool and die industry and is unique in Germany.

WE-10.2 [R] E-learning: Using Technology as a Vehicle for Development, Case of Madagascar

Saraha T Ramanase; University of Antananarivo, Madagascar
Elisé Raveloson; University of Antananarivo , Madagascar
Jean-Jules Harijaona; University of Antananarivo , Madagascar
Herindrainy Olivier Rakotomalala; University of Antananarivo , Madagascar

In African countries, tertiary education occupies a nearly insignificant place in the national budget, 1.5 percent in Madagascar. The latter results in a lack of teachers, damaged infrastructure and poor quality education. Besides, the university capacity is only 35 percent of the students graduated with baccalaureate degrees. This vicious circle leads to an increase of the brain drain rate; each year, thousands of students move mainly to France. The objective of this paper is to discuss the possible solutions for improving the tertiary education accessibility in Madagascar. By the mean of the systemic analysis along the STEEP (social, technological, economical, environmental and political) dimensions, we found the possible solutions. Then, we made a comparative analysis of these solutions using three criteria: cost, teachers' accessibility and students' accessibility. As a result, we found that e-learning is the best alternative, especially now that optical fiber is implemented and the universities' equipment is reinforced with an agreement with Microsoft. However, reducing its cost requires the government involvement, the telecommunication companies' investment in the network accessibility within public-private partnership (PPP), and an increase of the number of students.

WE-10.3 [R] Reconstruction of the Interdisciplinary Perspective of Trabalho Interdisciplinar Orientado (Guided Interdisciplinary Work) in Training for Managers in Agribusiness

Angélica G Morales; Univ. Estadual Paulista, Brazil
Cristiane H Bernardo; Univ. Estadual Paulista, Brazil

The article in question has the purpose of the study of interdisciplinarity by the Trabalho Interdisciplinar Orientado, TIO (guided interdisciplinary work) in the course of Business Administration with emphasis in Agribusiness, Universidade Estadual Paulista "Julio de Mesquita Filho" (UNESP), offered on Campus Experimental Tup, in the State of So Paulo, Brazil. This work has the overall objective: to analyze the development of TIO and reflect on their structure, in order to evaluate their practice by identifying their strengths and weaknesses during the Course of Business Administration with emphasis in Agribusiness. Adopted a qualitative approach, based on a pesquisa-ao (action research), whose development is in the first part related to the diagnosis of the TIO in the course. Thus, when analyzing professor and student perceptions on the development of TIO, it was noted the TIO offers the possibility of interconnection of theoretical concepts and practical, from various disciplines, as well as being a methodological approach which takes advantage of an experience of the organizational environment through an interdisciplinary exercise among professors x professors, students x professors and students x students.

WE-10.4 [A] Educating Undergraduate Students on Systems Thinking and System Dynamics

Murat Kudret Yurtseven; Izmir University, Turkey
Walter W Buchanan; Texas A&M University, United States

Here we propose ideas on educating students on systems thinking and dynamics which have wide applications in engineering and technology management. This is from an ongoing study, involving the design of systems-oriented undergraduate courses at Izmir University. These courses are being designed to enrich the undergraduate education in engineering and social sciences in general, and technology management in particular. The first course in the sequence is Systems Thinking, Systems Practice, introducing basics of systems thinking and its application. The subject matter of this paper is the second and the third courses: Introduction to Dynamic Systems, and System Dynamics and Managing Complexity. The former is on the essentials of systems theory, covering both linear and nonlinear systems. This course establishes the theoretical and analytical grounds for the latter. The objectives of System Dynamics and Managing Complexity are designed to present a combination of quantitative and qualitative tools for modeling complex systems (industrial systems, socio-economic systems, ecological systems, etc.) and to teach the application of systems dynamics methodology. All three courses are offered to students of natural sciences, social sciences, and engineering. This particular approach to systems

thinking and system dynamics will produce relatively better results in teaching technology management topics.

WE-11 Information Technology - 2
Wednesday, 8/1/2012, 16:00 - 17:30
Room: Port Alberni
Chair(s) Jasper L Steyn ; University of Pretoria

WE-11.1 [R] One-Person Firms Application Product Survival Analysis: U.S. vs. Korea in App Store

Euy-Young Jung; Seoul National University, Korea, South
Seogwon Hwang; Science & Technology Policy Institute, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South

App Store is a fast growing emerging market that has several characteristics. In over 100 App Stores, Korea App Store has two interesting points, the absence of a games category and a relatively high ratio of one-person firms, which are not only producing and selling their own goods and services, but also the smallest size. Compared to the United States App Store, we elucidate the one-person firm's product survival that is linked to two revealing points. We find that first, Korean one-person firm products are competitive while foreign one-person firm products are less competitive in Korea App Store. The possible reason could be insufficient understanding of the market and failure of customer satisfaction. Second, the dominant position of Korean one-person firm products in Korea App Store does not last long. As new products are released and the market becomes more competitive over time, Korean OPF products are forced to exit the chart.

WE-11.2 [R] An Evaluation of the Impact of ICT on Agricultural Productivity in Nigeria

Oladiran O Abidakun; University of Pretoria, South Africa

As one of the main targets of the Millennium Development Goal (MDG) is the halving of hunger by 2015, there is no gainsaying that the eradication of hunger remains one of the highest priorities of the human race. With countries on the continent having astronomical percentages of her people termed as having chronic undernourishment or hunger, Africa is the world's most hungry continent. The ability of the emerging technologies, particularly the use of improved information and communication technological systems to bring about a tremendous improvement in agricultural productivity, cannot be overestimated. In spite of this, however, there has been little literature and reliable data on the effects of the use of ICT in Nigeria's agricultural system, especially as it concerns their impact on the system and the necessary processes that need to be put in place for their maximal exploitation. The objective of this research project can therefore be said to be two-pronged: First is to investigate and evaluate the usage of ICT systems amongst Nigerian farmers, and, secondly, on the basis of this make recommendations as to how the usage can be improved. Using survey data collected from farmers across Nigeria, the use and impact of ICT technologies, particularly mobile telephony and the internet to support the major agricultural business processes of production, processing, storage and marketing, are investigated and evaluated along the major agricultural sectors of crop production, livestock farming, fishing and forestry. Recommendations on ways of improvement are given and the use of public-private partnerships as models for maximizing the use of ICT as a mechanism for increased agricultural production was also examined.

WE-11.3 [R] The Evolution of Taiwanese Information Technology Industry

Jian-Hung Chen; National Chi Nan University, Taiwan
Hsing-Hsiung Chen; Industrial Technology Research Institute, Taiwan

The global information technology (IT) industry has experienced many dramatic changes. Since the emergence of IBM personal computers in the 1980s to the prevalence of the internet and mobile communications, the Taiwanese information technology industry survived and prospered in the past three decades. This research analyzes the interactions of the industry system and the development environment by an evolutionary perspective. Taiwan has successfully developed a reinforcing relationship with the international industry leaders and as a result moved up the value chain. Taiwan's survival strategy during the rise and falls of the industry demonstrated a successful model for a latecomer to incrementally develop new core capabilities and thus become one of the industry leaders.

HA-00 PLENARY - 4

DATE: THURSDAY, 8/02/2012
TIME: 08:30 - 10:00
ROOM: PAVILION BALLROOM
CHAIR: TBD

HA-00.1 [K] How to Save the Economy with Management of Technology

Aaron Shenhar; Rutgers University, United States

This presentation will analyze the pitfalls of the economic system and our society's neglect of technology management as a strong driver for growth and prosperity. While companies as well as governments focus on financial solutions, many overlook the potential and power of technology and its management. It may well be the only hope for the U.S. economy today for keeping its leadership position. Based on studying the role of government, industry, and academia, this presentation will show what each one of these sectors can do to help the economy grow again.

HA-00.2 [K] Sharing of Experiences and Views on Implementing/Initiating High Tech Projects and Industrial Infrastructure in Thailand

Itti Rittaporn; Toyota Tsusho Electronics Co., Ltd., Thailand

From the early 1960s, Thailand is a country that strives to move up the technology ladder toward being a high-tech country. Yet, it seems Thailand has not done well enough compared to other similar countries. Based on personal experiences in both public R&D organizations (microelectronics, semiconductor industry) and private sectors (automotive and software), I would like to share with the audience the paths Thailand has taken, the achievements, the challenges it is facing, and the possible technological and industrial roadmaps for Thailand from a personal perspective. I would also like to define "power devices and green electronics" to be the crucial keywords for Thailand's automotive and electronics industries to survive and thrive in the coming decades.

HB-01 Intellectual Property - 3
Thursday, 8/2/2012, 10:30 - 12:00
Room: Pavilion Ballroom A
Chair(s) Mary Mathew; Indian Institute of Science

HB-01.1 [R] Intellectual Property Negotiation of Embryonic Technologies in Brazilian Aerospace Sector

César A O'Donnell Alván; General Command of Aerospace Technology, Brazil
José H Sousa Damiani; Instituto Tecnológico de Aeronáutica, Brazil

In order to develop embryonic technologies in the aerospace sector, it is usually necessary to perform successive projects until the technology obtains enough maturity to be effectively incorporated into a product. When these projects are carried out in partnership, it is essential that the intellectual property conditions on the results must be previously established in order to avoid future disputes between the partners. This article addresses a very common case in management of embryonic technologies: the development of joint technological projects carried out between public research institutions and private sector companies. The approach is focused on negotiating aspects of intellectual property on a project of the aerospace sector, implemented through a partnership between a private company and the

Department of Aerospace Science and Technology, a research institution of the Brazilian Air Force. The study allows the identification of difficulties involved in these types of negotiations, taking into consideration the economic interests of the private sector and the legal limitations of the public sector. The analysis of these difficulties led to the identification of critical aspects in the management of intellectual property in joint technological projects involving embryonic technologies in the aerospace sector.

HB-01.2 [R] Intellectual Property Strategies, Collaboration and Technological Capabilities: The Fuel Cell Cluster in Vancouver, BC

Claudia Diaz-Perez; Universidad Autonoma Metropolitana Cuajimalpa, Mexico
Jaime Aboites Aguilar; Universidad Autónoma Metropolitana Xochimilco, Mexico
Adam Holbrook; Simon Fraser University, Canada

This paper describes the development of the fuel cell cluster in Vancouver, Canada, with data collected over three years. This allows to following up the links that come up and the patterns and purposes of collaboration among cluster actors. Knowledge flows through patenting and the university role on the knowledge creation are key issues for this research. Other factors considered are access to venture capital, characteristics of the city where the cluster is located, and the policies oriented to support its development. The paper is organized in five parts: (i) The ways to collaborate and the links produced between different types of organizations. (ii) The role of customers, suppliers and competitors to produce innovations and the identification of fuel cells market opportunities. Particularly, the paper addresses the role of the university on the fuel cell market development because some differences related to the traditional role reported in the clusters literature were found. (iii) The geographic location of the cluster and the analysis of policies behind the cluster growth. (iv) The intellectual property strategies to protect knowledge and commercialize it at the fuel cell market. (v) The identification of core capabilities that have positioned companies as competitors on the international market.

HB-02 Quality Management - 2
Thursday, 8/2/2012, 10:30 - 12:00
Room: Pavilion Ballroom B
Chair(s) David Kruger; Tshwane University of Technology

HB-02.1 [R] Applying Six Sigma Methodology to Improve Quality of Information: Case of a Manufacturing Organisation

Sang Hyun Lee; University of South Australia, Australia
Abrar Haider; University of South Australia, Australia

Information is the most important resource of any organization. Its influence spans enabling business processes to strategic corporate decisions support. The ability to capture the right information, process it in the right way, and communicate it to right stakeholders in the right time is extremely important. Quality of information, therefore, has been the focus of research in academia and industry for the past two decades. However, many organizations are still struggling with information quality improvement and mitigating the impacts of poor quality of information. This is because information quality is a multi-dimensional concept and involves technical, organizational, and human dimensions of information system. This paper addresses the technical dimension of information quality and focuses on the relationship that information quality dimensions have with each other. It takes a product perspective of information and provides an application of six-sigma methodology to improve information quality in a Korean manufacturing organization. It focuses on correlation and relative importance of information quality dimensions through the use of the analytic hierarchy process. This paper thus demonstrates how to measure information quality and institute an ongoing process of information quality improvement in the organization.

HB-02.2 [R] Incremental Innovation and Management Styles of Group Activities: An Empirical Study on Tangible and Intangible Effects by Quality Control Circle Activities

Ken Kitazawa; The Japan Institute for Labour Policy and Training, Japan
Hiroshi Osada; Tokyo Institute of Technology, Japan

This research analyzed conditions and processes of incremental innovation created by group activities, focusing on more than 100 quality control circle (QCC) cases appearing in the Journal of QC Circle. Their tangible and intangible effects of QCCs were statistically analyzed based on the management style of QCC. The framework of the analysis is as follows: The factors for tangible effects were set the financial amounts or improvement rate, and the factors for intangible effects were set organizational capabilities developed by QCC. Regarding organizational capabilities were categorized into motivation skill, human relations skill and knowledge and technical skill according to existing studies. The conditions of management style were set following three aspects: (1) group member's promotion of self-directing activities for improvement, (2) differences of group members attributes, and (3) effective support by managers. As a result of quantitative analysis, the aspects on (1) and (2) had significant effects. Besides of these quantitative analyses, the cases with remarkable achievement on both tangible and intangible effects were focused on and case studies were done. Based on these analyses, several suggestions for management on group activities were proposed.

HB-02.3 [R] The Influence of Work Values on Workplace Friendships: Taiwan and China

Chun-Te Lin; Yu Da University, Taiwan
Chun-Ling Lu; Yu Da University, Taiwan

According to a literature review, we know important aspects of workplace friendship research not only examining formal enterprise policies but also emphasizing informal workplace support. But there is knowledge ambiguous that are informal context of work values on workplace friendships. Drawing on two regions, from enterprises comprising 1,050 effective questionnaires, we examined work values on workplace friendship and compared difference between these two regions, Taiwan and China. Results show the work values have strong predictive power on workplace friendship. In both Taiwan and China, work values significantly affect workplace friendship and this influence in Taiwan is stronger than in China.

HB-03 Strategic Management of Technology - 4
Thursday, 8/2/2012, 10:30 - 12:00
Room: Pavilion Ballroom C
Chair(s) Charles M Weber; Portland State University

HB-03.1 [A] Linking Strategy and Roadmap: Integrative Design of Technology, Product and Production

Günther Schuh; Fraunhofer Institute for Production Technology, Germany
Patrick A Hacker; Fraunhofer Institute for Production Technology, Germany
Johannes Schubert; Fraunhofer Institute for Production Technology, Germany
Markus Wellensiek; Fraunhofer Institute for Production Technology, Germany
Peter Kitzer; 3M Deutschland GmbH, Germany
Matthias Meinecke; Alstom Power, Switzerland
Clemens Schaller; BSH Bosch und Siemens Hausgeräte GmbH, Germany
Peter Weber; BMW, Germany
Christoph Zeppenfeld; MAN Diesel & Turbo, Germany

Technology, product and production planning is challenging. To face increasing complexity of strategic planning, a stronger, earlier and quicker integration of the planning areas product, technology and production is required. Current approaches hamper a total optimum in planning results. Technology management needs a new quality of integrativity. It cannot be reached with the motto, "Everyone does everything together." Instead, everyone has to define lighthouses, guidelines and references for the future for his own domain. Strategy and roadmap need to be linked in the coordinated process. In this paper we present a new integrative approach, which was developed based on results of the analysis of industry cases and successful practices of five technology-oriented companies. Firstly, clear visions of the future of the own planning area have to be developed in form of lighthouses to define

borders of each planning area's solution space. Secondly, guidelines building a framework for specific solutions can be derived. References that are describing each planning area in the future can be developed afterwards as target states. As a final step, the solution spaces of all planning areas have to be harmonized. In a participative decision making-process, agreed-on projects have to be implemented in a technology roadmap.

HB-03.2 [R] Platform Leadership in Business Ecosystem: Literature-Based Study on Resource Dependence Theory (RDT)

Byung Chul Choi; Rensselaer Polytechnic Institute, United States
Kenny Phan; Portland State University, United States

In business ecosystems, the platform leader takes on a role of overcoming main technological challenges and creating an innovative business model for the members of the ecosystem. Although the role of the platform leader and concepts of ecosystem have been developed by several authors, it still lacks a precise theoretical support to understand what enables the platform leader to obtain and maintain hegemony in the ecosystem. In this study, we develop a theoretical explanation to understand the fundamental strategic intentions of the platform leader based on the perspectives of resource dependence theory (RDT). Previous studies have greatly focused on technological leadership and sponsorship of the platform leader as a benevolent leader. However, we propose that the power of the platform leader depends on the degree of dependence of other agents in the ecosystem on platform leaders. We provide support for our proposition with examples observed in the U.S. IT industry where multiple platform leaders exist and manage different types of platform leadership. Our study provides an explanation to understand essential issues that the platform leader faces. Also, we synthesize the explanation with respect to the role of platform leader in the business ecosystem.

HB-03.3 [A] The Development of a Model for Dealing with Disruptive Emergent Contextual and Technological Change: A Resiliency Perspective

Richard V Weeks; University of Pretoria, South Africa

A distinguishing characteristic of the twenty-first century is the increasing emergence of unforeseen, unexpected and highly disruptive contextual and technological change that has a very disruptive effect on the operations of manufacturing and services institutions. These institutions at an operational level need a sense of order and stability to function. This implies the need for a sponge effect to absorb the disruptive impact, while addressing the consequences stemming from the contextual and technological change. It is the contention within this paper that resiliency management could well serve as the sponge effect. The model developed is based on the Cynefin Framework that draws a distinction between domains of ordered, complex and chaos. The appropriate response for these serve as guiding principles for the simultaneous management of operational ordered systems and complex adaptive systems. The model developed proposes a resiliency management interface between the domains of order and un-order (complexity and chaos). The value of the model is that managers of twenty-first century institutions can simultaneously maintain an effective operational environment, while managing the disruptive contextual and technological conditions that prevail at a specific point in time. The research methodology constitutes a multi-disciplinary literature review underpinning the theory and model development.

HB-03.4 [A] Technology Strategy in the Solar and WindRenewable Energy Industries

Yu-Kuang Lin; Masdar Institute, United Arab Emirates
Toufic Mezher; Masdar Institute, United Arab Emirates
Steve Griffiths; Masdar Institute, United Arab Emirates

The objective of this study is to investigate the different technology strategies for companies in the solar and wind industries given the dynamics of the renewable energy industry in general. We will investigate how these companies are creating value, capturing value, and delivering value. We looked at the internal and external factors that drove the competitiveness of the solar and wind companies. A literature review was conducted on the technology strategies as well as solar and wind renewable industries around the globe. Five case studies, including solar and wind companies from around the world, were carried out in order to understand their technologies' strategies. Based on this, effective technology strategies to create, capture, and deliver value in the solar and wind renewable industries are identified.

HB-04 TUTORIAL: Making Excellent R&D/Technology Portfolio Decisions
Thursday, 8/2/2012, 10:30 - 12:00
Room: Pavilion Ballroom D
Speaker(s) Michael M Menke; Value Creation Associates

Project portfolio management (PPM) is the process to decide which projects get funded and which have to be dropped or deferred. This is critical for all organizations with scarce resources, i.e. more good project ideas than people or money to do them all. Most R&D and technology organizations have this problem, but also many IT, marketing, manufacturing, capital project and even public sector organizations. PPM helps organizations align and execute strategy, maximize value and manage risk. PPM also helps optimize the use of scarce resources and manage bottlenecks as the funded projects progress through the project pipeline. This tutorial defines portfolio management, discusses why it is important, presents the most useful frameworks, concepts, tools and displays, reviews several PPM case studies, and presents the results of a new international benchmarking study on the best practices organizations use to achieve excellence in portfolio management. It concludes with some advice on how organizations can improve in the areas that the benchmarking study showed are most difficult to execute with high quality. The tutorial will be very helpful to all R&D, technology and innovation organizations that have many great opportunities but limited budgets.

HB-05 Knowledge Management - 4
Thursday, 8/2/2012, 10:30 - 12:00
Room: Orca
Chair(s) Kunio Shirahada; JAIST

HB-05.1 [A] The Rise of Taylorism in Knowledge Management

Donald A Kennedy; Kennedy Technical Services Inc, Canada
Mustafa A Nur; Atehkamehk Transportation, Canada

Interviews with engineers near retirement suggest that engineering work has become more prescriptive over the span of their careers. Work is now highly controlled by procedures and increased approvals from senior management. This approach to work is paralleled by Frederick Taylor developing scientific management at the turn of the 20th century. Drivers for regimented processes may be higher employee turnover and lower knowledge retention in modern workplaces. A seven-year-old organization is studied. Problems with the quality of past engineering work were highlighted by senior management, and tight controls were implemented as a means to improve operations. The workflow for a typical project is tracked, demonstrating the effort required to move it through the various gates established to control the final product. Middle management acknowledges that executing any project is unacceptably slow and the costs are too high. Establishing clearly defined roles and responsibilities hinders effective project management as identified by best practices. As the tight control on the work hinders the engineer's sense of accomplishment, turnover remains high. This justifies the need for higher levels of documentation to assure smooth transitions during handover to the new employee, and the cycle continues.

HB-05.2 [R] How are Competitive Advantages Created Inside the Industry?

Fang-Chen Kao; Largan Precision Co., Ltd, Taiwan
Justine Chang; Chaoyang University of Technology, Taiwan
Jing-Lin Huang; National Yunlin University of Science & Technology, Taiwan
Shang-Ping Lin; National Yunlin University of Science & Technology, Taiwan

This study, which is based on literature of the creative dynamic field perspective, and, through a longitudinal and qualitative case study, analyzed in depth to explore and conclude important factors of creative dynamic field theory. The study disclosed how the nature of these important factors affect an organization in continuing technology innovation and,

moreover, searching and identifying opportunities in the market to make favorable market positioning and thus maintaining best competitive advantages in the industry. In addition, the study enhanced the application of theory on realistic society with an in-depth systematic analysis on a single case and concluding the study subject's successful model for other businesses to observe and learn for further development.

HB-05.3 [R] Knowledge Structuring Tools for Technology Management: An Overview and Three Cases of Citation Based Approach

Ichiro Sakata; The University of Tokyo, Japan
Masanori Akiyama; The University of Tokyo, Japan

In today's increasingly global and knowledge-based economy, competitiveness and growth depend on the ability to keep pace with the seeds of innovation in science and swiftly develop technological applications. Planners or managers of scientific and technological research must grasp broader research coverage and make decisions on effective investment in promising and emerging technologies, especially under circumstances of limited resources. Since the traditional expert-based approach is time-consuming and subjective, it is expected to be supplemented by a computer-based approach, including text, web and link mining, network analysis, link prediction and visualization. We developed a computer-based approach to comprehend science, technology, knowledge and market structures as well as detect trends for effective decision making. We demonstrate the effectiveness of our tools by taking three different fields as examples. Even in the cases of complicated structure of knowledge, our tools are considered to be effective. Our approach can contribute to technological road mapping, the selection of appropriate technologies, knowledge integration and effective human resource management.

HB-05.4 [R] How to Start Continuously Improving Innovation in Organizational Knowledge: A Case Study on Apple, Inc.

Shang-Ping Lin; National Yunlin University of Science & Technology, Taiwan
Jing-Lin Huang; National Yunlin University of Science & Technology, Taiwan
Justine Chang; Chaoyang University of Technology, Taiwan
Fang-Chen Kao; Largan Precision Co., Ltd, Taiwan

This study based on Polanyi's knowledge philosophy theory, Barnard and Simons organizational theory, organizational behavior and organizational learning and knowledge innovation theory, to explore in-depth the nature of knowledge innovation and design structure of knowledge innovation, and further examined and adjusted by the case of Apple, Inc. The study aims to explore and design specific organizational innovation dynamic field and use dynamic field basis and case analysis to adjust structure of knowledge innovation and content of knowledge innovation cycle, thus making up the deficiency in knowledge innovation cycle theory so it can be more conforming to practical application.

HB-06 Project/Program Management - 3
Thursday, 8/2/2012, 10:30 - 12:00
Room: Finback
Chair(s) Cornelis C van Waveren; University of Pretoria

HB-06.1 [R] The Use of Power: Differences between Supplier and Customer and the Impact on the Results of an IT Project

Kari K Lilja; Tampere University of Technology, Finland
Ari Linden; Tampere University of Technology, Finland

The use and distribution of power varies widely among companies. Power may be concentrated in one person's hands or it may be delegated all over the organization. If a supplier or customer with a very strict chain of command has business or a common project with a partner who represents a delegating and participating type of organization culture, disastrous misunderstandings may occur due to the fact that participants do not understand each other's style of decision making. This paper presents the results of two independent research studies concerning the use of power. In the first, the experiences of project managers of customers and suppliers and consultants concerning the differences in power structures in different organizations are compared. We found that the experts and managers were disturbed by the differences, especially if the project affected their own work. Each group of interviewees considered that the differences impacted the project. The second research study concentrates on the impacts of differences in the use of power on the requirements assessment process.

HB-06.2 [R] Emerging Collaboration Tools Effect on Virtual Teams' Risk Management

Darlene J Alexander-Houle; University of Phoenix, United States

Global teams, with multiple cultures, norms and trends, use virtual collaboration tools to facilitate the frequency of team meetings and to mitigate expenses which occur with face-to-face gatherings. Assessing what minimal in-person interaction may be necessary for risk management is important as environment and social forces, illustrated by tsunamis and labor disruptions, challenge global teams. This research proposes collaboration tools for program managers and the potential to align team member's risk tolerance using four properties of propensity, attitude, capacity, and knowledge, or RiskPACK. Observation findings in a pilot study evaluating combinations of conference calls with virtual rooms, email, and SharePoint websites indicate virtual rooms enhance conference calls and SharePoint websites improve agility and effective response time. Controlling for the team's familiarity with the tools, the study finds diverse cultures and norms neutralized by a combination of a nominal in-person meeting and formally scheduled periodic virtual meetings. Proposing to expand the potential for significant improvements in identifying RiskPACK for teams by combining all three of the collaboration tools, this session reviews the value in further structured research.

HB-06.3 [R] Scope Management and Change Control Process Study for Project-based Companies in the Construction and Engineering Industries

Neslihan Alp; University of Tennessee at Chattanooga, United States
Banning Stack; University of Tennessee at Chattanooga, United States

Most engineering and construction projects are complex project efforts which are performed on a fast-tracked design and implementation schedule. Poor project scope definition, change control, and management performance lead projects into budget overruns and late finishes. This study seeks to research and analyze scope management and change control practices to determine existing efficiencies and deficiencies for scope management and change control for large and complex projects on a fast-track schedule. Research was conducted in two ways. First, existing research projects were identified within the project management areas of scope management and change control. Secondly, an electronic survey was developed (74 percent response) regarding scope definition methodology, change control process, impact of unauthorized scope creep, and other general project management issues. From the analysis of the survey data, the author found two primary results 1) 78 percent of the population responded that unauthorized scope creep results in project cost overruns, and 2) 62 percent of participants responded that between 41 percent and 100 percent of projects are executed at a fast-tracked pace for the engineering, construction, and architectural industries. Additional analysis of the research and survey data and conclusions is provided to support the best practice recommendations provided throughout the body of the paper.

HB-08 Commercialization of Technology - 1
Thursday, 8/2/2012, 10:30 - 12:00
Room: Parksville
Chair(s) Dietmar H Winzker; University of Pretoria

HB-08.1 [R] Beyond Niche Thinking: Market Selection in Science-Based Ventures

Sarah J Lubik; University of Cambridge, United Kingdom
Elizabeth Garnsey; University of Cambridge, United Kingdom
Tim Minshall; University of Cambridge, United Kingdom

Matching a new technology to an appropriate market is a major challenge for new technology-based firms (NTBF). Such firms are often advised to target niche-markets where the firms and their technologies can establish themselves relatively free of incumbent competition. However, technologies are diverse in nature and do not benefit from identical strategies. In contrast to many information and communication technology (ICT) innovations which build on an established knowledge base for fairly specific applications, technologies based on emerging science are often generic and so have a number of markets and applications open to them, each carrying considerable technological and market uncertainty. Each of these potential markets is part of a complex and evolving ecosystem from which the venture may have to access significant complementary assets in order to create and sustain commercial value. Based on dataset and case study research on UK advanced material university spin-outs (USO), we find that, contrary to conventional wisdom, the more commercially successful ventures were targeting mainstream markets by working closely with large, established competitors during early development. While niche markets promise protection from incumbent firms, science-based innovations, such as new materials, often require the presence, and participation, of established companies in order to create value.

HB-08.2 [R] Overcoming Commercialization Challenges in Science-based Business: Strategies for Advanced Materials Ventures

Elicia M Maine; Simon Fraser University, Canada
Sarah Lubik; University of Cambridge, United Kingdom
Elizabeth Garnsey; University of Cambridge, United Kingdom

Science-based businesses have become the main drivers of commercialization for radical technological advances but face high technology uncertainty over long time frames and the need for both significant complementary assets and substantial financing. Advanced materials ventures are a sparsely studied type of science-based business, though sufficiently different from others such as biotech, to merit individual study. What strategies do advanced materials ventures use to overcome their daunting commercialization challenges? To address this question, this paper draws on literature on value creation and advanced materials commercialization, and presents evidence from a sample of 43 advanced materials ventures. Through a hierarchical cluster analysis, the sample was subdivided into nanomaterials, performance materials, and fuel cell ventures: subgroup commercialization characteristics are described and compared. Through analysis of sample variables, success metrics, and case studies, we identify successful commercialization strategies according to subgroup. Our findings suggest that embracing uncertainty enhances value creation for nanomaterials and performance materials ventures but can diminish value creation for ventures commercializing fuel cell technologies.

HB-08.3 [R] Decision-Making Processes in Biotech Commercialization: Constraints to Effectuation

Elicia M Maine; Simon Fraser University, Canada
Pek-Hooi Soh; Simon Fraser University, Canada
Nancy Dos Santos; BC Cancer Research Agency, Canada

This research explores two entrepreneurial decision-making processes utilizing effectuation and causation modes in the context of new venture creation in the biotechnology industry. Using a case study approach, we investigate the evolution of three biotech ventures from the start of the venture, featuring major decisions over a period of 10 to 20 years. Assessment of qualitative interviews with founders and CEOs demonstrates that, initially, each company began in effectuation mode and, over time, transitioned to a spectrum between effectuation and causation. The two ventures which retained effectuation logic did not engage in clinical trials. Decision making processes in this study illustrate the interplay between entrepreneurs' ability to manage technological and market uncertainty and circumstantial changes arising from change leadership, venture capital funding and development of lead candidates in the clinical stage of product development.

HB-08.4 [R] A Benchmark Analysis of Canadian Clean Technology Commercialization Accelerators

Kourosh Malek; National Research Council of Canada, Canada
Elicia Maine; Simon Fraser University, Canada
Ian McCarthy; Simon Fraser University, Canada

Although the size of the Canadian clean energy market is small, high R&D capacity and clean-tech ventures delivering emerging clean energy technologies could potentially make Canada a global leader in supplying direct products, services and infrastructure to clean energy markets. Technology commercialization centers are of vital importance in facilitating and accelerating the transfer of academic and applied research to create and support technology-based ventures. However, there is a lack of clarity around the governance, performance, operation, and business model of such organizations. In order to develop and implement the best business practices for clean energy commercialization accelerators (CECAs), this paper explores different business operational models which were adopted by different non-profit clean energy commercialization organizations. A two-stage approach was employed. In the first stage, over 15 organizations (including 12 non-profit organizations and three university research parks) in Canada, the U.S., and Europe were selected for benchmark analysis. Four distinct business operational models emerge based upon an in-depth analysis: incubation focused, technology-enabled, market-enabled, and strategic partnership. Thereafter, a typology of organizations is proposed, based on four discriminating models: governance, finance, operation, and revenue. This typological analysis is then employed to unravel best business practices for CECAs, in view of governance structure, management practice, community impacts, overall business model and performance, strategic plan, and operation.

HB-09 PANEL: Meet the Editors
Thursday, 8/2/2012, 10:30 - 12:00
Room: Port Hardy
Moderator: Timothy R Anderson; PICMET
Panelist(s) C. M Chang; State University of New York at Buffalo
Scott W Cunningham; Delft University of Technology
Tugrul U Daim; Portland State University
Jeremy Hall; Simon Fraser University
Saku J Mäkinen; CITER / Tampere University of Technology
Steve T Walsh; University of New Mexico

Meet the editors of the Technology Management related journals. The editors will be discussing the philosophies, criteria, and submission processes of their journals and answer questions from prospective authors.

HD-01 Innovation Management - 7
Thursday, 8/2/2012, 14:00 - 15:30
Room: Pavilion Ballroom A
Chair(s) Charles M Weber; Portland State University

HD-01.1 [A] The Diffusion of Technological Innovation in the Brazilian Ethanol Industry

Alceu S Camargo Jr.; Universidade de São Paulo, Brazil
Abraham Sin Oih Yu; Universidade de São Paulo, Brazil
Paulo T Nascimento; Universidade de São Paulo, Brazil
Gilberto M Santos; FEA/USP, Brazil

Rogers (1995) defines the diffusion of an innovation as a process by which an innovation increases its acceptation by the market and the evolution of its employment becomes irreversible to an economic sector or to the whole economy. This process presents several determinant factors, where the most important are the amount of initial investments, operation cost, quality, productivity and the movements of the earlier and later adopters of the innovation. This study focuses on the analysis of the technological changing process in the Brazilian ethanol industry. The objective is to achieve a better understanding of the dynamic of the technological evolution and its diffusion among the Brazilian mills and distilleries, considering the most important incremental innovations exploited in the ethanol production

process, their productivity improvements, flexibility to convert or change, the consequent cost benefit relations and their diffusion characteristics in the last four decades. The most important result and contribution of the study is the development of a mapping of the diffusion of the most important technological changing in the Brazilian ethanol that presents the evolution of productivities. The model is able to support the investment decisions in the sector, considering its prediction potential regarding the productivity improvements and stagnation cycles.

HD-01.2 [R] Innovations in Deep Hole Vibration Drilling Leading to the Process Optimization

Alan Lasic; University of Ljubljana, Slovenia
Luka Cerce; University of Ljubljana, Slovenia
Janez Kopac; University of Ljubljana, Slovenia

Deep hole drilling operations face problems like insufficient chip evacuation, especially for small diameters. The consequences are reflected in tool breakage and in an inferior quality of the drilled surface. The technology, which uses the drill axial oscillations or vibrations to ensure better chip fragmentation, represents the biggest progress in the optimization of a fluent chip evacuation. Unlike the previous solutions depending on the artificially excited vibrations are the vibrations in the self-vibratory drilling naturally excited at a certain revolution frequencies and are self-maintained by the cutting energy. Therefore the technology does not require an external adjunction of energy. The object of this research is the stabilization of the axial vibrations at a suitable frequency and magnitude for an optimal chip fragmentation. The paper will embrace the manufacture of a prototype tool holder with an adapted axial stiffness, which was made on the basis of simulated dynamical analysis in the cutting zone. The aim of the technology presented is to improve the productivity of small diameter deep hole drilling through the optimization of the vibration phase in order to eliminate the retreat cycles and use of coolant.

HD-01.3 [A] Scientific Research Analysis of Sectoral Innovation Systems

Joao J Aguirre; ITM Instituto Tecnologico Metropolitano, Colombia
Mauricio Restrepo Restrepo; CIDET (Electrical Research and Development Center), Colombia

This article addresses the issue of sectoral innovation systems (SIS) in carrying out an holistic analysis, evaluating the performance of scientific literature based on conceptual definitions, exploring the different features that SIS possess, identifying emerging trends of research topics and high level relationships, and thereby establishing a clear picture of the subject evolution level, based on a detailed scientific basis and specialized searches. Several technological maps showing the relationship between lead authors on SIS, the publishing trends and the level of referencing are showed, similarly exploring the partnership dynamics between institutions and countries that have more influence on the knowledge development and advancement on issues related to SIS.

HD-02 Technology Management in the Energy Sector - 7

Thursday, 8/2/2012, 14:00 - 15:30
Room: Pavilion Ballroom B
Chair(s) Matti Karvonen; Lappeenranta University of Technology

HD-02.1 [R] Temporal Cross-over Points for Renewable Energy Technology Project Investment with Consideration for Energy Pricing, Carbon Tax Credits, and Implied Socio-political Value

Cory Hallam; University of Texas at San Antonio , United States
Gordon Karau; University of Texas at San Antonio , United States
William T Flannery; University of Texas at San Antonio, United States
Anita Leffel; University of Texas at San Antonio, United States
Luis Alarco; University of Texas at San Antonio, Spain

This study explores the technological, economic and socio-political conditions surrounding the world's first installation of a wind-hydro-diesel hybrid electrical generating system on the Island of el Hierro, Spain. A modified levelized cost of energy (LCOE) model is presented for both existing diesel energy systems and the renewable energy hybrid closed-loop system to determine the economic crossover point of project selection. By comparing the projected economic cross over point against the oil price at which the decision to build the hybrid system was made, the socio-economic value of risk avoidance can be quantified. It can also be used to represent the system's ability to hedge against future petroleum price rises and mitigate the effects of climate change. This inference has the unique advantage that it can be used to illustrate an inherent value of the system that can be difficult to quantify otherwise. The economic cross-over analysis also represents a method for comparing multiple energy options in discounted and non-discounted cash flow scenarios that indicate potential socio-political value applied to projects that are initiated at an input energy cost point well below their equilibrium economic cross-over point. A graduate student spent time on site to collect data for the cost build up models presented in this paper.

HD-02.2 [R] GIS Decision Model for Global Replication of Hybrid Closed-loop Renewable Energy Systems

Cory Hallam; University of Texas at San Antonio , United States
Luis Alarco; University of Texas at San Antonio, Spain
William T Flannery; University of Texas at San Antonio, United States
Anita Leffel; University of Texas at San Antonio, United States

Larger Geographically isolated populations do not typically have access to primary grid power, and thus rely on generating plants that depend on external supplies of fossil fuels to provide consistent access to power. The application of hybrid closed-loop renewable energy systems can alleviate this dependence and significantly reduce the carbon footprint by reducing the effective combustion byproducts per unit of energy provided. Using case study data, a GIS decision model is presented for determining feasible locations for implementing such a switch, based on successive GIS data layers. Data layers include urban, electrification, geographic topography, soil/ground composition, and wind. Further consideration may exist for investigating constraints on the location choice through the application of restriction layers, including conservation areas, historic sites, etc. The probability density function can then be maximized based on the successive layers as a metric for optimizing or prioritizing initial location choice. The quality of GIS layers with respect to information content for varying international locations directly influences the optimization function in this decision model.

HD-02.3 [R] Integrated Technology Roadmap Development Process: Creating Smart Grid Roadmaps to Meet Regional Technology Planning Needs in Oregon and the Pacific Northwest

Kelly R Cowan; Portland State University, United States
Tugrul U Daim; Portland State University, United States

Smart grid has been described as the energy Internet, where energy technology meets information technology. The incorporation of such technology into vast existing utility infrastructures offers many advantages, including possibilities for new smart appliances, energy management systems, better integration of renewable energy, value added services, and new business models, both for supply- and demand-side management. Smart grid also replaces aging utility technologies that are becoming increasingly unreliable, as the average ages for many critical components in utility systems now exceed their original design lives. However, while smart grid offers the promise of revolutionizing utility delivery systems, many questions remain about how such systems can be rolled out at the state, regional, and national levels. Many unique regulatory and market structure challenges exist, which makes it critical to pick the right technology for the right situation and to employ it in the right manner. Technology roadmapping may be a valuable approach for helping to understand factors that could affect smart grid technology and product development, as well as key business, policy, and market drivers. As emerging smart grid technologies are developed and the fledgling industry matures, a critical issue will be understanding how the combination of industry drivers impact one another, with technology development informing the development of business or service models, which in turn can lead to rethinking of

policy and market structures. This will be a co-evolutionary process. To better understand how this could affect future smart grid roadmaps in both Oregon and the Pacific Northwest region, this research proposes to build upon existing roadmapping processes by adding decision modeling tools which incorporate key metrics defined by experts. This will create a more robust roadmap that will allow key variables to be tested and different pathways to be explored.

HD-02.4 [A] An Evaluation of the Zero-Watt Standby System Employing Light and RF Energy

Werayuth Wallada; NECTEC, Thailand
Matanee Kitjaroen; NECTEC, Thailand
Thairat Sapsang; NECTEC, Thailand
Patharakorn Rattanawan; NECTEC, Thailand
Pornanong Pongpaibool; NECTEC, Thailand
Kullaprapa Navanugraha; NECTEC, Thailand
Siwaruk Siwamogsatham; NECTEC, Thailand

Recently, the zero-watt standby system was invented to diminish the power consumption in the standby mode of an appliance. In this system, a strong energy of sound, light, or radio frequency (RF) is emitted from the remote control unit to wake up the appliances from a completely shut down state. Initially, we developed the system to operate utilizing LED as the energy transmitter and solar cells as the energy receiver. The system performs well where the power consumption in standby mode reduces to zero watts. Subsequently, we modified the system by employing the RF energy. In this paper, we evaluate the zero-watt standby system utilizing light and RF energy source that we have developed. The evaluation criteria are the system characteristics, the system performance, and the implementation tendency. Basically, the light energy can be simply fabricated, while the RF energy source can broaden the controlling location. The user's preference is typically focused on the control range, invisibility, and cost. These evaluation results can help users or manufacturers to adopt the appropriate system for their appliances and applications.

HD-03 Strategic Management of Technology - 5
Thursday, 8/2/2012, 14:00 - 15:30
Room: Pavilion Ballroom C
Chair(s) Steve T Walsh; University of New Mexico

HD-03.1 [R] The Disruptive Nature of Organic Photovoltaic Technology

Steven Walsh; University of New Mexico, United States
Yorgos Marinakis; University of Twente - Nikos, Netherlands
Seamus Curran; University of Houston, United States
Regan Stinnette; Sandia National Laboratories, United States

Organic photovoltaic (OPV) technology is identified as a disruptive innovation that will diffuse as a low end encroachment, i.e., as an innovation that sells to buyers in a new market who would have bought the old product only if it were a little less expensive such that they are on the fringe of buying (fringe disruptive); or as an innovation that sells to buyers whose preferences are so divergent that a price reduction would not have enticed them to buy the old product such that they are detached from the current market (detached disruptive). It is suggested that if a firm wants to implement a disruptive OPV innovation on the fringe of the market, it must engage in a market-focused strategy; and if a firm wants to implement a disruptive OPV innovation in a detached market, it must engage in a technology-focused strategy.

HD-03.2 [R] Influence of Industry on the de Jure Standards Formation Process in Japan

Suguru Tamura; Waseda University, Japan
Takuya Okano; Waseda University, Japan

This research investigates how relationships among, or member balance in, a standard developing organization (SDO) affects the results of de jure standards setting in Japan. This issue is examined by investigating the membership of a de jure standard SDO. This research shows the implications of the relationships between product characteristics and de jure standards setting activities as well as industrial structures and activities because industrial structures such as the number of major players in an industrial area seem to have a major influence over the formation of standards. In this research, the membership of the Japanese standardization organization, named the Japanese Industrial Standardization Committee (JISC), is studied to examine the effect of differences in group associations of the members. The JISC comprises 26 committees, each of which consists of 1020 members. Each committee decides the de jure standards of Japan as a quasi-governmental organization in each industrial area. Committee members belong to three related areas: neutral, producer, and user/consumer. In conclusion, the JISC committees do not always equally constitute members of these three groups. In some industry areas such as the aircraft industry, the number of producer participants in the standardization body is greater than that in other bodies. This suggests that in some industries, the number of members belonging to the producer group is more than that belonging to the neutral and user/consumer group in the process of de jure standards setting.

HD-03.3 [R] The Study of Market Strategies of Fabless Semiconductor Companies in Japan

Akihiko Nagai; Nagoya Institute of Technology, Japan
Hiroki Nakagawa; Nagoya Institute of Technology, Japan
Takayuki Ito; Nagoya Institute of Technology, Japan

In Japan, since strong ties bind leading domestic semiconductor and user companies, a tendency exists under which the market accessibility of fabless semiconductor companies is blocked. Nevertheless, several fabless semiconductor companies have been successful to market access. The following two market strategies have been seen in these companies: specific user-based strategy and expanding user strategy. In this paper, we examine the strategy of these companies, and propose the market strategy to achieve high added value.

HD-04 Science and Technology Policy - 3
Thursday, 8/2/2012, 14:00 - 15:30
Room: Pavilion Ballroom D
Chair(s) Daphney H Mayindi; Dept. of Rural Development and Land Reform

HD-04.1 [R] Role of Chinese Scientists in Important Emergencies

Xuan Liu; University of Science and Technology of China, China
Yizhong Zhang; China Research Inst. for Science Popularization, China
Zhao Hui Li; China Research Inst. for Science Popularization, China

In recent years, a series of important emergencies have taken place in China, such as Wenchuan earthquake, Hainan banana cancer crisis and Shang Hai Jing an fire. Chinese scientists played more and more significant roles in each stage of emergency response process. First of all, scientists engaged in decision-making process as professional consultants. Secondly, scientists did valuable research-supporting work for risk response. Thirdly, Chinese scientists gave authoritative conclusions to clarify the valid incidents disposal strategy. Fourthly, scientists were the pioneers in risk reduction and emergency management research. Lastly, scientists played an important role in training emergency personnel. The Chinese government already formed a series of strategies in many aspects of public administration to improve the scientists' engagement and performance in emergency incidents. There are five main working mechanisms for Chinese scientists to take part in emergency management: government-specialists-mechanisms, science-community-systematization, expert-contact-mechanism, scientist-media interaction mechanism and a combination of emergency science research and popularization.

HD-04.2 [R] Studies on Scientists' Public Outreach and Engagement Activities in China: Policies, Status and Characteristics

Liang Qi; China Research Inst. for Science Popularization, China
Fujun Ren; China Research Inst. for Science Popularization, China

Scientists have incomparable professional advantages in science communication and have the obligation to inform the public about what they are doing and what affect their research has on society. This article in the first place introduces the main forms that scientists communicate with public in China and the extent of their participation. The policy background was also discussed in the first part. The status and forms of how academicians participate in science communication are also stated in this article. They were more willing to communicate with the public compared with other scientists. The main characteristics of how scientists participate in science communication were discussed in the final part of the article. Big differences appeared among scientists with different genders, ages and educational backgrounds when they participate in science communication.

HD-05 Knowledge Management - 5
Thursday, 8/2/2012, 14:00 - 15:30
Room: Orca
Chair(s) Kiyoshi Niwa; The University of Tokyo

HD-05.1 [R] Effective Learning and Knowledge Discovery Using Processed Medical Incident Reports

Masanori Akiyama; The University of Tokyo, Japan
Satoru Yamamoto; The University of Tokyo, Japan
Katsuhide Fujita; The University of Tokyo, Japan
Ichiro Sakata; The University of Tokyo, Japan
Yuya Kajikawa; The University of Tokyo, Japan

Effective management of technology plays an essential role in defining the power of an arena. In many developed countries, such as Japan, healthcare facilities employ advanced information systems to capture daily healthcare records. We have collected thousands of incidence reports from the Japan Council for Quality Health Care, which is managed by the Ministry of Health, Labour and Welfare. The incident reports were electronically stored in written conversation format. We successfully distinguished the incident reports using artificial intelligence technology. Using natural language processers, Japanese vocabularies were systematically structured, captured and classified. As a preliminary, we explored the similarities between reports and the co-occurrence events of related characters among medical incidences. In this study, we took advantage of advanced health informatics approaches and available encrypted datasets to extract hidden knowledge associated with medical error events. The occurrence of medical errors, such as inappropriate oral medicine, may be statistically associated with and can be explained by event scenes. This data-driven research involves the intimate collaboration and technology management of statisticians, computer scientists, and practitioners-a concept known as convergence-and attempts to statistically understand the dynamics of medical incidences to enhance clinical patient safety situation awareness.

HD-05.2 [A] Mobilizing ICT, Business and Human Processes: An Integrative Conceptual Model

Shantanu Maddhann; University of Jyväskylä, Finland
Nazmun Nahar; University of Jyvaskyla, Finland

Information and communication technologies (ICT) are changing exponentially and will continue to do so in the near future. Mobility is an everyday human activity. Every human interaction is based around mobility. Now the mobility in computing is entering its next stage by making computing mobile by transferring computing to mobile devices. There is already a trend in this direction by employing various organizational based applications for CRM, logistics, sales, marketing, etc. Driven by economic and technological reasons, these small organizational changes will converge into full organizational implementations. These organizational changes will spill over into everyday human life, e.g. C2C applications. Despite these big changes there is not a "structural view to mobility potential discovery at organizational level or every day human activity level." This not only makes every day human activity and business processes less efficient but also slows down the technological adaptation that organizations need to do to keep with basic infrastructural changes in the technology. Therefore, this research has been undertaken. Through an in-depth literature review and industry experience, this research devises an integrative conceptual model in this direction. Where the basic characteristics of mobility and technology can be brought out together in such a way that hidden and unseen mobility potentials in organizations and everyday human activities can be recognized, thereby changing the view to future business development or recognizing new vertical business segments. The model developed in this research may have diverse important applications in research and practice. Several important directions for future research are also suggested by this research.

HD-05.3 [R] Utilizing the Relevant IT Tools for Knowledge Transfer in Complex Software and Systems Development in Globally Distributed High-tech Organizations

Nataliia Samoilenko; University of Jyvaskyla, Finland
Nazmun Nahar; University of Jyvaskyla, Finland

Knowledge transfer is a complicated process because knowledge can exist in different forms and places. Knowledge can be heterogonous and dynamic as it can change all the time. It resides in human heads and hands, within organizations' knowledge repositories, in the Internet, etc. Transfer of heterogonous and dynamic knowledge becomes even more complicated in complex software and systems development in globally distributed high-tech organizations. Thus, there is a significant need for studying such a multifaceted and complex phenomenon more deeply. We review applicable theories (cooperation theory) and analyze past literature on knowledge transfer and various IT tools. We develop a framework based on the analysis of existing literature, expert views and our personal knowledge in this area. The framework is comprised of the most appropriate IT tools that can facilitate effective knowledge transfer. The framework may have wide applications in industrial and research settings. The implications of the findings are also discussed for further research.

HD-07 Technology Diffusion - 2
Thursday, 8/2/2012, 14:00 - 15:30
Room: Beluga
Chair(s) Leon Pretorius; University of Pretoria

HD-07.1 [R] Combining Scenario Analysis with the Diffusion Model and the Competitive Model for Analyzing the Development of the Smartphone Operating System

Fang-Mei Tseng; Yuan Ze University , Taiwan
Ya-Lin Liu ; Yuan Ze University, Taiwan

The sales volume of smartphones has grown rapidly, and software and service have become more critical for the growth of the industry. There are five major platforms in the market, Android, iOS, Symbian, Blackberry, and Windows. The competition among them is severe, and it has become critical to understand the key factors that lead to the successful development of a smartphone operating system (OS). However, few studies have considered how to estimate the sales volume among competitive innovation products/technologies when available data are limited. Therefore, to more accurately estimate future demand and competition among smartphone OSs in our empirical study, we used scenario analysis and the Delphi method to predict possible scenarios for the future development of four OSs (Android, iOS, Symbian, and Blackberry). Then we used the competitive model and innovation diffusion model to forecast the adoption volume of each OS over the next five years. The results show that the top three key decision factors for OS development are demand and preference of customers, degree of development with application stores, and variation in global market growth. There were no significant substitution effects among the OSs. On the contrary, the Android and Blackberry platforms had a symbiotic relationship. In the adoption volume forecasts, three scenarios (the most optimistic, the most pessimistic, and the most likely) were considered. The adoption volumes of the four OSs (ranked as Android > iOS> Symbian > Blackberry) were the same for all three scenarios over the next five years.

HD-07.2 [A] Combining Scenario Analysis, the Delphi Method, and the

Innovation Diffusion Model for Analyzing the Development of the Light-Emitting Diode Panel Industry

Fang-Mei Tseng; Yuan Ze University , Taiwan
Hou-Tzung Lin; Yuan Ze University, Taiwan

According to an industry report, light-emitting diode (LED) technology will replace cold cathode fluorescent lamp (CCFL) technology in the near future. Therefore, for liquid crystal display (LCD) panel-manufacturing companies to allocate their resources efficiently, it is very important that they understand the demand of these two technologies. This study combined scenario analysis, the Delphi method, and innovation diffusion to analyze the situation over the next five years. Scenario analysis was applied twice. The result of the first one showed that the organic light-emitting diode (OLED) TV market will grow slowly in the next 5 years, with the LED TV becoming the leader in the market, and also that the panel is the most critical factor in the development of the LCD TV. Therefore, the second analysis was run to analyze in more detail the competitive situation between LED and CCFL panels. The most optimistic, the most pessimistic, and the most likely scenarios of the LED panel market in the next five years were described. The global sales of CCFL and LED panels were also predicted for the three scenarios above using the innovation diffusion model. According to the forecasting results, the LED panel will replace the CCFL panel as the mainstream product in the second quarter of 2012, in the first quarter of 2013, and in the third quarter of 2012 under the optimistic, pessimistic, and likely scenarios, respectively.

HD-07.3 [R] Institutionalisation of Technology in Contemporary Business Organizations

Azadeh Pishdad; University of South Australia, Australia
Abrar Haider ; University of South Australia, Australia
Andy Koronios ; University of South Australia, Australia

In contemporary business paradigm, organizations compete for political power, institutional legitimacy, and social and economic fitness. Business organizations are shaped by the interactions of the environment that they operate in, rules and norms imposed on them, behaviors of their internal systems, and cognitive patterns of their stockholders. An organization as an institution, thus, evolves through the mutual interactions of various organizational sub-institutions. Technology works as the binding factor that shapes organizations and gives them their existing form and legitimacy by integrating together these sub-institutions. The form and legitimacy define how organizations evolve their structures, culture, and systems. Implementation of technology, therefore, is not one off endorsement of technology or/ and isolated incident of technology implementation; instead it should engage in the process of technology institutionalization to maintain its legitimacy, power, and social and economic fitness on an ongoing basis. This paper reviews literature on how technology institutionalization occurs in organizations, and more precisely how institutional logic relating to technology implementation is diffused within organizations through three isomorphic processes, i.e., coercive, mimetic and normative. The paper concludes that technology lifecycle management is characterized and shaped by continuous interfacing of technology with organizational, social, cultural, environmental, political, and other institutional factors. The degree of interaction among these factors defines technology implementation, institutionalization, deinstitutionalization and re-institutionalization in the organization.

HD-08 Commercialization of Technology - 2

Thursday, 8/2/2012, 14:00 - 15:30
Room: Parksville
Chair(s) Robert Harmon; Portland State University

HD-08.1 [R] A Comprehensive Strategic Model for the Commercialization of New Product Development Technologies

Angela Baltz; Portland State University, United States
Adam Bobek; Portland State University, United States
Trevor Combs; Portland State University, United States
Christopher Imondi; Portland State University, United States
Matthew Trippel; Portland State University, United States

A significant amount of time, money and resources can be invested into a new product development effort. In this era of open innovation, organizations have additional external commercialization options to consider compared to development of technology internally. An effective strategic model utilizing open innovation development options is required to exploit market opportunities for commercialization of technologies. These decisions need to be made in the early stages of development to optimize project selection and investment. This paper provides a model to aid the decision maker(s) in identifying the optimal product development approach based upon a methodology grounded in accredited literature and the input of new product development experts. The effectiveness of this model is validated using case studies and interviews of past product development efforts.

HD-08.2 [A] An Approach to Systematically Derive a Diversification into Emergent Markets Driven by Technological Core-competencies

Maximilian Kauffmann; University of Stuttgart / IAT, Germany
Michael Schmitz; University of Stuttgart / IAT, Germany
Antonino Ardilio; Fraunhofer IAO, Germany

Traditional medium-sized enterprises are often known as hidden champions. However, existing target markets do not increasingly afford anymore the essential annual growth by well-established product innovation processes. Despite the need for changes it is important for traditional companies to keep production sites as well as workers. Consequentially, the question arises on how to devise new products based on the existing technological competencies which are forward-looking and satisfy anticipated requirements of emergent markets. With a translation of technology functions derived from technological core competencies into market-functions by taxonomy, new high-potential industry sectors were identified. In order to prioritize potential interesting sectors systematically, trend analyses and descriptions of industry specific level of maturity were used. Thousands of secondary literature documents were automated, screened and annotated in order to build up the data basis for trends and level of maturity descriptions. Considering the anticipated developments in each attractive industry sector, a multi-stage creative and synectics based workshop process is used to conceive of new potential applications in those attractive sectors. Finally, detailed information on preselected markets are compiled and used to build up business cases which frame the decision fundament to a successful diversification strategy. Within the paper this procedure is descripted with the help of a case study.

HD-08.3 [A] Actualizing Dreams: Commercialization of Civil Robotics

Byung Sung Yoon; Portland State University, United States

In common with other emerging technologies such as information technology, nanotechnology, green technology and biotechnology, robotic technology has been expected to bring a bright future to human beings for several decades. Commercially, in several applications including industrial robots and special purpose robots for military and exploration, the innovative technologies have been commercialized actively. Nevertheless, in the view of technology commercialization, the development of robotics as a real-life technology has seemed to be tardier than the general public's expectation in recent years. The goal of this paper is to explore what the main obstacles are in the commercialization of robotics technology and what the possible solutions to surmount the obstacles are. To respond to these questions, first of all, this paper defines recent and future markets of real-life robotics. And then the critical technologies which need to be developed prior to the commercialization are studied. By extension, this paper analyzes the levels and issues of each technology mentioned above.

Note: [R] = Research Paper; [A] = Industry Application; [K] = Keynote

SESSIONS

HE-03 PICMET 2013 and 2014 Planning Session
Thursday, 8/2/2012, 16:00 - 17:30
Room: Pavilion Ballroom C
Chair(s) Timothy Anderson; Portland State University
Dilek Cetindamar; Sabanci University
Tugrul U Daim; Portland State University
Antonie J Jetter; Portland State University
Dundar F Kocaoglu; Portland State University
Kiyoshi Niwa; The University of Tokyo
Gary Perman; IEEE
Liono Setiowijoso; Portland State University
Charles M Weber; Portland State University
Ann White; Portland State University

This panel session will provide an opportunity to give feedback on PICMET '12 and to get involved in the planning for PICMET '13 and '14 conferences. PICMET '13 will be held July 28-August 1, 2013, at the San Jose Marriott in San Jose, California, USA. PICMET '14 will be held in July 2014, in Kanazawa, Japan.

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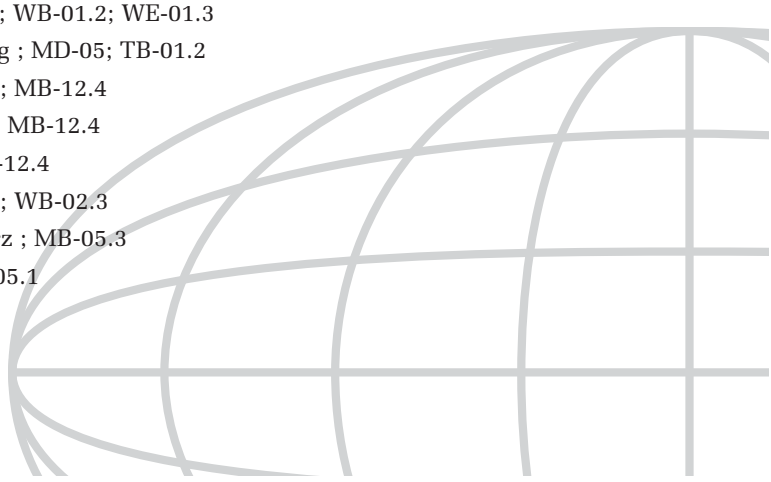

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