



# PICMET '09



## PICMET



Dear PICMET Guests:

**It is a great pleasure for us to welcome you to PICMET '09.**

The first decade of the 3rd millennium has undeniably shown us that the world is going through significant changes. These changes are at the root of the basic assumptions about the global economy and the balance of the world powers. The rise of Asia as a new economic power, the role of natural resources in the realignment of emerging economies, the shift from manufacturing to services in developed economies, the fast pace in which the transition is taking place from hydrocarbons to renewable energy, the dizzying speed with which we have experienced the progression from computer technology to info, bio, nano, and now the energy technologies, the sustainability issues, the environmental issues, and the global impact of the recent financial crisis are clear signs that fundamental changes are taking place in the world.

Technology cannot solve every problem in society, but technology cannot be viewed in isolation from the rest of the society, either. PICMET defines the primary role of Technology Management as the management of the technologies to assure that they work for the betterment of humankind. This role has never been more important than it is now. It is the responsibility of the Technology Management community to utilize and 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 emerging leaders in the Technology Management field. Recognizing this challenge, the PICMET '09 Conference explores the role of technology management as an integrator of technology and society at the focal point of fundamental changes in the world.

Approximately 750 papers were submitted to PICMET '09. After they were reviewed by at least one referee from the 121-member Program Committee in a double-blind refereeing process, 329 were accepted for inclusion 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 '09 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 CD-ROM 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 44 sections, listed below, each containing several papers on the topic of the section.

- **Technology Management Framework**
- **Strategic Management of Technology**
- **Science and Technology Policy**
- **Collaborations in Technology Management**
- **Competitiveness in technology Management**
- **Convergence of Technologies**
- **Emerging Technologies**
- **Decision Making in technology Management**
- **Innovation Management**
- **Knowledge Management**
- **Software Process Management**
- **Manufacturing Management**
- **Productivity Management**
- **Project/Product Management**
- **R&D Management**
- **Resource Management**
- **Supply Chain Management**
- **Sustainability**
- **E-Business**
- **Entrepreneurship/Intrapreneurship**
- **Intellectual Property**
- **New Product Development**
- **People and Organizations**
- **Technology Management Education**
- **Design Issues**
- **Global Issues**
- **Cultural Issues**
- **Environmental Issues**
- **Technology Forecasting**
- **Technology Roadmapping**
- **Technology Assessment and Evaluation**
- **Technology Adoption**
- **Technology Diffusion**
- **Technology Transfer**
- **Technology Management in the Public Sector**

# PICMET '09

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- **Technology Management in the Service Sector**
- **Technology Management in the Health Sector**
- **Technology Management in the Energy Sector**
- **Technology Management in Automotive Industry**
- **Technology Management in IT Industry**
- **Technology Management in Semiconductor Industry**
- **Technology Management in Telecommunication Industry**
- **Technology Management in Transportation**
- **Technology Management in Wireless Technology**

A large number of colleagues around the world contributed to the success of PICMET '09.

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 '09; 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; Pisek Gerdri coordinated the on-site activities; and Jeff Birndorf of endesign developed graphic arts for the conference.

Vince Reindl and John Schipper 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 reviewed the papers and provided valuable assistance to assure the highest quality of presentations.

The members of the Program Committee who reviewed the papers in a double-blind refereeing process were Mustafa Abbas, Hitoshi Abe, Rimal Abu Taha, Dawood Abugharbieh, John O. Aje, Fatima M. Albar, Joe Amadi-Echendu, Muhammad Amer, Elif Baktir, Nuri Basoglu, Pamela R. Becker, Nima Behkami, Caroline Benton, Tal Ben-Zvi, John Bers, Nametsegang Boemo-Mokhawa, Greg Bourque, Alan Brent, Olgay Cangur, Lawrence D. Carter, Cesar A. Castilla, Sinan Cayir, Dilek Cetindamar, Leong Chan, Shann-Bin Chang, C. M. Chang, Hongyi Chen, Mario M. Coccia, Kelly R. Cowan, Brian P. Cozzarin, Americo B. Cunha, Pranabesh Dash, David Dorr, Robert D. Dryden, William (Ike) Eisenhower, Alptekin Erkollar, M. Hosein Fallah, Dave Fenwick, Elliot Fishman, Richard M. Franza, Pisek Gerdri, Peter Ghavami, Clandia M. Gomes, Stuart Graham, Nisheeth Gupta, Robert R. Harmon, Abram Hernandez, Jonathan C. Ho, Martin Hoegl, Boonkiart Iew-

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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 Interim Dean Richard I. Knight of Portland State University's Maseeh College of Engineering and Computer Science for his continuous support and encouragement.

We believe the PICMET '09 *Proceedings* and this *Bulletin* contain some of the best knowledge available on Technology Management for addressing the challenges and opportunities in a world going through fundamental changes. 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 '09

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STATE OF OREGON  
**PROCLAMATION**  
OFFICE OF THE GOVERNOR

- WHEREAS:** The engineering and technology sector of the economy of the State of Oregon is essential to the State's continued economic growth; and
- WHEREAS:** The effective management of engineering and technology processes, programs, and projects is necessary to assure the fullest benefits; and
- WHEREAS:** The field of engineering and technology management is international in scope and constantly changing; and
- WHEREAS:** The Department of Engineering and Technology Management at Portland State University, in cooperation with the IEEE Oregon Section, have convened the Portland International Center for Management of Engineering and Technology (PICMET) Conference, August 2-6, 2009, to provide a forum for the exchange of information and ideas among practitioners in this important field.

**NOW,**  
**THEREFORE:** I, Theodore R. Kulongoski, Governor of the State of Oregon, hereby proclaim **August 2-6, 2009** to be

**TECHNOLOGY MANAGEMENT WEEK**

In Oregon and encourage all Oregonians to join in this observance.

IN WITNESS WHEREOF, I hereunto set my hand and cause the Great Seal of the State of Oregon to be affixed. Done at the Capitol in the City of Salem in the State of Oregon on this day, July 9, 2009.



*Theodore R. Kulongoski*  
Theodore R. Kulongoski, Governor

*Kate Brown*  
Kate Brown, Secretary of State

# PICMET '09

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RON WYDEN  
OREGON

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June 29, 2008

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Portland International Center for  
Management of Engineering and Technology  
Portland State University  
Department of Engineering and Technology Management  
P.O. Box 751  
Portland, OR 97207

Dear Participants:

I want to welcome you to the Portland International Center for Management of Engineering and Technology (PICMET) 2009 Conference, "Technology Management in the Age of Fundamental Change." PICMET is a well established international organization, and Oregon is honored to have the broad representation of over 40 countries attending. The Department of Engineering and Technology Management is just one of the many outstanding programs at Portland State University that is laying the foundation for the increasingly technology-driven world in which we live.

In an age when information often becomes overwhelming, the focus that you make on balancing both the quantity and the quality of information is particularly important. I am very proud that this institution of higher learning recognizes the significance of hosting the PICMET Conference where attendees from around the globe can exchange innovative ideas for managing the vast world of technology.

Please enjoy your conference and your time in the City of Roses.

Sincerely,



Ron Wyden  
United States Senator

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# PICMET '09

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TERRORISM, NONPROLIFERATION, AND TRADE

It is my pleasure and honor to welcome you to Oregon for the 2009 Portland International Center for Management and Engineering Conference.

I am glad that you have once again chosen to hold your event in the 1<sup>st</sup> Congressional District. I am proud to be in my sixth term representing this area in Congress. This district is home to Oregon's Silicon Forest and Portland State University, a true urban research university, both of which provide a fitting backdrop for your gathering.

As the chairman of the House Science Committee's Technology and Innovation Subcommittee, I work every day on many issues that are closely associated with your interests. Since the opening of the 111th Congress, I have led the Science Committee to expand opportunities for the most creative entrepreneurial firms through the Small Businesses Innovation Research grant program, and I recently held a hearing to examine possible improvements to the laws that govern technology transfer in the United States.

Another Science Committee priority was the recent establishment of the Advanced Research Projects Agency for Energy, which has a mission of fostering innovation to meet our energy and economic needs. This program received funding in the recovery package and is currently soliciting proposals that will help reduce our dependency on foreign oil, reduce greenhouse gas emissions, and improve energy efficiency across all economic sectors. Like you, I believe programs like these provide the seed corn for future innovation and economic development, which is vital to staying competitive in the global economy.

As a member of the Education and Labor Committee and vice chair of the Community College Caucus, I also have worked to expand education in math, science, and engineering. It is essential that we properly prepare students to meet the needs of an increasingly technical and knowledge-driven workforce.

Your participation this week will help further the cause of science and technology, ultimately making the United States a stronger competitor in our changing global economy. On behalf of the 1st Congressional District, I would like to thank you for your dedication and hard work. I also sincerely hope you all enjoy your time in the city of Portland.

With warm regards,

David Wu  
Member of Congress

# PICMET '09

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# PICMET '09

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## PROGRAM COMMITTEE

The Program Committee consisted of 120 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.

Mustafa Abbas  
Hitoshi Abe  
Rimal Abu Taha  
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# PICMET '09

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## ADVISORY COUNCIL

The International Advisory Council provides advice and counsel on the strategic directions of PICMET and the identification of the critical issues of technology management that are addressed at the conference. The members are listed below.

**Dr. Daniel Berg**, Professor and former President, RPI – USA

**Dr. Frederick Betz**, Adjunct Professor, Portland State University – USA

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# 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 of the previous year. 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.



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.

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## 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

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## **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**

Clive-Steven Curran

### **ADVISOR & CO-AUTHOR**

Prof. Dr. Jens Leker

### **UNIVERSITY**

University of Muenster, Germany

### **PAPER TITLE**

“Seeing the Next iPhone Coming Your Way: How to Anticipate Converging Industries”

### **ABSTRACT**

The blurring of boundaries between hitherto distinct scientific disciplines, technologies or markets is a common and powerful phenomenon. Traditionally, it has been discussed in respect to telecommunications, information technologies and electronics. Subjects of this convergence often change what and where customers buy, with Apple’s renowned iPhone being one current example for customers’ tendency toward products with multiple benefits. More recently, the chemical and its related industries find themselves also affected by a larger convergence process. Concentrating on developments at the outposts of the chemical industry, we discuss indications of convergence with an example from the area of Nutraceuticals and Cosmeceuticals. Furthermore, we present and discuss a multiple indicator concept for monitoring convergence in an R&D-intensive field on the basis of publicly available data. We analyze 7,455 scientific and patent references on phytosterols with the aid of SciFinder Scholar and 3,836 documents employing STN AnaVist. Our results show clear indications for convergence and a proof of principle for our monitoring concept. A closer look at convergence and effective tools for spotting weak signals appears to be necessary. Particularly for practitioners, the opportunity to get a head start on their current and future competitors is of high strategic importance.



# MEDAL OF EXCELLENCE

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## MEDAL OF EXCELLENCE

Initiated at PICMET '04 in Seoul, Korea, the Medal of Excellence award is given for extraordinary achievements of individuals in any discipline for their outstanding contributions to science, engineering and technology management. The 2004 recipients were 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; and Rosalie A. Zobel, Director of Components and Systems in the Information Society and Media Directorate-General of the European Commission. The 2005 recipient was Bob Colwell, President, R & E Colwell and Associates, and former Fellow, Intel Corporation. In 2006, the awardees were Dr. Frederick Betz, Former Program Officer, NSF; Dr. Fariborz Maseeh, Founder and President, The Massiah Foundation; and Dr. T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami. The 2007 recipient was Mihail C. Roco, National Science Foundation (NSF), National Nanotechnology Initiative (NNI), and International Risk Governance Council (IRGC), USA.

## PICMET '09 AWARDEE

### **Albert H. Rubenstein**

*Founder and President, International Applied Science and Technology Associates (IASTA); and Professor Emeritus, Industrial Engineering and Management Sciences, Northwestern University*

Dr. Albert H. Rubenstein is founder and president of International Applied Science and Technology Associates (IASTA) and professor emeritus of Industrial Engineering and Management Sciences at Northwestern University. At Northwestern, he founded and directed the Program of Research on the Management of Research, Development and Innovation; and the Master of Engineering Management program. He co-founded and directed the Center for Information and Telecommunication Technology.

Dr. Rubenstein was on the faculty of the Massachusetts Institute of Technology (MIT) from 1953-59 and on the faculty of Northwestern since 1959. He has been a visiting professor at the University of California (UC), Berkeley; UC Irvine; and UC San Diego. He has authored and co-authored over 150 publications. His latest books are *Managing Technology in the Decentralized Firm* (Wiley 1989 and iUniverse 2001) and *Installing and Managing Workable Knowledge Management Systems* (with Eliezer Geisler, Praeger 2003). He has consulted for over 100 firms and technology-based government agencies in the U.S. and a dozen other countries. In 1992 he was named the first Pioneer in Innovation Management and Engineering Manager of the Year by IEEE. He is a fellow of IEEE, AAAS, and the Society for Applied Anthropology. He was editor



of the *IEEE Transactions on Engineering Management* and a director of Narragansett Capital Corp. for 25 years each.

He has a B.S. in engineering from Lehigh University (1949) and an M.S. and Ph.D. from Columbia University (1950 and 1954). In 1993 he received an honorary Doctor of Engineering from Lehigh University. He was in the Combat Infantry in WWII. Since moving to Washington in 2005, he continues to be active in professional societies and consulting, including a contract with NASA in the field of knowledge management.



# LTM AWARDS

## LEADERSHIP IN TECHNOLOGY MANAGEMENT AWARDS

PICMET's 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.

Past recipients include Dr. Andrew S. Grove, CEO of Intel—USA; Norman Augustine, Chairman of Lockheed Martin—USA; Jack Welch, CEO of General Electric—USA; Dr. Richard M. Cyert, President of Carnegie Mellon University—USA; 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; 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; Dr. Kwan Rim, Chairman of Samsung Advanced Institute of Technology (SAIT)—Korea; Dr. Gunnar Hambræus, member of the Swedish Royal Academy of Science and former President and Chairman, Royal Swedish Academy of Engineering Sciences—Sweden; 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; 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; 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; William P. Venter, Chairman, Allied Electronics Corporation

Limited—South Africa; and Gideon de Wet, Professor Emeritus, University of Pretoria—South Africa.

## PICMET '09 AWARDEES:

### **Klaus Brockhoff**

*Professor, Otto Beisheim School of Management, Germany*

Dr. Klaus Brockhoff, in a teaching career spanning more than 40 years, has held business faculty positions at six universities, including the University of Bonn (Germany), University of Kiel (Germany), University of Lund (Sweden), New Jersey Institute of Technology (United States), and currently, since 1999, WHU—Otto Beisheim School of Management (Germany). A graduate of the University



of Bonn and the University of Munster, and a former research fellow at the University of California, Berkeley, Dr. Brockhoff has documented his research in the areas of technology management, innovation management, business strategy, and business policy in 21 books and more than 280 articles, many of which were published in leading international research journals

such as *Management Science*, *Journal of Product Innovation Management*, *IEEE Transactions on Engineering Management and Research Policy*. He has consulted for numerous government and business organizations and has received two noteworthy awards, the Max Planck Research Award and Karl Heinz Beckurts Award. Dr. Brockhoff is also an elected member of the Berlin-Brandenburg Academy of Sciences (Berlin) and the Academy of Technology (Berlin); he sat on the board of six journals (including *Research Policy*, *R&D Management* and *Technology Analysis & Strategic Management*), two corporations (Steuler Industrierwerke, Metro Group), and three foundations (VolkswagenStiftung, Pro Futura Stiftungen, and WHU Foundation). He holds an honorary doctorate from the University of Berne (Switzerland).

### **Anne M. Mulcahy**

*Chairman and Former CEO, Xerox Corporation—USA*

Xerox Corporation, one of the most enduring brands in business today, is the global leader in document management solutions with \$17.6 billion in annual revenues. At its helm is Anne Mulcahy, a 33-year veteran of Xerox who began her career selling copiers, and who has reinvented Xerox into an innovative technology and services enterprise that helps businesses find better ways to do great work. Building on Xerox's rich heritage of social

# LTM AWARDS

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responsibility, Mulcahy ensures that the company's business decisions and actions are aligned with a clear set of corporate values.

Today, Xerox is a financially solid technology company that has completely overhauled its product line and launched Xerox Global Services, offering content management, imaging and consulting services. It doesn't matter what form the information might take, Xerox has the technology and services to help manage the content and improve communications.



In May 2009, Mulcahy announced that she was retiring as CEO of Xerox, effective July 1, 2009. She will remain as chairman. Mulcahy was named CEO of Xerox on August 1, 2001, and chairman on January 1, 2002. Mulcahy was Xerox president and chief operating officer from May 2000 through July 2001. She began her Xerox career as a field sales representative in 1976 and assumed increasingly responsible sales and senior management positions.

In addition to the Xerox board, Mulcahy is a board director of Citigroup Inc., Fuji Xerox Company, Ltd., Target Corporation, The Washington Post Company, and she is the chairman of the corporate governance task force of the Business Roundtable. She is also a board member of Catalyst, a nonprofit organization supporting women in business.

In addition to the Xerox board, Mulcahy is a board director of Citigroup Inc., Fuji Xerox Company, Ltd., Target Corporation, The Washington Post Company, and she is the chairman of the corporate governance task force of the Business Roundtable. She is also a board member of Catalyst, a nonprofit organization supporting women in business.

## **Muhammad Yunus**

*Managing Director, Grameen Bank—Bangladesh*

Professor Muhammad Yunus is the founder and managing director of Grameen Bank, which pioneered microcredit – a method of banking where small loans are given to the poor, mostly to women, without collateral, for income generating activities, with high repayment rate, to help them get out of poverty.

The third oldest of nine children, Yunus was born in the village of Bathua, Chittagong. His father was Haji Muhammad Dula Mia Shawdagar, a jeweler, and his mother was Sofia Khatun. In 1944, his family moved to the city of Chittagong, and he studied at Lamabazar Primary School. Later, he passed the matriculation examination from Chittagong Collegiate School.

During his school years, he was an active Boy Scout and traveled to West Pakistan and India in 1952; to Europe, the USA, and Canada in 1955; and to the Philippines and Japan in 1959 to attend Jamborees. In 1957, he enrolled in the department of economics at Dhaka University and completed his BA in 1960 and MA in 1961.

Following his graduation, Yunus joined the Bureau of Economics, Dhaka University. Later he was appointed as a lecturer in economics in Chittagong College in 1961. In 1965, Yunus was offered a Fulbright scholarship to study in the United States. He obtained his Ph.D. in economics from Vanderbilt University in the United States in 1969. From 1969 to 1972, Yunus was an assistant professor of economics at Middle Tennessee State University in Murfreesboro, Tennessee.

During the Liberation War of Bangladesh in 1971, Yunus founded a Citizen's Committee in Nashville, Tennessee, published a newsletter named *Bangladesh Newsletter*, and ran the Bangladesh Information Center in Washington, DC, with other Bangladeshis living in the United States, to raise support for the liberation of East Pakistan



and lobby the US Congress to stop military aid to Pakistan. Inspired by the birth of Bangladesh in 1971, Yunus returned to Bangladesh in 1972 and joined the Economics Department of the University of Chittagong after a brief spell in the Planning Commission. He became actively involved with poverty reduction after observing the famine of 1974 and established Rural Economics Programme as a part of the Department's academic program. In 1975,

# LTM AWARDS

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he organized Nabajug (New Era) Tebhaga Khamar (three share farm), which the government later adopted as the Packaged Input Programme.

In 1976, during visits to very poor households in the village of Jobra near Chittagong University, Yunus discovered that very small loans could make an enormous difference to a poor person's life. Jobra women who made bamboo furniture had to take out loans at usurious rates for buying bamboo and had to give up their profits to the moneylenders. Shocked by this reality, he lent USD 27.00 from his own pocket to 42 people in the village to help them pay back their loans to the loan-sharks and be free.

When he approached traditional banks to lend to the poor, he found that they were not interested as the poor were not considered creditworthy. Yunus strongly believed that given the chance the poor will repay the borrowed money, and that it would help the poor work their way out of poverty. After many efforts, in December 1976 Yunus finally succeeded in securing a credit line, offering himself as the guarantor, for his project from Janata Bank to lend it to the poor in Jobra. On October 2, 1983, the project was converted into a full-fledged bank named Grameen Bank (Village Bank), which specialized in making small loans to the poor.



As of May 2008, Grameen Bank (GB) has 7.5 million borrowers, 97 percent of whom are women. With 2,515 branches, GB provides services in 82,072 villages, covering more than 97 percent of the total villages in Bangladesh. Since its inception, it has lent over USD 7 billion to the poor people with a near 100 percent repayment rate. All of its money comes from the depositors of the bank.

Yunus has also founded a number of companies in Bangladesh to address diverse issues of poverty and development. These include Grameen Phone (a mobile telephone company), Grameen Shakti (Grameen Energy), Grameen Fund (social venture capital company), Grameen Textile company, Grameen Knitwear company, Grameen Education company, Grameen Agriculture company, Grameen Fisheries and Livestock company, Grameen Business Promotion company, Grameen Danone Foods Ltd., Grameen Healthcare Services, among others. He is also founder of the Grameen Trust, which extends the Grameen micro-credit system all over the world.

In October 2006, Muhammad Yunus was awarded the 2006 Nobel Peace Prize, along with Grameen Bank, for

their efforts to create economic and social development. The Norwegian Nobel Committee stated, "Muhammad Yunus has shown himself to be a leader who has managed to translate visions into practical action for the benefit of millions of people, not only in Bangladesh, but also in many other countries. Loans to poor people without any financial security had appeared to be an impossible idea. From modest beginnings three decades ago, Yunus has, first and foremost through Grameen Bank, developed micro-credit into an ever more important instrument in the struggle against poverty." Muhammad Yunus became the first Bangladeshi and third Bengali to ever receive a Nobel Prize.

He has won a number of other awards, including the Ramon Magsaysay Award, the World Food Prize, and the Sydney Peace Prize. Within Bangladesh, he has received the President's Award (1978); Central Bank Award (1985); and Independence Day Award (1987), the highest national award. The Bangladesh government brought out a commemorative stamp to honor his Nobel Award. Yunus was inducted as a member of the Legion d'Honneur by President Chirac of France. In January 2008, Houston, Texas declared January 14 as "Muhammad Yunus Day." He is one of the founding members of Global Elders chaired by Nelson Mandela. He was the 2008 commencement speaker at MIT on June 6, 2008. Yunus has been awarded 28 honorary doctorate degrees and serves on the board of many national and international organizations. He is the author of two New York Times bestsellers: *Banker to the Poor* (1997) and *Creating a World Without Poverty, Social Business and the Future of Capitalism* (2008).

Muhammad Yunus is married to Dr. Afrozi Yunus and has two daughters, Monica and Deena.



# GENERAL INFORMATION

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## CONFERENCE FOCUS

When future historians look back at the year 2009, they will undoubtedly refer to it as a year of change, more accurately a year of the culmination of changes that have been shaping the world over the past decades. It is always difficult to pinpoint the exact timing of big changes in society, but this time many of the changes are vividly recognizable. The assumption of endless availability of energy is no longer being made. The balance of power is being redefined by the level of innovation and creative utilization of raw materials and brain power throughout the world. Manufacturing, which was the backbone of industrialized nations for centuries, is changing hands and moving to developing countries while the services are rising in the developed parts of the world. The technological changes are continuing at an unprecedented pace with the combination of computer technology, information technology, biotechnology, nanotechnology and energy technologies playing a central role. These fundamental changes represent huge challenges and huge opportunities. One undeniable factor behind them is the focal point of technology, coupled with the crucial role of Technology Management in making technology work for the betterment of humankind.

It is the responsibility of the Technology Management community to guide technology effectively in a world in the midst of fundamental changes, and to prepare it for better futures. This is a tall order for the leaders and emerging leaders in the Technology Management field. The focus of the PICMET '09 Conference is on the role of Technology Management in such a world.

## 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 '09 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 '09 program consists of

- Optional short courses from Wednesday, July 29, through Saturday, August 1, where experts from around the world share their knowledge and ideas with the participants
- Ph.D. Colloquium, "Getting Your PhD....and Beyond," Sunday, August 2, 13:00 - 17:00, Broadway Rooms
- Plenary sessions by global leaders from industrial corporations, academic institutions and government agencies in the Pavilion Room
- Three special meetings:
  1. Engineering and Technology Management Education and Research, Tuesday, August 4, 10:30-12:00, Pavilion East
  2. Country Representatives Meeting, Wednesday, August 5, 12:00-14:00, Alexander's Restaurant (23rd floor)
  3. PICMET '10 & '11 Planning Session, Thursday, August 6, 16:00-17:30, Pavilion East
- Research papers by cutting-edge researchers
- Applications papers by researchers and practitioners working on industry applications
- A panel discussion with interactions between panelists and the audience
- Tutorials on select topics by authorities in the field

## PUBLICATIONS

There will be two publications at PICMET '09

- The "Bulletin" containing the conference schedule and abstracts of each presentation
- The "Proceedings" containing all of the papers on CD-ROM

## REGISTRATION POLICY

All PICMET attendees, including speakers and session chairs, must register and pay the registration fee to have

# GENERAL INFORMATION

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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 Monday and Tuesday evening events. Pre-conference short courses and site visits are not included in the registration fee. Tickets for these events may be purchased at the registration desk.*

## SESSION AND PAPER DESIGNATIONS

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	00: Pavilion 01: Pavilion-East 02: Pavilion-West 03: Broadway-I 04: Broadway-II 05: Broadway-III 06: Broadway-IV 07: Forum 08: Council 09: Directors 10: Studio 11: Galleria-1 12: Galleria-2 13: Galleria-3

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 Broadway III.

## 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, 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, 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 Plaza Suite on the Plaza Level is designated as the Authors Room. If you need information about anything else concerning the conference, volunteers in the registration area will try to help you.

## EMAIL

Computers with Internet connections will be provided on the Plaza Level in the Plaza Foyer to give you the opportunity to check your e-mail and to send messages. Wireless access will be available in a designated area on the Plaza Level.

## 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. They will do their best to help you. If you need information about anything else concerning the conference, a volunteer in the registration area will try to help you.

# CITY OF ROSES

## GETTING AROUND PORTLAND

Portland's public transportation is made up of the MAX (Metropolitan Area Express) light rail, Tri-Met buses, and the Portland Streetcar. All are free within the downtown area and east across the Willamette River as far as the Lloyd Center stop. Outside this "Fareless Square," fares range from \$2.00 - \$2.30, less for seniors ("honored citizens"), the disabled and youths. Tickets are interchangeable and can be purchased aboard buses or from ticket machines along the MAX or Streetcar lines.

Complete information about Portland's public transportation system, including maps, is available at <http://www.trimet.org>.

## AIRPORT TRANSPORTATION

The pickup area for taxis and town cars is located in the center section of the airport terminal's lower roadway on the baggage claim and departure level. Most transportation providers serve downtown Portland, which is approximately 20-40 minutes from Portland International Airport, depending on traffic.

If you are traveling light and do not mind walking two blocks, you can board the MAX (Metropolitan Area Express) Red Line on the baggage claim level of the Portland International Airport (follow the signs to MAX Light Rail). Get off the train at the Pioneer Square stop (between 6th Ave. and Broadway) in downtown Portland and walk two blocks south on 6th Avenue to the **Hilton Portland and Executive Tower (921 SW 6th Ave., Portland, Oregon)**. One-way tickets are \$2.30 ("all zone") and can be purchased at the ticket machine inside the airport close to the MAX line.

## CLIMATE

The temperature in Portland generally varies between 56°F (13°C) in the evening to 80°F (27°C) during the day in July/August in Portland. The low humidity makes summer months very pleasant and comfortable. You may need a sweater or light jacket in the evening.

## GRATUITIES

Informally known as tipping, in the United States tipping

is voluntary. Tips are supposed to be rewarded for services performed as well as a supplement to an employee's income (gratitude). Following are recommended gratuities:

- For your hotel stay: housekeeping, \$2.00 per day; bellman, \$1.00 per bag and discretionary for above and beyond services provided for you.
- For a taxi ride: 10 – 15 percent of the fare
- For restaurant service: 15 – 20 percent of your total bill.

## TRAVEL OREGON

Portland, otherwise known as "The City of Roses," is a robust and vibrant city with endless things to see and do. Frommer's Guidebooks declared Portland to be one of the world's top travel destinations for 2007. *AARP The Magazine* recently named Portland as one of the top five places to live in the U.S. Music, food and art festivals

abound throughout the city during the summer months. Museums, art galleries, unique retail shops, and restaurants of all varieties are within walking distance of the Hilton.

The State of Oregon is famous for its award winning wineries and golf courses, as well as its breathtaking coastline, rivers and mountains. If you are into wine tasting,

golfing, fishing, hiking, river rafting, mountain climbing, walking in an ancient forest, or simply taking in a spectacular view, all of these possibilities and many more are within a short drive of Portland. We hope you will venture out and experience Portland and the surrounding countryside while you are in Oregon.

*Following is a sampling of events and destinations while you are visiting. For a complete list, visit [http://www.travelportland.com/event\\_calendar/](http://www.travelportland.com/event_calendar/) (provided by Travel Portland, <http://www.travelportland.com>).*

## PORTLAND EVENTS

**First Thursday Gallery Walk**  
(Thursday, August 6)

"First Thursday" is an after-hours evening gallery walk that takes place on the first Thursday of each month. First Thursday takes place on August 6th. You can stroll



Downtown Portland and the Willamette River

# CITY OF ROSES

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through galleries in the Pearl District (loosely bordered by W. Burnside and NW Hoyt, and NW 13th and NW Park) or in the Skidmore District (roughly between Front and Fourth Aves. from SW Oak to NW Glisan St.).

## **Portland Beavers Baseball**

*(PGE Park, 1844 SW Morrison, Portland)*

The Portland Beavers, Portland, Oregon's Triple-A affiliate of the San Diego Padres, will play against the following teams at PGE Park, which is a short MAX (Metropolitan Area Express) ride from the Hilton. Tickets can be purchased at the PGE Park Box Office.

Beavers vs. Las Vegas 51s; Tuesday, July 28; 19:05  
Beavers vs. Las Vegas 51s; Wednesday, July 29; 19:05  
Beavers vs. Las Vegas 51s; Thursday, July 30; 19:05  
Beavers vs. Las Vegas 51s; Friday, July 31; 19:05  
Beavers vs. Sacramento River Cats; Saturday, August 1; 19:05  
Beavers vs. Sacramento River Cats; Sunday, August 2; 14:05  
Beavers vs. Sacramento River Cats; Monday, August 3; 19:05  
Beavers vs. Sacramento River Cats; Tuesday, August 4; 13:05

## **Portland Saturday Market**

*(Waterfront Park near Ankeny and Naito; Saturdays 10:00-17:00; Sundays 11:00-16:30)*

Stroll down row upon row of local handcrafted items and homemade foods. The Portland Saturday Market—open Sundays too—is the nation's largest open-air craft market. Talk directly to the artists and learn about their creative styles and products.



Wednesday Farmers Market

## **Saturday Portland Farmers Market**

*(South Park Blocks between SW Harrison & SW Montgomery; 08:30 - 14:00; Saturdays only)*

This market, located at Portland State University, attracts

a large crowd of people seeking the finest and freshest produce from local farmers as well as breads, cheese, flowers and more.

## **Wednesday Portland Farmers Market**

*(South Park Blocks between SW Salmon and SW Main behind the Arlene Schnitzer Concert Hall; 10:00—14:00; Wednesdays only)*

Local farmers provide fresh produce, flowers and other items to the business crowd and downtown residents.

## **Noon Tunes Summer Concert Series: Rhythm Culture**

*(Tuesdays and Thursdays; Pioneer Courthouse Square, 701 SW 6th St.; 12:00-13:00; free)*

This year's series will feature some of the best local, regional and national talent around! Noon Tunes has become a summertime tradition in the heart of downtown providing free entertainment over the lunch hour every Tuesday and Thursday throughout the summer.

## **Oregon Zoo Summer Concerts: Jewel**

*(Friday, July 31; Oregon Zoo, 4001 SW Canyon Rd.; 19:00; \$22.50)*

Jewel Kilcher, professionally known as Jewel, is an American singer-songwriter, guitarist, actress, and poet. She has received three Grammy Award nominations and has sold twenty-seven million albums worldwide, and almost twenty million in the United States alone.

## **Washington Park Summer Festival: Portland Festival Symphony**

*(Sunday, August 2; Washington Park, head of SW Park Place; 18:00; free)*

Join us at the Washington Park amphitheater for an evening of free music from the Portland Festival Symphony.

## **Washington Park Summer Festival: Al-Andalus Ensemble with Dance**

*(Monday, August 3; Washington Park, head of SW Park Place; 18:00; free)*

Join us at the Washington Park amphitheater for an evening of free music from the Portland Festival Symphony.

## **Washington Park Summer Festival: Vagabond Opera**

*(Tuesday, August 4; Washington Park, head of SW Park Place; 18:00; free)*

Join us at the Washington Park amphitheater for an evening of free music from the Portland Festival Symphony.

# CITY OF ROSES

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## **Oregon Zoo Summer Concerts: The Wailers**

*(Wednesday, August 5; Oregon Zoo, 4001 SW Canyon Rd.; 19:00; \$10.50)*

As the greatest living exponents of Jamaica's reggae tradition, the Wailers have completed innumerable other tours, playing to an estimated 24 million people across the globe. They have also been the first reggae band to tour new territories on many occasions, including Africa and the Far East.

## **Washington Park Summer Festival: The New Iberians**

*(Thursday, August 6; Washington Park, head of SW Park Place; 18:00; free)*

Join us at the Washington Park amphitheater for an evening of free music from the Portland Festival Symphony.

## **The Bite of Oregon**

*(August 7-9; Gov. Tom McCall Waterfront Park, SW Naito and Columbia St., Portland; Admission \$7; [www.biteoforegon.com](http://www.biteoforegon.com))*

From coast to Cascades to canyons, the Bite of Oregon is a stunning celebration of Oregon, its food, its people and its extraordinary quality of life. Come join the fun at the best summer party on the Portland waterfront!

## **Epicurean Excursion**

*(Hosted by Portland Walking Tours; 10:00 and 14:00; Meet your guide INSIDE and upstairs in the mezzanine library at the Heathman Hotel at 1001 SW Broadway at Salmon.; call ahead for reservations, phone: 503 774-4522)*

A unique and delicious walking tour where you'll taste the foods, sip the drinks, meet some artisans and vendors in their shops while exploring the lively Pearl District. If you watch the Food Network or consider yourself a "foodie," this is the adventure for you.

## **PORTLAND ATTRACTIONS**

### **Art Galleries**

The Pearl District, loosely bordered by W. Burnside and NW Hoyt, and NW 13th and NW Park, represents a good share of the gallery arena and comes to serious life on First Thursday each month with after-hours gallery scenersters.

Galleries can also be found in fairly concentrated numbers in the Skidmore District (roughly between Front and Fourth Aves. from SW Oak to NW Glisan St.) and the city's downtown core. Not to be overlooked are galleries throughout the metro area as well.

### **Oregon Historical Society**

*(1200 S.W. Park Avenue, Portland, Oregon 97205; Museum Store: S.W. Broadway at Madison; phone: 503 222-1741; for hours and admission charge visit [www.ohs.org](http://www.ohs.org))*

In the heart of Portland's Cultural District, the Oregon Historical Society houses treasures of the Northwest, a priceless collection that tells the story of Oregon from its

earliest people to the present day. Visit the interactive exhibit, Oregon My Oregon, see exquisite paintings in Oregon Art and learn about the Battleship Oregon in the Hayes Maritime Gallery. Exhibits are designed for visitors of all ages, with artwork, artifacts, photographs, audio/visual presentations and hands-on displays for

children. The Oregon Historical Society Museum Store is Portland's premier spot for distinctive Northwest gifts, including jewelry, artwork, books and games.

### **Oregon Museum of Science and Industry (OMSI)**

*(1945 S.E. Water Avenue, Portland, Oregon; 503 797-4000; [www.oms.edu](http://www.oms.edu))*

Imagine a place where you can journey to the outer reaches of the galaxy, feel the power of an earthquake, climb aboard a real submarine, uncover a fossil, enter the world of virtual reality, or travel the globe in a five-story high IMAX<sup>®</sup> domed theater. You can also enjoy a view of the city while dining at the OMSI Market Café or find the perfect gift at the Science Store. With more than 200 hands-on exhibits, there is something for everyone in the family. Touch, explore, question and discover at the Oregon Museum of Science and Industry (OMSI), located on Portland's waterfront. Open year-round; hours vary.

The museum is currently exhibiting "CSI: The Expe-



Pioneer Square, Portland's Livingroom

# CITY OF ROSES

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rience.” Imagine entering a crime scene and being the one responsible for noticing and collecting every trace of evidence. The pressure is on: you know the analysis of your evidence must be scientifically sound to crack the case. You’ve seen the hit television crime drama, CSI: Crime Scene Investigation on CBS. Now, there’s a forensic science exhibit related to the TV show, as well as a Web-based learning adventure. CSI: The Experience is a completely immersive exhibit that invites visitors to enter “crime” scenes where they identify and record evidence.

## **Pioneer Courthouse Square**

*(701 SW 6th Ave., Portland)*

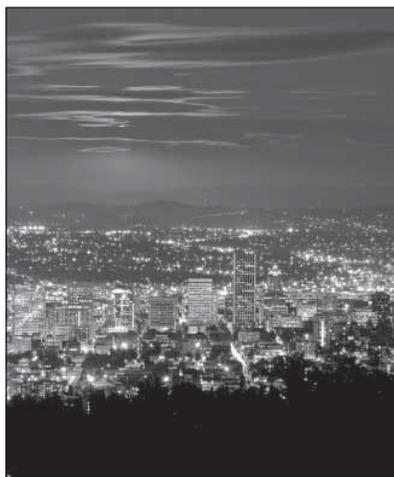
Bricks and ambiance are the two main ingredients that make up Pioneer Courthouse Square. Bordered by 6th and Broadway and Yamhill and Morrison, this people-watching common place is host to not only year-round events, but also to everyday brown-baggers and those wanting simply to rest and take in their surroundings. Starbuck’s and Powell’s Travel Bookstore also can be found on this popular property recognized locally as Portland’s living room.

## **Pittock Mansion**

*(3229 N.W. Pittock Drive, Portland, Oregon 97210; phone: 503 823-3623; for hours and admission charge visit [www.pittockmansion.org](http://www.pittockmansion.org))*

Experience the charm of a lost era as you learn about Henry and Georgiana Pittock and the beautiful estate that symbolizes the growth of Portland. Admire remarkable antique furnishings and fine arts set in a 1914 National Historic Register property. Pack a picnic basket and enjoy a sweeping view of mountains, rivers and the city. And don’t forget your camera.

Pittock Mansion presents “Flights of Fancy Art Deco designs of Erté.” Explore the extravagant fashions imagined by famed illustrator Erté through this display of prints and sculptures. Born Romain de Tiroff, but known by the French pronunciation of his initials, Erté is most famous for his Art Deco illustrations of dramatically dressed women. He worked for Harper’s Bazaar magazine for more than 20 years, creating over 200 covers, and designed costumes and sets for theater, opera, and Hollywood productions. Often featuring women



View from Pittock Mansion

draped in flowing silks and furs and covered with jewels and feathered plumes, Erté’s exotic designs delight the eye with their detail and sinuous lines.

## **Portland Art Museum**

*(1219 S.W. Park Avenue, Portland, Oregon, 97205; phone: 503 226-2811; for hours and admission charge visit [www.portlandartmuseum.org](http://www.portlandartmuseum.org))*

Find out why the oldest museum in the Northwest, the Portland Art Museum, is internationally renowned for exciting art experiences. Located in the heart of downtown’s cultural district, the Museum’s campus includes an outdoor sculpture court and historical interiors. Tour the world and travel through history in magnificent permanent collection galleries, six stories of modern art and special exhibitions.

## **Portland Classical Chinese Garden**

*(Northwest 3rd Ave. at Everett Street, Portland, Oregon 97209; hours: 10:00–18:00; admission, \$8.50; phone: 503 228-8131; [www.portlandchinesegarden.org](http://www.portlandchinesegarden.org))*

*“Most cherished in this mundane world is a place without traffic; truly in the midst of the city, there can be mountains and forest.”*

*~Wen Zhengming (1470–1559)*

Transport yourself to ancient China as you enter Lan Su Yuan. The Portland Classical Chinese Garden is a harmonizing blend of water, architecture, stone and poetry set against a richly planted landscape. Located in Portland’s Old Town/Chinatown, the “Garden of Awakening Orchids” is a collaboration with Portland’s Chinese sister city, Suzhou.

## **Portland Spirit**

*(Office: 110 S.E. Caruthers Street, Portland, Oregon 97214; phone: call for reservations and further information: 503 224-3900 or 1-800 224-3901; [www.portlandspirit.com](http://www.portlandspirit.com))*

The Portland Spirit welcomes you aboard the Northwest’s premier dining ship. Daily lunch and dinner cruises offer a perfect opportunity to surround yourself with unmatched views of the Portland skyline. Freshly prepared cuisine, full-service bars and live entertainment complete a river experience unlike any other.

## **Powell’s City of Books**

*(1005 W. Burnside)*

More than just a bookstore, Powell’s is a Portland institu-

# CITY OF ROSES

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tion. The largest independently owned bookstore in the country, Powell's has more than one million volumes of new, used, rare and out of print books and covers a city block. Powell's map helps guide browsers from one room to the next. Call for hours.

## **Tom McCall Waterfront Park**

It's hard to believe this three-mile stretch along the Willamette River was once a busy expressway. Rather than impatient motorists, the park is now occupied with new types of movers—joggers, bikers and rollerbladers, as well as pedestrians in the mood for nothing more energetic than a stroll. Bordered by Front Ave., (Bill Naito Pkwy.), Tom McCall Waterfront Park is taken up during the warmer months with cultural and musical events, as well as overheated folks hoping to cool off in the Salmon Street Springs Fountain at the end of SW Salmon St. A cruise along the Willamette River on the Portland Spirit (conveniently docked by Salmon Street Springs Fountain) is another way to cool down while seeing Portland from a different vantage point.

## **Washington Park**

Washington Park is not only one of Portland's most beautiful sights, it also contains many of the city's favorite haunts. Lying within the park's expansive boundaries are not only the requisite children's play area, tennis courts and picnic areas, but such wonderful surprises as Metro Washington Park Zoo, Japanese Garden, World Forestry Center, Hoyt Arboretum and the International Rose Test Gardens. Washington Park has its own MAX (Metropolitan Area Express) stop, which lets you off right at the zoo entrance (at the Pioneer Square stop, take the west-bound Red Line or Blue Line trains marked "Beaverton" or "Hillsboro"). Read on for more information on these attractions.

## **Oregon Zoo**

*(Washington Park, 4001 S.W. Canyon Road, Portland, Oregon 97221; phone: 503 226-1561; for hours and admission price visit [www.oregonzoo.org](http://www.oregonzoo.org))*

Trek through the tropics amid the sounds of birds, monkeys and other creatures. You're not in West Africa;

you're in Portland at the zoo's African Rain Forest exhibit. After you've survived the steamy tropics, dry off in the savanna, where giraffes, rhinos and hippos graze. From the tundras of Alaska to the coastal waters of Peru, travel around the world in an afternoon. Open daily at 9 a.m.; closing hours are seasonal. Admission charged; children two and younger free. Five minutes from downtown on Hwy. 26 West, or take MAX light rail.

## **Japanese Garden**

*(Washington Park, Portland, Oregon 97205; hours: 10:00-19:00 (Monday opens at noon); Information: 503 223-1321; Tours: 503 223-9233; for admission price visit [www.japanesegarden.com](http://www.japanesegarden.com))*

Nestled in the scenic west hills of Portland, the Japanese Garden is a haven of tranquil beauty which has been proclaimed one of the most authentic Japanese gardens outside of Japan. Encompassing five and one-half acres and offering five separate garden styles, the Garden includes an authentic Japanese Tea House, meandering streams, intimate walkways, and an unsurpassed view of Mt. Hood. Open daily, April 1–Sept. 30, 10 a.m. to 7 p.m.; Oct. 1–March 31, 10 a.m. to 4 p.m. Open Mondays at noon. Offering events, workshops and cultural holiday celebrations. Four Seasons—Five Senses—One Extraordinary Experience.



Portland's Japanese Garden

## **World Forestry Center**

*(Washington Park, 4033 S.W. Canyon Road, Portland, Oregon 97221; open daily 10:00-17:00; phone: 503 228-1367; for hours and admission price, visit [www.worldforestry.org](http://www.worldforestry.org))*

All new hands-on, interactive exhibits that are fun for the whole family are waiting to be explored at the Discovery Museum. You can get harnessed in and hoisted up 45 feet to see a bird's-eye-view of the forest, or take a wet-free raft ride in Class IV rapids. Climb underneath the forest to see the life below, or try your smoke jumping skills! Round out your adventure with video journeys to Siberia, China, South Africa and Brazil to learn about trees of the world. Come explore, discover and grow at the Discovery Museum! Five minutes from downtown Portland via Hwy. 26 or MAX light rail.

# CITY OF ROSES

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## **Hoyt Arboretum**

*(Washington Park, 4000 SW Fairview Blvd.; phone: 503 865-8733)*

Hoyt Arboretum is a much beloved Portland open space, covering 185 ridge top acres about two miles west of downtown. It is home to a collection of trees representing more than 1,100 species gathered from around the world. Twelve miles of trails wind through this living exhibit. The Visitor Center, at the heart of the Arboretum, offers maps, trail guides, and information. Spiraling up the southwest corner of the arboretum is the Vietnam Veterans' Living Memorial, which honors Oregonians who died or are still missing from that conflict.

## **International Rose Test Garden**

*(Washington Park, 400 SW Kingston Ave.; phone: 503 823-3636)*

Whether you want to take in spectacular scenery or the luscious smell of fragrant roses, the International Rose Test Garden offers both. Approximately 10,000 plants, among which are more than 400 varieties of roses, flourish high above a breathtaking city view. Established in 1917, the International Rose Test Garden is the oldest operating test garden in the country. Admission is free year-round.

## **Willamette Jetboat Excursions**

*(1945 S.E. Water Avenue, OMSI Submarine Dock, Portland, Oregon 97214; phone: 503 231-1532; www.willamettejet.com)*

See Portland's waterfront and more aboard the Willamette Jetboats. Enjoy the area's sights, history and scenic beauty while experiencing the fun and excitement found only in a jet boat. See giant ships, bridges, elegant riverfront homes, historic Oregon City and the majestic Willamette Falls. Reservations are highly recommended.

## **SHOPPING**

### **Shopping Portland's Downtown**

Nordstrom is famed for its emphasis on service and its upscale yet not stuffy fashion. Clothing offerings for men, women and children run the gamut from tres chic to tres trendy. (701 SW Broadway)

If you're looking for elegance—understated or otherwise—Saks Fifth Avenue is the place to shop. American and European designer wear for both men and women is spread over two levels, as is Saks' own line of clothing. (SW Fourth and Fifth Aves.)

## **Pearl District**

You can sample haute couture and hot cuisine in Portland's Pearl District, which has quickly become the place to see and be seen. The Pearl is composed of 50 city blocks of industrial warehouses turned sleek loft apartments, cutting-edge art galleries and vibrant international restaurants.

Though the neighborhood features outstanding brewpubs, delicious international cuisine and the world's largest independent bookstore, the soul of the Pearl is in its galleries. Check them out on the first Thursday of every month, when most galleries stay open late to showcase the talents of new and established artists.

## **Portland's Mall Scene**

Pioneer Place is four airy levels of glass, greenery and fountains. Saks Fifth Avenue anchors Pioneer Place's 80 specialty shops. (700 SW Fifth Ave.)

Just this side of the Columbia River is Jantzen Beach Center. It offers wonderful surprises including a 1921 C.S. Parker carousel. (1405 Jantzen Beach Center)

The nation's first major mall, Lloyd Center offers some 200 specialty shops in addition to familiar anchors. An ice rink offers entertainment. (Bordered by Multnomah and Broadway, 9th and 15th Streets)

Washington Square pulls shoppers into its many specialty shops with the help of several popular anchor stores. (9585 SW Washington Square Rd.)

Clackamas Town Center's 185 specialty shops and popular anchors are offset by an ice rink. (12000 SE 82nd)

Woodburn Company Stores, Oregon's largest outlet center, features 100 shops including Banana Republic Factory Store, Calvin Klein, Eddie Bauer, Great Outdoor Clothing Company, and Polo Ralph Lauren Factory Store to name a few. (I-5 South at the Woodburn exit)

Columbia Gorge Premium Outlets has your favorite brands at savings of 25 to 65 percent. The center's 45 stores include Adidas, Carter's, Eddie Bauer, Gap Outlet, Harry and David, Izod, Le Gourmet Chef, Liz Claiborne, Levi's, Mikasa, OshKosh B'Gosh, Samsonite, Zales Outlet and more. Columbia Gorge Premium Outlets is located just 15 minutes east of downtown Portland. (take I-84 east to Exit 17; 450 N.W. 257th Way, Troutdale, Oregon)

# GUEST PROGRAM

There is a very attractive “Guest Program” for the spouses and guests of PICMET '09 participants. The guest fee (\$395) includes:

- Admission to PICMET's evening social events (the Sunday evening icebreaker, the Monday evening reception, and the Tuesday awards banquet).
- Daily continental breakfast from 7:30 am to 9:30 am, Monday through Thursday (August 3-6), in Alexander's Lounge on the 23rd floor of the Hilton, where the view of Portland is spectacular.
- Three daily excursions (Monday, August 3 – Wednesday, August 5) described below.

## DAILY EXCURSIONS

MONDAY, AUGUST 3, 2009

09:00—09:30

Sissy Lawty, Convention Services Manager from the Travel Portland (formerly Portland Oregon Visitors Association), will give a short talk about Portland, highlighting local events and attractions.

10:00—12:30

### BEST OF PORTLAND WALKING TOUR

Wear your comfortable shoes for this award-winning walk, which clarifies why Portland is regularly recognized as one of the best places to live. You will hear about



Walking Tour

early and modern Portland as your guide shows you an enlightened city rich with artwork, parks, bridges, downtown trains, fountains, and 30+ brewpubs. Even locals are amazed and entertained by what they learn. The tour is under 2 ½ hours and is less than 1 ½ miles (no hills, no steps).

During the tour you will see:

- the actual penny flipped to name the city
- bronze drinking fountains from 1912
- the inside story of our 11 bridges
- a weather machine that most locals know nothing about
- over 30 public art pieces (including Portlandia)
- a controversial, naked, marble statue with some unique nicknames
- skateboard lanes (yes, you read that right)
- the inside scoop on coffee, beer, and rain
- a fountain that changes every 20 minutes
- something that appears to be an Elk
- a free electric car charging station
- and a lot more!

These are the things you will discover:

- Livability and sustainability: What this truly means to someone who lives or visits here.
- Urban planning and design: Why we have a unique downtown that feels like a European city.
- Alternative forms of transportation: How the city got built around people and not the automobile.
- Public art and the “Percent for Art” program: Did you know that buildings have to set aside 2% of their budget for public art?
- Portland's urban green spaces, parks, and gardens: If it rains, it must be green.
- Early Portland - We won't bore you with a history lesson!

*(Tour fee included in PICMET Guest Registration)*

TUESDAY, AUGUST 4, 2009

11:00—17:00

### SHOPPING EXCURSION

Shopping in Oregon is tax free, and this excursion will take you to two of Oregon's best shopping centers. The first stop will be south of Portland at Bridgeport Village, where you will have lunch at one of the many fine restaurants located in the Village. After lunch you will have some time to shop. Considered a “lifestyle shopping cen-

# GUEST PROGRAM

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ter,” Bridgeport Village offers an exclusive mix of local, regional and national shops unlike any other shopping experience in Oregon.

The next stop will be Woodburn Company Stores. With 100 stores, it is the largest tax-free outlet center in the West and the most visited place in Oregon. Big-name brands, skylight-covered walkways, and beautiful Northwest architecture and landscaping make this a unique and fun shopping experience year round.

*(Transportation and lunch are included in PICMET Guest Registration)*

WEDNESDAY, AUGUST 5, 2009  
10:00—14:00

## WASHINGTON PARK'S HOYT ARBORETUM AND INTERNATIONAL ROSE TEST GARDEN

A trip to Portland, the “City of Roses,” would not be complete without a visit to Washington Park in Portland’s West Hills (<http://www.washingtonparkpdx.org/>). Guests will board MAX (Portland’s light rail) for a short ride to one of the most visited and cherished locations in the city.



Botanist Bill Becker (R) and a student at Hoyt Arboretum

Hoyt Arboretum is a 187-acre living museum of trees and plants from all over the world. You will be accompanied by botanist Bill Becker, who will give you a brief tour of the arboretum. Tree collections are organized by taxonomy (plant families) and geography. Identification labels help you to learn about trees that catch your interest.

Hoyt Arboretum is a living laboratory where scientists and students can study trees and plants that would not otherwise grow in our climate and habitat. The Hoyt Collection includes more than 1,000 true species, with specimens grown from seeds collected in the wild. These plants produce seeds that can be used to replant native ecosystems that have been destroyed or are at risk.

The International Rose Test Garden is the oldest official, continuously operated public rose test garden in the United States. Although July is not the peak time for roses, there will be some varieties in bloom and the grounds (just over 5 acres) are beautifully landscaped. The incredible view of Portland from the park makes this



Rose Test Garden

trip worth doing. Featuring over 6,800 rose bushes representing 557 varieties, the International Rose Test Garden received *The Garden of Excellence Award* from the World Federation of Rose Societies in 2006.

After the tours, the group will board the light rail and head back into downtown Portland for lunch at the Red Star Tavern and Roast House. Considered one of the best restaurants in downtown Portland, it celebrates the diverse flavors and substantial traditions of American regional cuisine.

*(Light rail ticket and lunch are included in PICMET Guest Registration)*

# SOCIAL EVENTS

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To facilitate the informal interaction of the participants, several social events have been scheduled during PICMET '09.

## RECEPTION/BUFFET

DATE: SUNDAY, AUGUST 2  
TIME: 19:00—22:00  
LOCATION: HILTON PAVILION  
DRESS: INFORMAL

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

## DINNER AT THE WORLD TRADE CENTER

DATE: MONDAY, AUGUST 3  
TIME: 19:00—22:00  
LOCATION: WORLD TRADE CENTER,  
OUTDOOR PLAZA, 121 SW  
SALMON ST.  
DRESS: INFORMAL

Enjoy a savory buffet of local and international dishes while you mingle and network with colleagues. Singer Kenny Phan (PICMET's registration chair) and his band will perform a variety of pop, country and international songs. Included in the registration fee.\*

## AWARDS BANQUET

DATE: TUESDAY, AUGUST 4  
CASH BAR: 18:30—19:00  
(IN THE PLAZA FOYER)  
BANQUET: 19:00—22:00  
LOCATION: HILTON PAVILION  
DRESS: BUSINESS ATTIRE

This is the premier social event of the conference. The PICMET '09 "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 Monday and Tuesday evening events. Tickets for these events may be purchased at the registration desk.*



# SITE VISITS

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**Site visits to the following companies are offered during PICMET '09. Seating is limited, so sign up early (\$45).**

The times below include travel time. A bus will board passengers on SW Salmon St. by the Hilton. A PICMET volunteer will be in the hotel lobby by the 6th Ave. entrance to guide you to the bus.

## **XEROX**

**TUESDAY, AUGUST 4, 08:30—13:00**

This tour will take you through Xerox Corporation's Wilsonville site. Xerox is the world's leading document management technology and services enterprise. A \$17.6 billion company, Xerox provides the document industry's broadest portfolio of offerings. Digital systems include color and black-and-white printing and publishing systems, digital presses and "book factories," advanced and basic multifunction systems, laser and solid ink network printers, copiers, and fax machines. Xerox's services expertise is unmatched and includes helping businesses develop online document archives, analyzing how employees can most efficiently share documents and knowledge in the office, operating in-house print shops or mailrooms, and building Web-based processes for personalizing direct mail, invoices, brochures and more. Xerox also offers associated software, support and supplies such as toner, paper and ink.

The Wilsonville site is the largest Xerox site outside of the Rochester, New York, area and is focused on the Office business. The site employs approximately 1,600 employees in such areas as engineering, IT, manufacturing, supply chain, marketing, legal, finance, services, sales, and HR. Wilsonville is the primary research and development center for Xerox's proprietary solid ink technology. The site tour will cover an overview of Xerox and will highlight the solid ink engineering and manufacturing facilities on the Wilsonville site.

## **CASCADE MICROTECH**

**TUESDAY, AUGUST 4, 08:00—12:30**

Cascade Microtech is a worldwide leader in advanced wafer probing solutions for the electrical measurement and test of semiconductor integrated circuits and chips. Our customers use our products to perform testing of chips while in wafer form (on-wafer probing), in both engineering and production test environments. The day will begin with a welcome speech by Eric Strid (co-founder,

chief technical officer), followed by product demonstrations and discussions with product marketing managers and application engineers. You will learn about emerging markets and advanced test technologies to address new, complex semiconductor devices.

The Cascade Microtech products to be featured are:

- M150 manual probe station
- EDGE flicker noise measurement system
- eVue digital imaging system
- Pyramid production probe card
- RF/DC engineering probes
- Engineering test sockets and production test contactors

*\*We're sorry, but no camera or recording devices are allowed.*

## **MICRO SYSTEMS ENGINEERING, INC.**

**WEDNESDAY, AUGUST 5, 08:00—12:00**

The Micro Systems Engineering, Inc. (MSEI) manufacturing tour includes a detailed look at the surface-mount assembly and quality system for the production of high-reliability, medical-grade electronics modules. This manufacturing tour concentrates on those topics that dif-



ferentiate a high-reliability manufacturer from more standard volume production lines, including process design, test capability, equipment selection, failure analysis and incoming quality control. The 45-minute walk through the MSEI production facility will give a great introduction to the technologies and capabilities of a high-reliability leading medical manufacturer. MSEI is a Biotronik company.

# TECHNICAL PROGRAM

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## PROGRAM OVERVIEW

The PICMET '09 technical program consists of 124 sessions including 4 plenaries, 9 tutorials, 1 panel discussion, 3 special sessions and 107 paper sessions.

The plenaries are scheduled from 08:30 to 10:00 every morning, Monday, August 3 through Thursday, August 6, in the Pavilion Room on the Plaza level. 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 of 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 '09 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 78 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 13 break-out sessions throughout the day, Monday through Thursday.

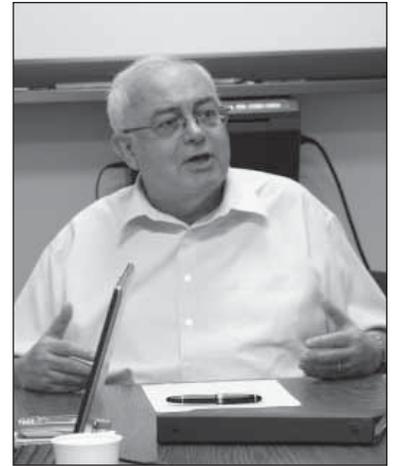
In order to make the sessions easy to see, we have prepared the schedule listings in two different formats for you.

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 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 '09.



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# SHARE THE PICMET EXPERIENCE

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We define “**PICMET Experience**” as

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



# DAILY SCHEDULE

MONDAY, AUGUST 03, 2009

	00	01	02	03	04	05	06	07	08	09	10	11	12	13
	Pavilion East	Pavilion West	Broadway- Broadway-1	Broadway- Broadway-2	Broadway- Broadway-3	Broadway- Broadway-4	Forum Suite	Council Suite	Directors Suite	Studio Suite	Galleria-1	Galleria-2	Galleria-3	
<b>MA</b> 08:30-10:00	Plenary Session - 1													
<b>MB</b> 10:30-12:00	Creating Cyber-enabled Environments for Collaborative Discovery Work	2nd Generation Accelerated Radical Innovation Theory and Application	Project / Program Management - 1	E-Business - 1		Entrepreneurship / Intrapreneurship - 1	Technology Management Education - 1	Technology Management in Semiconductor Industry - 1	Strategic Management of Technology - 1	Decision Making in Technology Management - 1	Technology Assessment and Evaluation - 1	Competitiveness in Technology Management - 1	Technology Forecasting - 1	
<b>MC</b> 12:00-14:00														
<b>MD</b> 14:00-15:30	Meet the Editors	Innovation Management - 1	Technology Roadmapping - 1	Manufacturing Management - 1	Cultural Issues - 1	E-Business - 2	Technology Management Education - 2	Technology Management in Semiconductor Industry - 2	Strategic Management of Technology - 2	Technology Management Framework - 1	People and Organizations - 1	Technology Management in Automotive Industry - 1		
<b>ME</b> 16:00-17:30	Applying the Accelerating Radical Innovation Model		Technology Roadmapping - 2	Manufacturing Management - 2	Cultural Issues - 2	Science and Technology Policy - 1	Technology Management Education - 3	Technology Management in Semiconductor Industry - 3	Strategic Management of Technology - 3		Technology Adoption - 1	Technology Management in Automotive Industry - 2	Technology Diffusion - 1	
	Pavilion East	Pavilion West	Broadway- Broadway-1	Broadway- Broadway-2	Broadway- Broadway-3	Broadway- Broadway-4	Forum Suite	Council Suite	Directors Suite	Studio Suite	Galleria-1	Galleria-2	Galleria-3	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13

# DAILY SCHEDULE

TUESDAY, AUGUST 04, 2009

	00	01	02	03	04	05	06	07	08	09	10	11	12	13
	Pavilion	Pavilion	Pavilion	Broadway-	Broadway-2	Broadway-3	Broadway-4	Forum	Council	Directors	Studio	Galleria-1	Galleria-2	Galleria-3
	East	West	West	1	2	-3	4	Suite	Suite	Suite	Suite	Galleria-1	Galleria-2	Galleria-3
<b>TA</b>	Plenary Session -2													
<b>TB</b>	10:30-12:00	Engineering and Technology Management Education and Research	Innovation Management -2	Project Strategy: Evolution of a Theory	Manufacturing Management -3	Technology Transfer -1	Design Issues -1	Technology Management in Energy Sector -1	Convergence of Technologies -1	Global Issue -1	Technology Management in Wireless Technology -1	Technology Adoption -2	Productivity Management -1	Supply Chain Management -1
<b>TC</b>	12:00-14:00													
<b>TD</b>	14:00-15:30	The Magic of Six: Six Technology Management Activities and Six Tools - Part I	Innovation Management -3	Project / Program Management -1-2	Technology Management in Service Sector -1	Technology Transfer -2	Software Process Management -1	R&D Management -1	People and Organizations -2	Collaborations in Technology Management -1	Technology Management Framework -2	Technology Management in Healthcare Sector -1	Environmental Issues -1	Supply Chain Management -2
<b>TE</b>	16:00-17:30	The Magic of Six: Six Technology Management Activities and Six Tools - Part II	Innovation Management -4	Project / Program Management -1-3	Technology Management in Service Sector -2	Technology Transfer -3	Software Process Management -2	R&D Management -2	The Knowledge Myopia: Evolution and Future of Knowledge Management	Collaborations in Technology Management -2	Decision Making in Technology Management -2	Emerging Technologies -1	Technology Management in Telecommunication Industry -1	
	00	Pavilion East	Pavilion West	Broadway-1	Broadway-2	Broadway-3	Broadway-4	Forum Suite	Council Suite	Directors Suite	Studio Suite	Galleria-1	Galleria-2	Galleria-3

# DAILY SCHEDULE

WEDNESDAY, AUGUST 05, 2009

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	
	Pavilion	Pavilion	Pavilion	Broadway-	Broadway-	Broadway	Broadway-4	Forum	Council	Directors	Studio	Galleria-1	Galleria-2	Galleria-3	
	n	East	West	1	Broadway-2	-3	Broadway-4	Suite	Suite	Suite	Suite	Galleria-1	Galleria-2	Galleria-3	
<b>WA</b>	08:30-10:00	Plenary Session - 3													
<b>WB</b>	10:30-12:00			Project / Program Management - 4		Technology Management in IT Industry - 1	Public Sector - 1	Science and Technology Policy - 2	Knowledge Management - 1		Decision Making in Technology Management - 3	Emerging Technologies - 2	Sustainability - 1		
<b>WC</b>	12:00-14:00														
<b>WD</b>	14:00-15:30	Managing Corporate Technology Through the Balanced Business Scorecard and Other Methods	Innovation Management - 5	Project / Program Management - 5		Technology Management in IT Industry - 2	Entrepreneurship / Intrapreneurship - 2	R&D Management - 3	Knowledge Management - 2	Science and Technology Policy - 3	Decision Making in Technology Management - 4	New Product Development - 1	Sustainability - 2		
<b>WE</b>	16:00-17:30	Management of Strategic Technology Networks	Innovation Management - 6	Project / Program Management - 6	Technology Management in Healthcare Sector - 2	Technology Management in IT Industry - 3	Entrepreneurship / Intrapreneurship - 3	Technology Forecasting - 2	Knowledge Management - 3		Decision Making in Technology Management - 5	New Product Development - 2	Sustainability - 3		
		Pavilion	Pavilion	Broadway-	Broadway-2	Broadway	Broadway-4	Forum	Council	Directors	Studio	Galleria-1	Galleria-2	Galleria-3	
	n	East	West	1	Broadway-2	-3	Broadway-4	Suite	Suite	Suite	Suite	Galleria-1	Galleria-2	Galleria-3	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	

# DAILY SCHEDULE

THURSDAY, AUGUST 06, 2009

	00	01	02	03	04	05	06	07	08	09	10	11	12	13
	Pavilion Plenary Session - 4	Pavilion East	Pavilion West	Broadway- 1	Broadway-2 -3	Broadway-4	Forum Suite	Council Suite	Directors Suite	Studio Suite	Galleria-1	Galleria-2	Galleria-3	
<b>HA</b>	08:30-10:00													
<b>HB</b>	10:30-12:00		Decision Making in Technology Management - 6	Project / Program Management - 7	Technology Management in Healthcare Sector - 3	Intellectual Property - 1	New Product Development - 3	R&D Management - 4	Knowledge Management - 4	Strategic Management of Technology - 4				
<b>HC</b>	12:00-14:00													
<b>HD</b>	14:00-15:30	Project Management Alignment Program - A Collaborative Methodology for Delivering Highly Successful Outcomes		Technology Roadmapping - 3	Environmental Issues - 2	Technology Transfer - 4	R&D Management - 5	Knowledge Management - 5	Strategic Management of Technology - 5					
<b>HE</b>	16:00-17:30	PICMET '10 and '11 Planning Session												
		Pavilion East	Pavilion West	Broadway- 1	Broadway-2 -3	Broadway-4	Forum Suite	Council Suite	Directors Suite	Studio Suite	Galleria-1	Galleria-2	Galleria-3	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13

# SCHEDULE OF SESSIONS

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## SCHEDULE OF SESSIONS BY DATE

### MONDAY, AUGUST 3, 2009

Session Number	Date	Time	Room	Session Title
MA 00	Monday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 1"
MB 01	Monday	10:30 - 12:00	Pavilion East	TUTORIAL: "Creating Cyber-enabled Environments for Collaborative Discovery Work"
MD 01	Monday	14:00 - 15:30	Pavilion East	PANEL: "Meet the Editors"
ME 01	Monday	16:00 - 17:30	Pavilion East	TUTORIAL: "Applying the Accelerating Radical Innovation Model"
MB 02	Monday	10:30 - 12:00	Pavilion West	"2nd Generation Accelerated Radical Innovation - Theory and Application"
MD 02	Monday	14:00 - 15:30	Pavilion West	"Innovation Management - 1"
MB 03	Monday	10:30 - 12:00	Broadway-1	"Project / Program Management - 1"
MD 03	Monday	14:00 - 15:30	Broadway-1	"Technology Roadmapping - 1"
ME 03	Monday	16:00 - 17:30	Broadway-1	"Technology Roadmapping - 2"
MB 04	Monday	10:30 - 12:00	Broadway-2	"E-Business - 1"
MD 04	Monday	14:00 - 15:30	Broadway-2	"Manufacturing Management - 1"
ME 04	Monday	16:00 - 17:30	Broadway-2	"Manufacturing Management - 2"
MD 05	Monday	14:00 - 15:30	Broadway-3	"Cultural Issues - 1"
ME 05	Monday	16:00 - 17:30	Broadway-3	"Cultural Issues - 2"
MB 06	Monday	10:30 - 12:00	Broadway-4	"Entrepreneurship / Intrapreneurship - 1"
MD 06	Monday	14:00 - 15:30	Broadway-4	"E-Business - 2"
ME 06	Monday	16:00 - 17:30	Broadway-4	"Science and Technology Policy - 1"
MB 07	Monday	10:30 - 12:00	Forum Suite	"Technology Management Education - 1"
MD 07	Monday	14:00 - 15:30	Forum Suite	"Technology Management Education - 2"
ME 07	Monday	16:00 - 17:30	Forum Suite	"Technology Management Education - 3"
MB 08	Monday	10:30 - 12:00	Council Suite	"Technology Management in Semiconductor Industry - 1"
MD 08	Monday	14:00 - 15:30	Council Suite	"Technology Management in Semiconductor Industry - 2"
ME 08	Monday	16:00 - 17:30	Council Suite	"Technology Management in Semiconductor Industry - 3"
MB 09	Monday	10:30 - 12:00	Directors Suite	"Strategic Management of Technology - 1"
MD 09	Monday	14:00 - 15:30	Directors Suite	"Strategic Management of Technology - 2"
ME 09	Monday	16:00 - 17:30	Directors Suite	"Strategic Management of Technology - 3"
MB 10	Monday	10:30 - 12:00	Studio Suite	"Decision Making in Technology Management - 1"
MD 10	Monday	14:00 - 15:30	Studio Suite	"Technology Management Framework - 1"
MB 11	Monday	10:30 - 12:00	Galleria-1	"Technology Assessment and Evaluation - 1"
MD 11	Monday	14:00 - 15:30	Galleria-1	"People and Organizations - 1"
ME 11	Monday	16:00 - 17:30	Galleria-1	"Technology Adoption - 1"
MB 12	Monday	10:30 - 12:00	Galleria-2	"Competitiveness in Technology Management - 1"

# SCHEDULE OF SESSIONS

MD	12	Monday	14:00 - 15:30	Galleria-2	"Technology Management in Automotive Industry - 1"
ME	12	Monday	16:00 - 17:30	Galleria-2	"Technology Management in Automotive Industry - 2"
MB	13	Monday	10:30 - 12:00	Galleria-3	"Technology Forecasting - 1"
ME	13	Monday	16:00 - 17:30	Galleria-3	"Technology Diffusion - 1"

## TUESDAY, AUGUST 4, 2009

TA	00	Tuesday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 2"
TB	01	Tuesday	10:30 - 12:00	Pavilion East	SPECIAL SESSION: "Engineering and Technology Management Education and Research"
TD	01	Tuesday	14:00 - 15:30	Pavilion East	TUTORIAL: "The Magic of Six: Six Technology Management Activities and Six Tools - Part I"
TE	01	Tuesday	16:00 - 17:30	Pavilion East	TUTORIAL: "The Magic of Six: Six Technology Management Activities and Six Tools - Part II"
TB	02	Tuesday	10:30 - 12:00	Pavilion West	"Innovation Management - 2"
TD	02	Tuesday	14:00 - 15:30	Pavilion West	"Innovation Management - 3"
TE	02	Tuesday	16:00 - 17:30	Pavilion West	"Innovation Management - 4"
TB	03	Tuesday	10:30 - 12:00	Broadway-1	TUTORIAL: "Project Strategy: Evolution of a Theory"
TD	03	Tuesday	14:00 - 15:30	Broadway-1	"Project / Program Management - 2"
TE	03	Tuesday	16:00 - 17:30	Broadway-1	"Project / Program Management - 3"
TB	04	Tuesday	10:30 - 12:00	Broadway-2	"Manufacturing Management - 3"
TD	04	Tuesday	14:00 - 15:30	Broadway-2	"Technology Management in Service Sector - 1"
TE	04	Tuesday	16:00 - 17:30	Broadway-2	"Technology Management in Service Sector - 2"
TB	05	Tuesday	10:30 - 12:00	Broadway-3	"Technology Transfer - 1"
TD	05	Tuesday	14:00 - 15:30	Broadway-3	"Technology Transfer - 2"
TE	05	Tuesday	16:00 - 17:30	Broadway-3	"Technology Transfer - 3"
TB	06	Tuesday	10:30 - 12:00	Broadway-4	"Design Issues - 1"
TD	06	Tuesday	14:00 - 15:30	Broadway-4	"Software Process Management - 1"
TE	06	Tuesday	16:00 - 17:30	Broadway-4	"Software Process Management - 2"
TB	07	Tuesday	10:30 - 12:00	Forum Suite	"Technology Management in Energy Sector - 1"
TD	07	Tuesday	14:00 - 15:30	Forum Suite	"R&D Management - 1"
TE	07	Tuesday	16:00 - 17:30	Forum Suite	"R&D Management - 2"
TB	08	Tuesday	10:30 - 12:00	Council Suite	"Convergence of Technologies - 1"
TD	08	Tuesday	14:00 - 15:30	Council Suite	"People and Organizations - 2"
TE	08	Tuesday	16:00 - 17:30	Council Suite	TUTORIAL: "The Knowledge Myopia: Evolution and Future of Knowledge Management"
TB	09	Tuesday	10:30 - 12:00	Directors Suite	"Global Issue - 1"
TD	09	Tuesday	14:00 - 15:30	Directors Suite	"Collaborations in Technology Management - 1"
TE	09	Tuesday	16:00 - 17:30	Directors Suite	"Collaborations in Technology Management - 2"
TB	10	Tuesday	10:30 - 12:00	Studio Suite	"Technology Management in Wireless Technology - 1"

# SCHEDULE OF SESSIONS

TD	10	Tuesday	14:00 - 15:30	Studio Suite	"Technology Management Framework - 2"
TE	10	Tuesday	16:00 - 17:30	Studio Suite	"Decision Making in Technology Management - 2"
TB	11	Tuesday	10:30 - 12:00	Galleria-1	"Technology Adoption - 2"
TD	11	Tuesday	14:00 - 15:30	Galleria-1	"Technology Management in Healthcare Sector - 1"
TE	11	Tuesday	16:00 - 17:30	Galleria-1	"Emerging Technologies - 1"
TB	12	Tuesday	10:30 - 12:00	Galleria-2	"Productivity Management - 1"
TD	12	Tuesday	14:00 - 15:30	Galleria-2	"Environmental Issues - 1"
TE	12	Tuesday	16:00 - 17:30	Galleria-2	"Technology Management in Telecommunication Industry - 1"
TB	13	Tuesday	10:30 - 12:00	Galleria-3	"Supply Chain Management - 1"
TD	13	Tuesday	14:00 - 15:30	Galleria-3	"Supply Chain Management - 2"

## WEDNESDAY, AUGUST 5, 2009

WA	00	Wednesday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 3"
WD	01	Wednesday	14:00 - 15:30	Pavilion East	TUTORIAL: "Managing Corporate Technology Through the Balanced Business Scorecard and Other Methods"
WE	01	Wednesday	16:00 - 17:30	Pavilion East	TUTORIAL: "Management of Strategic Technology Networks"
WD	02	Wednesday	14:00 - 15:30	Pavilion West	"Innovation Management - 5"
WE	02	Wednesday	16:00 - 17:30	Pavilion West	"Innovation Management - 6"
WB	03	Wednesday	10:30 - 12:00	Broadway-1	"Project / Program Management - 4"
WD	03	Wednesday	14:00 - 15:30	Broadway-1	"Project / Program Management - 5"
WE	03	Wednesday	16:00 - 17:30	Broadway-1	"Project / Program Management - 6"
WE	04	Wednesday	16:00 - 17:30	Broadway-2	"Technology Management in Healthcare Sector - 2"
WB	05	Wednesday	10:30 - 12:00	Broadway-3	"Technology Management in IT Industry - 1"
WD	05	Wednesday	14:00 - 15:30	Broadway-3	"Technology Management in IT Industry - 2"
WE	05	Wednesday	16:00 - 17:30	Broadway-3	"Technology Management in IT Industry - 3"
WB	06	Wednesday	10:30 - 12:00	Broadway-4	"Public Sector - 1"
WD	06	Wednesday	14:00 - 15:30	Broadway-4	"Entrepreneurship / Intrapreneurship - 2"
WE	06	Wednesday	16:00 - 17:30	Broadway-4	"Entrepreneurship / Intrapreneurship - 3"
WB	07	Wednesday	10:30 - 12:00	Forum Suite	"Knowledge Management - 1"
WD	07	Wednesday	14:00 - 15:30	Forum Suite	"R&D Management - 3"
WE	07	Wednesday	16:00 - 17:30	Forum Suite	"Technology Forecasting - 2"
WB	08	Wednesday	10:30 - 12:00	Council Suite	"Science and Technology Policy - 2"
WD	08	Wednesday	14:00 - 15:30	Council Suite	"Knowledge Management - 2"
WE	08	Wednesday	16:00 - 17:30	Council Suite	"Knowledge Management - 3"
WD	09	Wednesday	14:00 - 15:30	Directors Suite	"Science and Technology Policy - 3"
WB	10	Wednesday	10:30 - 12:00	Studio Suite	"Decision Making in Technology Management - 3"
WD	10	Wednesday	14:00 - 15:30	Studio Suite	"Decision Making in Technology Management - 4"
WE	10	Wednesday	16:00 - 17:30	Studio Suite	"Decision Making in Technology Management - 5"

# SCHEDULE OF SESSIONS

WB	11	Wednesday	10:30 - 12:00	Galleria-1	"Emerging Technologies - 2"
WD	11	Wednesday	14:00 - 15:30	Galleria-1	"New Product Development - 1"
WE	11	Wednesday	16:00 - 17:30	Galleria-1	"New Product Development - 2"
WB	12	Wednesday	10:30 - 12:00	Galleria-2	"Sustainability - 1"
WD	12	Wednesday	14:00 - 15:30	Galleria-2	"Sustainability - 2"
WE	12	Wednesday	16:00 - 17:30	Galleria-2	"Sustainability - 3"

## THURSDAY, AUGUST 6, 2009

HA	00	Thursday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 4"
HD	01	Thursday	14:00 - 15:30	Pavilion East	TUTORIAL: "Project Management Alignment Program – A Collaborative Methodology for Delivering Highly Successful Outcomes"
HE	01	Thursday	16:00 - 17:30	Pavilion East	SPECIAL SESSION: "PICMET '10 and '11 Planning Session"
HB	02	Thursday	10:30 - 12:00	Pavilion West	"Decision Making in Technology Management - 6"
HB	03	Thursday	10:30 - 12:00	Broadway-1	"Project / Program Management - 7"
HD	03	Thursday	14:00 - 15:30	Broadway-1	"Technology Roadmapping - 3"
HB	04	Thursday	10:30 - 12:00	Broadway-2	"Technology Management in Healthcare Sector - 3"
HD	04	Thursday	14:00 - 15:30	Broadway-2	"Environmental Issues - 2"
HB	05	Thursday	10:30 - 12:00	Broadway-3	"Intellectual Property - 1"
HD	05	Thursday	14:00 - 15:30	Broadway-3	"Technology Transfer - 4"
HB	06	Thursday	10:30 - 12:00	Broadway-4	"New Product Development - 3"
HB	07	Thursday	10:30 - 12:00	Forum Suite	"R&D Management - 4"
HD	07	Thursday	14:00 - 15:30	Forum Suite	"R&D Management - 5"
HB	08	Thursday	10:30 - 12:00	Council Suite	"Knowledge Management - 4"
HD	08	Thursday	14:00 - 15:30	Council Suite	"Knowledge Management - 5"
HB	09	Thursday	10:30 - 12:00	Directors Suite	"Strategic Management of Technology - 4"
HD	09	Thursday	14:00 - 15:30	Directors Suite	"Strategic Management of Technology - 5"



# SCHEDULE OF SESSIONS

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## SCHEDULE OF SESSIONS BY ROOM

Session Number	Date	Time	Room	Session Title
MA 00	Monday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 1"
TA 00	Tuesday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 2"
WA 00	Wednesday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 3"
HA 00	Thursday	08:30 - 10:00	Pavilion	PLENARY: "Plenary Session - 4"
MB 01	Monday	10:30 - 12:00	Pavilion East	TUTORIAL: "Creating Cyber-enabled Environments for Collaborative Discovery Work"
MD 01	Monday	14:00 - 15:30	Pavilion East	PANEL: "Meet the Editors"
ME 01	Monday	16:00 - 17:30	Pavilion East	TUTORIAL: "Applying the Accelerating Radical Innovation Model"
TB 01	Tuesday	10:30 - 12:00	Pavilion East	SPECIAL SESSION: "Engineering and Technology Management Education and Research"
TD 01	Tuesday	14:00 - 15:30	Pavilion East	TUTORIAL: "The Magic of Six: Six Technology Management Activities and Six Tools - Part I"
TE 01	Tuesday	16:00 - 17:30	Pavilion East	TUTORIAL: "The Magic of Six: Six Technology Management Activities and Six Tools - Part II"
WD 01	Wednesday	14:00 - 15:30	Pavilion East	TUTORIAL: "Managing Corporate Technology Through the Balanced Business Scorecard and Other Methods"
WE 01	Wednesday	16:00 - 17:30	Pavilion East	TUTORIAL: "Management of Strategic Technology Networks"
HD 01	Thursday	14:00 - 15:30	Pavilion East	TUTORIAL: "Project Management Alignment Program – A Collaborative Methodology for Delivering Highly Successful Outcomes"
HE 01	Thursday	16:00 - 17:30	Pavilion East	SPECIAL SESSION: "PICMET '10 and '11 Planning Session"
MB 02	Monday	10:30 - 12:00	Pavilion West	"2nd Generation Accelerated Radical Innovation - Theory and Application"
MD 02	Monday	14:00 - 15:30	Pavilion West	"Innovation Management - 1"
TB 02	Tuesday	10:30 - 12:00	Pavilion West	"Innovation Management - 2"
TD 02	Tuesday	14:00 - 15:30	Pavilion West	"Innovation Management - 3"
TE 02	Tuesday	16:00 - 17:30	Pavilion West	"Innovation Management - 4"
WD 02	Wednesday	14:00 - 15:30	Pavilion West	"Innovation Management - 5"
WE 02	Wednesday	16:00 - 17:30	Pavilion West	"Innovation Management - 6"
HB 02	Thursday	10:30 - 12:00	Pavilion West	"Decision Making in Technology Management - 6"
MB 03	Monday	10:30 - 12:00	Broadway-1	"Project / Program Management - 1"
MD 03	Monday	14:00 - 15:30	Broadway-1	"Technology Roadmapping - 1"
ME 03	Monday	16:00 - 17:30	Broadway-1	"Technology Roadmapping - 2"
TB 03	Tuesday	10:30 - 12:00	Broadway-1	TUTORIAL: "Project Strategy: Evolution of a Theory"
TD 03	Tuesday	14:00 - 15:30	Broadway-1	"Project / Program Management - 2"
TE 03	Tuesday	16:00 - 17:30	Broadway-1	"Project / Program Management - 3"

# SCHEDULE OF SESSIONS

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WB	03	Wednesday	10:30 - 12:00	Broadway-1	"Project / Program Management - 4"
WD	03	Wednesday	14:00 - 15:30	Broadway-1	"Project / Program Management - 5"
WE	03	Wednesday	16:00 - 17:30	Broadway-1	"Project / Program Management - 6"
HB	03	Thursday	10:30 - 12:00	Broadway-1	"Project / Program Management - 7"
HD	03	Thursday	14:00 - 15:30	Broadway-1	"Technology Roadmapping - 3"
MB	04	Monday	10:30 - 12:00	Broadway-2	"E-Business - 1"
MD	04	Monday	14:00 - 15:30	Broadway-2	"Manufacturing Management - 1"
ME	04	Monday	16:00 - 17:30	Broadway-2	"Manufacturing Management - 2"
TB	04	Tuesday	10:30 - 12:00	Broadway-2	"Manufacturing Management - 3"
TD	04	Tuesday	14:00 - 15:30	Broadway-2	"Technology Management in Service Sector - 1"
TE	04	Tuesday	16:00 - 17:30	Broadway-2	"Technology Management in Service Sector - 2"
WE	04	Wednesday	16:00 - 17:30	Broadway-2	"Technology Management in Healthcare Sector - 2"
HB	04	Thursday	10:30 - 12:00	Broadway-2	"Technology Management in Healthcare Sector - 3"
HD	04	Thursday	14:00 - 15:30	Broadway-2	"Environmental Issues - 2"
MD	05	Monday	14:00 - 15:30	Broadway-3	"Cultural Issues - 1"
ME	05	Monday	16:00 - 17:30	Broadway-3	"Cultural Issues - 2"
TB	05	Tuesday	10:30 - 12:00	Broadway-3	"Technology Transfer - 1"
TD	05	Tuesday	14:00 - 15:30	Broadway-3	"Technology Transfer - 2"
TE	05	Tuesday	16:00 - 17:30	Broadway-3	"Technology Transfer - 3"
WB	05	Wednesday	10:30 - 12:00	Broadway-3	"Technology Management in IT Industry - 1"
WD	05	Wednesday	14:00 - 15:30	Broadway-3	"Technology Management in IT Industry - 2"
WE	05	Wednesday	16:00 - 17:30	Broadway-3	"Technology Management in IT Industry - 3"
HB	05	Thursday	10:30 - 12:00	Broadway-3	"Intellectual Property - 1"
HD	05	Thursday	14:00 - 15:30	Broadway-3	"Technology Transfer - 4"
MB	06	Monday	10:30 - 12:00	Broadway-4	"Entrepreneurship / Intrapreneurship - 1"
MD	06	Monday	14:00 - 15:30	Broadway-4	"E-Business - 2"
ME	06	Monday	16:00 - 17:30	Broadway-4	"Science and Technology Policy - 1"
TB	06	Tuesday	10:30 - 12:00	Broadway-4	"Design Issues - 1"
TD	06	Tuesday	14:00 - 15:30	Broadway-4	"Software Process Management - 1"
TE	06	Tuesday	16:00 - 17:30	Broadway-4	"Software Process Management - 2"
WB	06	Wednesday	10:30 - 12:00	Broadway-4	"Public Sector - 1"
WD	06	Wednesday	14:00 - 15:30	Broadway-4	"Entrepreneurship / Intrapreneurship - 2"
WE	06	Wednesday	16:00 - 17:30	Broadway-4	"Entrepreneurship / Intrapreneurship - 3"
HB	06	Thursday	10:30 - 12:00	Broadway-4	"New Product Development - 3"
MB	07	Monday	10:30 - 12:00	Forum Suite	"Technology Management Education - 1"
MD	07	Monday	14:00 - 15:30	Forum Suite	"Technology Management Education - 2"
ME	07	Monday	16:00 - 17:30	Forum Suite	"Technology Management Education - 3"
TB	07	Tuesday	10:30 - 12:00	Forum Suite	"Technology Management in Energy Sector - 1"
TD	07	Tuesday	14:00 - 15:30	Forum Suite	"R&D Management - 1"

# SCHEDULE OF SESSIONS

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TE	07	Tuesday	16:00 - 17:30	Forum Suite	"R&D Management - 2"
WB	07	Wednesday	10:30 - 12:00	Forum Suite	"Knowledge Management - 1"
WD	07	Wednesday	14:00 - 15:30	Forum Suite	"R&D Management - 3"
WE	07	Wednesday	16:00 - 17:30	Forum Suite	"Technology Forecasting - 2"
HB	07	Thursday	10:30 - 12:00	Forum Suite	"R&D Management - 4"
HD	07	Thursday	14:00 - 15:30	Forum Suite	"R&D Management - 5"
MB	08	Monday	10:30 - 12:00	Council Suite	"Technology Management in Semiconductor Industry - 1"
MD	08	Monday	14:00 - 15:30	Council Suite	"Technology Management in Semiconductor Industry - 2"
ME	08	Monday	16:00 - 17:30	Council Suite	"Technology Management in Semiconductor Industry - 3"
TB	08	Tuesday	10:30 - 12:00	Council Suite	"Convergence of Technologies - 1"
TD	08	Tuesday	14:00 - 15:30	Council Suite	"People and Organizations - 2"
TE	08	Tuesday	16:00 - 17:30	Council Suite	TUTORIAL: "The Knowledge Myopia: Evolution and Future of Knowledge Management"
WB	08	Wednesday	10:30 - 12:00	Council Suite	"Science and Technology Policy - 2"
WD	08	Wednesday	14:00 - 15:30	Council Suite	"Knowledge Management - 2"
WE	08	Wednesday	16:00 - 17:30	Council Suite	"Knowledge Management - 3"
HB	08	Thursday	10:30 - 12:00	Council Suite	"Knowledge Management - 4"
HD	08	Thursday	14:00 - 15:30	Council Suite	"Knowledge Management - 5"
MB	09	Monday	10:30 - 12:00	Directors Suite	"Strategic Management of Technology - 1"
MD	09	Monday	14:00 - 15:30	Directors Suite	"Strategic Management of Technology - 2"
ME	09	Monday	16:00 - 17:30	Directors Suite	"Strategic Management of Technology - 3"
TB	09	Tuesday	10:30 - 12:00	Directors Suite	"Global Issue - 1"
TD	09	Tuesday	14:00 - 15:30	Directors Suite	"Collaborations in Technology Management - 1"
TE	09	Tuesday	16:00 - 17:30	Directors Suite	"Collaborations in Technology Management - 2"
WD	09	Wednesday	14:00 - 15:30	Directors Suite	"Science and Technology Policy - 3"
HB	09	Thursday	10:30 - 12:00	Directors Suite	"Strategic Management of Technology - 4"
HD	09	Thursday	14:00 - 15:30	Directors Suite	"Strategic Management of Technology - 5"
MB	10	Monday	10:30 - 12:00	Studio Suite	"Decision Making in Technology Management - 1"
MD	10	Monday	14:00 - 15:30	Studio Suite	"Technology Management Framework - 1"
TB	10	Tuesday	10:30 - 12:00	Studio Suite	"Technology Management in Wireless Technology - 1"
TD	10	Tuesday	14:00 - 15:30	Studio Suite	"Technology Management Framework - 2"
TE	10	Tuesday	16:00 - 17:30	Studio Suite	"Decision Making in Technology Management - 2"
WB	10	Wednesday	10:30 - 12:00	Studio Suite	"Decision Making in Technology Management - 3"
WD	10	Wednesday	14:00 - 15:30	Studio Suite	"Decision Making in Technology Management - 4"
WE	10	Wednesday	16:00 - 17:30	Studio Suite	"Decision Making in Technology Management - 5"
MB	11	Monday	10:30 - 12:00	Galleria-1	"Technology Assessment and Evaluation - 1"
MD	11	Monday	14:00 - 15:30	Galleria-1	"People and Organizations - 1"
ME	11	Monday	16:00 - 17:30	Galleria-1	"Technology Adoption - 1"
TB	11	Tuesday	10:30 - 12:00	Galleria-1	"Technology Adoption - 2"

# SCHEDULE OF SESSIONS

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TD	11	Tuesday	14:00 - 15:30	Galleria-1	“Technology Management in Healthcare Sector - 1”
TE	11	Tuesday	16:00 - 17:30	Galleria-1	“Emerging Technologies - 1”
WB	11	Wednesday	10:30 - 12:00	Galleria-1	“Emerging Technologies - 2”
WD	11	Wednesday	14:00 - 15:30	Galleria-1	“New Product Development - 1”
WE	11	Wednesday	16:00 - 17:30	Galleria-1	“New Product Development - 2”
MB	12	Monday	10:30 - 12:00	Galleria-2	“Competitiveness in Technology Management - 1”
MD	12	Monday	14:00 - 15:30	Galleria-2	“Technology Management in Automotive Industry - 1”
ME	12	Monday	16:00 - 17:30	Galleria-2	“Technology Management in Automotive Industry - 2”
TB	12	Tuesday	10:30 - 12:00	Galleria-2	“Productivity Management - 1”
TD	12	Tuesday	14:00 - 15:30	Galleria-2	“Environmental Issues - 1”
TE	12	Tuesday	16:00 - 17:30	Galleria-2	“Technology Management in Telecommunication Industry - 1”
WB	12	Wednesday	10:30 - 12:00	Galleria-2	“Sustainability - 1”
WD	12	Wednesday	14:00 - 15:30	Galleria-2	“Sustainability - 2”
WE	12	Wednesday	16:00 - 17:30	Galleria-2	“Sustainability - 3”
MB	13	Monday	10:30 - 12:00	Galleria-3	“Technology Forecasting - 1”
ME	13	Monday	16:00 - 17:30	Galleria-3	“Technology Diffusion - 1”
TB	13	Tuesday	10:30 - 12:00	Galleria-3	“Supply Chain Management - 1 “
TD	13	Tuesday	14:00 - 15:30	Galleria-3	“Supply Chain Management - 2”



# PERSONAL SCHEDULE

	Sunday	Monday	Tuesday	Wednesday	Thursday
08:00 – 08:30 Bright Start					
8:30 – 10:00 (A)		Plenary (Hilton Pavilion)	Plenary (Hilton Pavilion)	Plenary (Hilton Pavilion)	Plenary (Hilton Pavilion)
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 '10 and PICMET '11 Planning Session (Pavilion East)
19:00 – 22:00	Welcome Reception (Hilton Pavilion)	Dinner at the World Trade Center (A few blocks from the Hilton)	Awards Banquet (Hilton Pavilion)		

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# PLENARIES

## PLENARY SESSION—1

DATE: MONDAY, AUGUST 3, 2009  
TIME: 08:30-10:00  
ROOM: PAVILION ROOM, PLAZA LEVEL

Session Chair: Ralph Quinsey, President and CEO,  
TriQuint Semiconductor, Inc., USA

### KEYNOTE-1

**Julia I. Lane, Program Director, Science of Science & Innovation Policy, National Science Foundation, USA**

#### “Science of Science & Innovation Policy”

This keynote describes the current status of the Science of Science & Innovation Policy program at NSF. It explains the current status of awards, and future likely emphasis areas. It also describes the state of the federal Science of Science Policy interagency group, and the associated Roadmap ([scienceofsciencepolicy.net](http://scienceofsciencepolicy.net))

*Dr. Julia I. Lane is the Program Director of the Science of Science & Innovation Policy program at the National Science Foundation. Her previous jobs included Senior Vice President and Director, Economics Department at NORC/University of Chicago, Director of the Employment Dynamics Program at the Urban Institute, Senior Research Fellow at the U.S. Census Bureau and Assistant, Associate and Full Professor at American University.*



*Julia has published over 60 articles in leading economics journals, and authored or edited five books. She has been the recipient of over \$20 million in grants from foundations such as the National Science Foundation, the Sloan Foundation, the MacArthur Foundation, the Russell Sage Foundation, the National Institute of Health; and from government agencies such as the Departments of Commerce, Labor, and Health and Human Services in the U.S., the ESRC in the U.K., and the Department of Labour and Statistics New Zealand in New Zealand, as well as from international organizations such as the World Bank. She has organized over 30 national and international conferences, received several national awards, given keynote speeches all over the world, and serves on a number of national and international advisory boards.*

*She is one of the founders of the LEHD program at the*

*Census Bureau, which is the first large-scale linked employer-employee dataset in the United States. She is also the PI of the NORC data enclave, a remote access collaborative environment for researcher access to sensitive business micro-data.*

*A native of England who grew up in New Zealand, Julia has worked in a variety of countries, including Australia, Germany, Malaysia, Madagascar, Mexico, Morocco, Namibia, Sweden, and Tunisia. Her undergraduate degree was in Economics and Japanese from Massey University in New Zealand; her M.A. in Statistics and Ph.D. in Economics are from the University of Missouri in Columbia. She is fluent in Swedish and German and speaks conversational French.*

### KEYNOTE-2

**Dr. Klaus Brockhoff, Otto Beisheim School of Management, Germany**

#### “Corporate Governance Impacting on Technology Management”

New technologies potentially change corporate governance dramatically. The virtual annual general meeting is a case in point. In this presentation, however, we concentrate on the opposite direction of interference. Here, corporate governance influences the kind of new technologies and their characteristics. This happens in interaction with the elements of each national corporate governance system. These interactions can have substantial implications for the choice of corporate technology strategies.

*Dr. Klaus Brockhoff, in a teaching career spanning more than 40 years, has held business faculty positions at six universities, including the University of Bonn (Germany), University of Kiel (Germany), University of Lund (Sweden), New Jersey Institute of Technology (United States), and currently, since 1999, WHU—*



*and currently, since 1999, WHU—Otto Beisheim School of Management (Germany). A graduate of the University of Bonn and the University of Münster, and a former research fellow at the University of California, Berkeley, Dr. Brockhoff has documented his research in the areas of technology management, innovation management, business strategy, and business policy in 21 books and more than 280 articles, many of which were published in leading international research journals, such as Management Science,*

# PLENARIES

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*Journal of Product Innovation Management, IEEE Transactions on Engineering Management and Research Policy. He has consulted for numerous government and business organizations and has received two noteworthy awards, the Max Planck Research Award and Karl Heinz Beckurts Award. Dr. Brockhoff is also an elected member of the Berlin-Brandenburg Academy of Sciences (Berlin) and the Academy of Technology (Berlin); he sat on the board of six journals (including Research Policy, R&D Management and Technology Analysis & Strategic Management), two corporations (Steuler Industrierwerke, Metro Group), and three foundations (VolkswagenStiftung, Pro Futura Stiftungen, and WHU Foundation). He holds an honorary doctorate from the University of Berne (Switzerland).*

## PLENARY SESSION—2

**DATE:** TUESDAY, AUGUST 4, 2009  
**TIME:** 08:30-10:00  
**ROOM:** PAVILION ROOM, PLAZA LEVEL

Session Chair: Jon Clemens, President, Sharp Technology Ventures, USA

### KEYNOTE-1

**Dr. T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami, USA; President, International Association for Hydrogen Energy**

**“Peace and Prosperity through Hydrogen Economy, Sustainability and World Federation”**

*Dr. Veziroglu graduated from the City and Guilds College, the Imperial College of Science and Technology, University of London, with degrees in Mechanical Engineering (A.C.G.I., B.Sc.), Advanced Studies in Engineering (D.I.C.) and Heat Transfer (Ph.D.). After serving in some Turkish government agencies as a Technical Consultant and Deputy Director of Steel Silos, and then heading a private company, he joined the University of Miami Engineering Faculty and served as the Director of Graduate Studies, Chairman of the Department of Mechanical Engineering, Associate Dean for Research and Director of the Clean Energy Research Institute. Since May 2004 he is on leave from the University of Miami and is establishing UNIDO-ICHET*



*(United Nations Industrial Development Organization – International Center for Hydrogen Energy Technolo-*

*gies) in Istanbul, Turkey, as its director. He has published some 350 scientific reports and papers, edited 200 volumes of proceedings, and is the Editor-in-Chief of the monthly scientific journal International Journal of Hydrogen Energy. He has been an invited lecturer and/or consultant on energy research and education to many countries and to several universities and research organizations in the United States. Dr. Veziroglu has organized several conferences and symposia on Alternative Energy Sources, Environment, Hydrogen Energy, Heat and Mass Transfer, and Remote Sensing, including the first major conference on Hydrogen Energy. He is a member of some 20 scientific organizations and is a Fellow of the British Institution of Mechanical Engineers, the American Society of Mechanical Engineers and the American Association for the Advancement of Science. He is also the Founding President of the International Association for Hydrogen Energy. Dr. Veziroglu has been the recipient of several international awards, including the Turkish Presidential Science Award, 1975; Honorary Professorship, Xian Jiaotong University, Xian, China, 1981; I. V. Kurchatov Medal, Kurchatov Institute of Atomic Energy, Moscow, U.S.S.R, 1982; Energy for Mankind Award, 1986, Twenty-Five Years' Service Award, American Nuclear Society, 1987; Turkish Superior Service to Mankind Award, 1991; Honorary Doctorate, Anadolu University, Eskisehir, Turkey, 1998; Honorary Member, Argentinean Academy of Sciences, 2000; and Honorary Doctorate, Donetsk State Technical University, Donetsk, Ukraine, 2001. In 2000, he was nominated for the Nobel Prize in Economics for both envisioning the Hydrogen Economy and striving towards its realization.*

### KEYNOTE-2

**Dr. Ibrahim Dincer, University of Ontario Institute of Technology, Canada**

**“Confluence of Energy, Environment and Sustainable Development”**

Energy is a key element of the interactions between nature and society and is considered crucial for the environment and sustainable development. Many environmental issues are caused by or relate to the production, transportation, conversion, and consumption of energy, for example, acid rain, stratospheric ozone depletion, and global warming/climate change. Recently, a variety of potential solutions—ranging from renewable to hydrogen energy—to the current environmental problems, particularly associated with the greenhouse gas emissions, has evolved.

One thing is very true that achieving sustainable solutions to today's energy and environmental problems re-

# PLENARIES

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quires long-term planning and actions. A secure supply of energy resources is generally necessary but not sufficient for societal development. Sustainable societal development, however, requires a sustainable supply of energy resources, i.e., a secure supply that is readily and sustainably available in the long term at reasonable cost and that can be utilized for all required tasks without causing negative societal impacts. Effective and efficient utilization of energy resources and systems/processes can also contribute to sustainable development. Energy issues are particularly prevalent at present and renewable energy resources appear to provide one component of an effective sustainable solution. An understanding of the thermodynamic aspects of sustainable development can help in taking sustainable actions regarding energy.

This presentation will introduce some key pillars as the main targets for current and future local and global problems, such as better efficiency, better cost effectiveness, better use of energy resources, better energy security, better environment and better sustainability, and discuss these thoroughly for implementation. It will also discuss various other key aspects, e.g., global warming, green energy, energy-utilization patterns, policy and strategy development, energetic and environmental measures, technology developments, infrastructure, alternatives, as well as life cycle assessment and its role.

*Dr. Ibrahim Dincer is a full professor of Mechanical Engineering in the Faculty of Engineering and Applied Science at the University of Ontario Institute of Technology (UOIT). Renowned for his pioneering works in the area of sustainable energy technologies, he has authored and co-authored numerous books and book chapters, more than 450 refereed journal and conference papers, and many technical reports. He has chaired many national and international conferences, symposia, workshops and technical meetings. He has delivered nearly 150 keynote and invited lectures. He is an active member of various international scientific organizations and societies, and he serves as editor-in-chief (for the International Journal of Energy Research*



*by Wiley, as well as the International Journal of Exergy and International Journal of Global Warming by Inderscience), associate editor, regional editor, and editorial board member on various prestigious international journals. He is a recipient of several research, teaching and service awards, including the Premier's Research Excellence Award in Ontario, Canada, in 2004. He has made innovative contributions to the understanding and development of sustainable energy technologies and their implementation, particularly*

*through exergy. He has actively been working in the areas of hydrogen and fuel cell technologies, and his group has developed various novel technologies and methods.*

## PLENARY SESSION—3

DATE: WEDNESDAY, AUGUST 5, 2009  
TIME: 08:30-10:00  
ROOM: PAVILION ROOM, PLAZA LEVEL

Session Chair: Dr. Renjeng Su, Dean, Maseeh College of Engineering & Computer Science, Portland State University, USA

## KEYNOTE-1

**Dr. Albert H. Rubenstein, IASTA, Inc.; and Professor Emeritus, Northwestern University, USA**

### **“Models and Metrics for the Technology Transfer Process from Federal Labs to Application and the Market”**

The author and his colleagues have worked with over a dozen federal agencies, as well as many industrial firms, on the process of getting new technology out of their labs and into their own innovation programs and/or into the broader markets of industry and other agencies.

The focus of this paper is on metrics and flow models for the outputs, at each stage of the process, and the barriers and facilitators that impede or enhance the flow. It deals with the notorious “Valley of Death” that slows or sinks items of technology at various stages of the R&D/innovation process. It suggests standard methodology for identifying and measuring the impacts, outputs, barriers and facilitators encountered in the flow.

Criteria trees are suggested for connecting stage outputs to the Critical Success Factors (CSFs) of the operating units, parent organizations and other sponsors and clients served by the labs.

Some examples of common barriers and facilitators are given, including the over-focus of many Technology Transfer Offices on “paper” intellectual property (IP), such as patents and licenses, versus “real” outputs and impacts, such as new products and applications of technology that are transferred to and adopted by the various types of potential users of the technology.

Specific examples are also drawn from studies by the

# PLENARIES

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author and his colleagues in the fields of aerospace and automotive research; homeland security, agriculture, transportation, health care, and military R&D; and environment, energy and materials R&D.

Dr. Albert H. Rubenstein is founder and president of International Applied Science and Technology Associates (IASTA) and professor emeritus of Industrial Engineering and Management Sciences at Northwestern University. At Northwestern, he founded and directed the Program of Research on the Management of Research, Development and Innovation; and the Master of Engineering Management program. He co-founded and directed the Center for Information and Telecommunication Technology.

*Dr. Rubenstein was on the faculty of M.I.T. from 1953-59 and on the faculty of Northwestern since 1959. He has been a visiting professor at the University of California (UC), Berkeley; UC Irvine; and UC San Diego. He has authored and co-authored over 150 publications. His latest books are *Managing Technology in the Decentralized Firm* (Wiley 1989 and *iUniverse* 2001) and *Installing and Managing Workable Knowledge Management Systems* (with Eliezer Geisler, Praeger 2003). He has consulted for over 100 firms and technology-based government agencies in the U.S. and a dozen other countries. In 1992 he was named the*



*first Pioneer in Innovation Management and Engineering Manager of the Year by IEEE. He is a fellow of IEEE, AAAS, and the Society for Applied Anthropology. He was editor of the IEEE Transactions on Engineering Management and a director of Narragansett Capital Corp. for 25 years each.*

*He has a B.S. in engineering from Lehigh University (1949) and an M.S. and Ph.D. from Columbia University (1950 and 1954). In 1993 he received an honorary Doctor of Engineering from Lehigh University. He was in the Combat Infantry in WWII. Since moving to Washington in 2005, he continues to be active in professional societies and consulting, including a contract with NASA in the field of knowledge management.*

## KEYNOTE-2

**Julia Novy-Hildesley, Executive Director, Lemelson Foundation, USA**

**“Growing the Next Generation of Inventors and Innovators to Solve the World’s Problems”**

As we face the current global economic and environmental crisis, invention is arguably more important today than ever before. We need to inspire and nurture the next generation of inventors and ensure that life-improving and livelihood-generating technologies get into the hands of the nearly three billion people living on less than two dollars per day.

This presentation will discuss:

The Lemelson Foundation is working with partners to design educational approaches that engage high school and university students in invention, creating a pipeline of future inventors whose technologies will spark new enterprises, leading to job creation and social and economic development. For example, over the past 15 years, the National Collegiate Inventors and Innovators Alliance (NCIIA) has launched hundreds of courses and student teams, leading to over 100 patents and enterprises based on new technologies.

Innovative ways the Foundation is funding social enterprises in developing countries—through grants, loans and equity investments—that are designing and disseminating sustainable technologies in the areas of water, energy, health, agriculture, and biodiversity. For example, the Solar Electric Light Company (SELCO) in India has designed affordable solar technologies, ranging from lanterns and head lamps to home lighting systems, to serve families living at the base of the economic pyramid. SELCO has employed creative marketing, financing and distribution strategies to ensure the company’s profitability.

*Julia Novy Hildesley is Executive Director of the Lemelson Foundation. Established by Jerome Lemelson, one of U.S. history’s most prolific inventors, the Foundation sparks, sustains and celebrates innovation and the inventive spirit.*

*The Foundation’s work is rooted in the belief that ingenuity is evenly distributed throughout the world and that all people should have the opportunity to realize their creative potential and benefit from the power of technology. Programs in the U.S. and developing countries support invention led economic, social and environmentally sustainable development. The Foundation works with partners to recognize and celebrate accomplished inventors; provide financial and mentoring support to grassroots inventors; offer hands on opportunities that enable young people to develop their budding scientific curiosity; and disseminate technologies that improve people’s lives. To date the Foundation has donated or committed more than \$150 million in support of its mission.*

*The unifying theme across Julia’s past and current work is forging multi stakeholder partnerships to unleash innova-*

# PLENARIES

tion and develop strategies for economic growth that sustain natural resources. She has worked extensively toward these goals with government agencies, nongovernmental organizations, and private sector partners in the U.S., Tanzania, Kenya, South Africa, Mexico, Peru, Bolivia, Indonesia, India, French Polynesia, and other countries.

Prior to joining the Lemelson Foundation, Julia was the Director of the World Wildlife Fund's (WWF) Pacific office where she spearheaded the organization's strategy for marine conservation and public outreach on the west coast of the United States, and implemented WWF's program to promote certification and eco labeling of well managed fisheries in developing countries, in partnership with Unilever, the Dutch transnational corporation. She also taught courses on ocean policy and marine conservation at Stanford University in the Law School and Earth Sciences, Anthropological Sciences, and Human Biology departments.



Prior to joining WWF and teaching at Stanford, Julia conducted research in Madagascar, funded by a Fulbright Scholarship. She analyzed the potential for non timber forest products to serve as economic alternatives to slash and burn agriculture in the island's rain forests and published her work in the *Journal of Ethnopharmacology*. She continued working in this domain for the USAID in Madagascar and the World Bank in Washington D.C.

Julia earned a Master of Philosophy (MPhil) degree in International Development from the Institute for Development Studies at Sussex University in the United Kingdom, funded by a Marshall Scholarship. She earned her Bachelor's degree in Human Biology with a Minor in African Studies and graduated Phi Beta Kappa from Stanford University. Julia serves on the John F. Kennedy School of Government Women's Leadership Board, the Board of the World Affairs Council of Oregon, the Board of Mercy Corps' Social Innovations Committee, the Board of Directors of Grantmakers of Oregon and Southwest Washington, the Board of Advisors of the Anwarul Quadir Foundation and the Editorial Board of *Innovations*, a journal published by the MIT Press. Her writing has been published in the *Journal of Ethnopharmacology*, *Innovations*, and the *Far Eastern Economic Review*. A Fellow of the Donella Meadows Leadership Fellows Program, Julia was recognized as one of *Portland Business Journal's* 2008 "Forty leading business people under the age of 40," and featured in *Oregon Business Magazine's* 2005 "50 Great Leaders for Oregon." She speaks French, Spanish and Kiswahili.

## PLENARY SESSION—4

DATE: THURSDAY, AUGUST 6, 2009  
TIME: 08:30-10:00  
ROOM: PAVILION ROOM, PLAZA LEVEL

Session Chair: Terry Oliver, CTO, Bonneville Power Administration, USA

## KEYNOTE-1

**Dr. I.P. Jain, Centre for Non-Conventional Energy Resources, University of Rajasthan, Jaipur, India**

### "Renewable Energy for a Sustainable Future"

Energy is an important aspect in the development of any nation. In view of the rising energy demand and reducing sources of conventional energy, energy conservation, management and applications of non-conventional energy sources become imperative for a sustainable future. Reduced sources of conventional energy are cause for great worry among scientists, technologists, economists and political thinkers. We are consuming more energy than can be produced by nature.

The other aspect is pollution added by these sources to our environment. The more we use these sources, the poorer is our quality of life on this planet. The environmental benefits of renewable energy (RE) are well accepted and have been promoted by governments. It is found that wherever REs are in use, people have improved quality of life, health, sanitation, and reduced biomass.

The planet earth is fast making progress in the field of solar energy in the form of exploiting it for commercial applications. Solar energy is available abundantly and can be utilized for both thermal and electrical applications. The solar thermal programs include promotion of hot water systems for industrial, commercial and domestic users, solar cookers, solar dryers and solar stills.

Solar photovoltaic is suitable for many applications where other energy sources may not be feasible or cost-effective. Solar photovoltaic systems promoted are solar lanterns, solar home lighting systems, solar streetlights, solar water pumps, etc. A significant initiative that has been taken by many countries for increasing the use of solar photovoltaic systems pertains to installation of decentralized power plants for meeting the electrical energy needs of remote and isolated villages.

# PLENARIES

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Apart from harnessing solar and wind energy, tidal power and biomass power generation are the other potential energy sources which are attracting energy agencies to tap their power potential. Power generation based on biomass holds great promise as various countries are producing huge amounts of crop residues every year. Biogas production is one of the major programs all over the world to cater to families for helping rural populations in their energy needs. These plants are estimated to be generating fuel gas equivalent to many billions of tons of wood fuel per year and simultaneously producing enriched organic fertilizer, as artificial fertilizers are harmful for the earth.

Wind power is one of the major contributors to the power network. India has been recognized as a new “wind super power” for its development in this field. India has developed small hydro power projects (SHP) of up to 3MW capacity.

The program on new technologies covers chemical sources of energy including fuel cells, hydrogen energy and geothermal energy, alternate fuels for surface transportation and ocean energy. The R&D activities are supported in relation to these technologies in national laboratories and companies. Hydrogen energy systems are making inroads in several directions. All the major car companies have built prototypes of cars running on hydrogen fuel. Some cities have started demonstration projects using hydrogen fuel transit buses. Of course, hydrogen is already being used as the fuel of choice for space programs around the world. It will be used to power aerospace transports to build the international space station, as well as to provide electricity and potable water for its inhabitants.

It is to be noted that the developing international consensus on the reality of global warming will likely be followed over the next five to ten years. Advocates of REs for sustainable development for the future have hoped for impetus from the international response to global climate change. There are sufficient environmental and public health benefits of direct hydrogen fuel to justify moving ahead based on what we know already about fossil fuels, their consequences and their limitations. The economic case for hydrogen will continue to strengthen as well, even without a global warming treaty. A climate change treaty would only “sweeten the pot.”

Renewable energy (RE) provides the solution and also allows the progressive and non-traumatic transition of today’s energy sources toward feasible, safe, reliable and complete sustainable energy chains. Development of RE technologies is the way to supply energy to isolated places, many of them in India, Latin America and the Carib-

bean, which represent where two thirds of the population lives.

With vast natural resources the world is all set to make remarkable progress in power generation from renewable sources that are cost effective and eco-friendly. The renewable energy industry all over the world is a small but rapidly growing industry.

The agreement recently made internationally, to limit the world’s greenhouse gas emissions, gives an extraordinary chance to emphasize renewable energy as a true tool for recovering air quality. The coming decade will definitely see greater and greater use of “green power” so as to ensure less dependence on fossil fuels and also in order to prevent environmental degradation.

*Professor I. P. Jain was born in Lahore (then India) on November 25, 1946, and has had a brilliant academic career with an M.Sc. Physics obtained in 1969 (first position Gold Medalist) and Ph.D. in Physics in 1976 in the field of thin film technology from the University of Rajasthan in Jaipur, India. He worked for more than a year during 1983-84 with Nobel Laureate for Physics for 1981 Prof. Kai Siegbahn in the field of surface science at the University of Uppsala, Sweden, and earned the SIDA (a Swedish Institute and Development Agency) Diploma.*



*Professor Jain worked in various academic positions at the University of Rajasthan and served as an assistant professor of physics from 1975-1980, associate professor of physics from 1980- 2000, and professor and director of the Centre for Non Conventional Energy Resources, which was created by him because he saw the importance of renewable energy for sustainable development in the present world.*

*He was awarded CSIR (Scientific and Industrial Research) Fellowships in 1969-1972 and DAE (Department of Atomic Energy) Fellowships in 1973-1975. In May 2008 he was awarded the Emeritus Scientist position by the Council of Scientific and Industrial Research, Government of India, and he was among 20 such scientists in the country. He received the SIDA (Sweden) Fellowship in 1983-84, with Nobel Laureate Prof. Kai. Siegbahn; and the Commonwealth UK Fellowship in 1997 for helping universities in South Africa, Zimbabwe and Kenya.*

*Professor Jain’s fields of research interest are hydrogen storage materials and applications, thin films, surface and interfaces, ion beam mixing at metal/silicon surfaces*

# PLENARIES

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*and interfaces, and amorphous semiconductors. Prof. Jain has written 150 research publications during 1973 – 2009, out of which 90 appeared in international journals and 40 in national journals.*

*He assisted Nobel Laureate Prof. Kai Siegbahn in building the world's best high resolution ESCA machine and used it for his research; he developed the Ultra High Vacuum Depth Selective Conversion Electron Mossbauer Spectroscopy (DSCEMS) machine, a unique machine of its kind in India for research in surface science.*

*Prof. Jain has established various research facilities in his laboratory, e.g. Sivert-type instrument for hydrogen storage, UHV e-gun evaporation, DSCEMS technique, high vacuum thermal and e-gun thin film deposition units, low temperature 10k to 300k UV-Vis Spectrometer, Mossbauer spectroscopy, and the ball milling machine. Prof. Jain was instrumental in establishing various facilities at the University of Rajasthan, e. g. Transmission Electron Microscope (TEM) Laboratory in the Zoology Department, Thin Film and Material Science Labs in the Physics Department, X-ray Diffract Meter and Liquid Nitrogen Labs in the University Scientific Instrumentation Centre (USIC).*

*During the last nine years he has been involved in setting up a Centre for Non-Conventional Energy Resources, which is a new center for research, R&D and teaching in the field of renewable energy, which includes solar, hydrogen, wind, bio-energy, bio-gas and other sources of energy. Over the last two years he has initiated the M. Phil in Energy program for 22 students so that these students can develop careers in academics, research and industry.*

## KEYNOTE-2

**Andrew J. McKeon, Principal, carbonRational, USA**

### **“The Indispensable Role of ICT in a Carbon-constricted Global Economy”**

The earth's biosphere, despite all its complexity, can be seen simply as a system with an aim. The system is very information intense, energy conserving, and resilient, with the aim of sustaining life for the overall system.

Humanity is finding that its aims, as manifested through human industrialization, are increasingly out of alignment with the aim of the earth's biosphere. The greatest manifestation of this misalignment is global climate change, which is threatening the stability of earth's climate system.

To solve the problem of climate change, humanity must not only drastically reduce our dependency on carbon-based fuels, but also adjust the aims of our industrial economy to align with the aim of the earth's ecosystem. In a very real sense, business needs to rethink everything it does, and the biosphere will be an important teacher.

Information and communication technologies (ICT) will play important roles in this realignment. The biosphere is an information intense and energy efficient system, so the future global economy will also substitute information intensity for energy intensity. In the carbon-constricted economy of the future, ICT will be needed to reduce energy usage, research new technologies and make discoveries through information sharing made possible by continued development of information technology.

*Andrew J. McKeon is founder of InTERRAction, a consortium of experts from architecture, climate forecasting, communication, environmental science, law, management consulting and engineering who have joined together to help the corporate community address climate change and other environmental issues. He is principal of carbonRational, which advises both for-profit and not-for-profit companies on strategies to address climate change. He consulted for Xshares Advisors on the launch of the first carbon ETF (Exchange-Traded-Fund) traded on the NYSE and prepared a whitepaper on climate change and the carbon markets. He worked with Patriot National Bank, a Connecticut based Bancorp, to develop a green-lending practice; he advised TransitCenter on ways to use the emerging carbon markets to further their mission of moving commuters out of cars and into mass transit; and he is working with scientists from NASA's Goddard to find private sector applications for their Global Climate Model.*



*Mr. McKeon has been the Northeast Region Assistant District Manager for The Climate Project since 2006, when he was invited by former Vice-President Al Gore to train in his presentation on the climate crisis. He has been an expert panel member at the UN and at SIM (Society of Information Managers). Mr. McKeon has also worked for Goldman Sachs; Bell Laboratories Market Research; the Institute of Foreign Study, Tokyo, Japan; and Bell Laboratories System Technologies. He has an MBA and M.S. Engineering from Columbia University, New York, USA; and a BS in Engineering from the University of Bridgeport, Connecticut, USA.*

# SPECIAL SESSIONS

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## ENGINEERING AND TECHNOLOGY MANAGEMENT EDUCATION AND RESEARCH

DATE: TUESDAY, AUGUST 4  
TIME: 10:30-12:00  
LOCATION: PAVILION EAST

SPEAKERS: Dundar Kocaoglu, Tugrul Daim, Jiting Yang, Ibrahim Iskin, Siriphan Lersviriyachit, Turgut Turan—Portland State University

Strategic issues of research and education in the Engineering & Technology Management discipline will be discussed in this session. The results of a worldwide study on educational programs and research publications will be presented. All Engineering and Technology Management educators are welcome.

## COUNTRY REPRESENTATIVES MEETING

DATE: WEDNESDAY, AUGUST 5  
TIME: 12:00 – 14:00  
LOCATION: ALEXANDER'S RESTAURANT,  
23RD FLOOR

PICMET has 92 Country Representatives in 53 countries. They provide the linkage between PICMET headquarters and the different parts of the world by sending information to PICMET's quarterly electronic newsletter, *TM News*, disseminating PICMET information in their regions, proposing locations for future PICMET conferences, and starting PICMET chapters in their countries. Two such chapters, PICMET -Japan, and PICMET-Turkey, are already in operation.

PICMET 's Director and co-Director of International Activities, Dr. Kiyoshi Niwa of the University of Tokyo and Dr. Dilek Cetindamar of Sabanci University, respectively, invite the Country Representatives and those who are interested in becoming Country Representatives to a meeting to discuss the roles of the Country Representatives, the procedure to start and organize PICMET Chapters, and the requirements for holding future PICMET conferences in their countries.

*Lunch will be provided.*

## PICMET '10 AND '11 PLANNING SESSION

DATE: THURSDAY, AUGUST 6  
TIME: 16:00-17:30  
ROOM: PAVILION EAST

This panel session will provide a chance to give feedback on PICMET '09 as well as to get involved in the planning for PICMET '10 and '11 conferences. The next PICMET will be held July 18-22, 2010, at the Intercontinental Hotel in Bangkok, Thailand. The following year it will be back in Portland from July 31-August 4th.



# TUTORIALS

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## CREATING CYBER-ENABLED ENVIRONMENTS FOR COLLABORATIVE DISCOVERY WORK

DATE: MONDAY, AUGUST 3  
TIME: 10:30-12:00  
ROOM: PAVILION EAST

**Speakers: Michael Beyerlein, Susan Beyerlein, and Pamela Morris, Purdue University, USA**

The digital revolution has changed the way most of us work, especially those involved in creative knowledge work. The internet makes sharing and collaboration possible in research, development, and engineering (R, D, & E) around the globe. As a result, expertise no longer has to be geographically concentrated. Distributed expertise can be synthesized to enhance R, D, & E. However, effective work among people at dispersed locations can be challenging. Differences in work environments, culture, time zones, etc., make collaboration among multiple work sites and disciplines difficult. When it works well, richer perspectives develop and novel solutions emerge. When it works poorly, potential remains unrealized.

This tutorial will provide a framework for thinking about cross-boundary collaboration in knowledge work. What does it take to create a virtual work space that minimizes hurdles to effective collaboration and aligns with the way professionals work? The tutorial will then focus on the example of science gateways – a web-based solution to the challenges of collaboration. The nanoHUB gateway will be profiled in depth to show how it functions as a site for collaborative knowledge work that facilitates both learning and discovery. The nanoHUB serves multiple fields. The nanoHUB serves researchers in nanotechnology ([www.nanohub.org](http://www.nanohub.org)).

Dr. Michael Beyerlein is Department Head and Professor for Organizational Leadership & Supervision at Purdue University. Formerly, he was Director of the Center for Collaborative Organizations and Professor of Industrial/Organizational Psychology at the University of North Texas. His research interests include collaboration, including work teams, virtual teams, and virtual organizations; organizational design and change; creativity and innovation systems; knowledge management and the learning organization; leadership, especially across boundaries;



and science competencies, collaboration, and processes.

He has been a member of the editorial boards for *TEAM Magazine*, *Team Performance Management Journal*, and *Quality Management Journal* and senior editor of the Elsevier annual series *Advances in Interdisciplinary Studies of Work Teams* and the *Jossey-Bass/Pfeiffer Collaborative Work Systems* series. He has authored or edited 20 books, including: *The Handbook for High Performance Virtual Teams: A Toolkit for Collaborating Across Boundaries* (2008), *Guiding the Journey to Collaborative Work Systems: A Strategic Design Workbook* (2004), and *Collaborative Capital* (2005). He has been involved in projects with such companies as Boeing, Shell, NCH, AMD, Intel, Raytheon, First American Financial, Westinghouse, and Xerox and with government agencies such as Veterans Affairs, DCMAO, EPA, and the City of Denton, Texas.

Dr. Susan Tull Beyerlein holds a B.A. in English from the University of Oregon, an M.S. in general psychology from Fort Hays State University, and a Ph.D. in organization theory and policy with a minor in education research from the University of North Texas. She has taught a variety of management courses as an adjunct faculty member at several universities in the Dallas metroplex, with a particular focus on strategic management at both the undergraduate and MBA levels. Susan has served as a research scientist/project manager with the Center for the Study of Work Teams at the University of North Texas and the Department of Organizational Leadership and Supervision at Purdue University, and has been a recipient of grant awards from the Association for Quality and Participation, the National Science Foundation, and corporate donors. She co-edited 11 volumes of the Elsevier/JAI imprint annual book series entitled *Advances in Interdisciplinary Studies of Work Teams*, and was a member of the editorial team for the *Jossey-Bass/Pfeiffer Collaborative Work Systems* series. She co-edited the book *The Handbook for High Performance Virtual Teams: A Toolkit for Collaborating Across Boundaries* (2008). For a number of years, she has served as an *ad hoc* reviewer for *The Academy of Management Review*. Susan has published book reviews on contemporary business offerings in the journal *Business and the Contemporary World*, and her work has also appeared in *Structural Equation Modeling: A Multidisciplinary Journal*, *Teams: The Magazine for High Performance Organizations* (UK), *Journal of Management Education*, *Empirical Studies of the Arts*, and *Multiple Linear Regression Viewpoints*. She is a member of the Academy of Management, Beta Gamma Sigma—the honor society for collegiate schools of business—and Phi Kappa Phi National Honor Society.

Pamela L. Morris is currently a Ph.D. student in Communication at Purdue University specializing in Media,

# TUTORIALS

Technology, and Society (MTS). Her interests are collaborative computing, social networks, and remote and virtual teams. She is currently a graduate research assistant with both the Regenstrief Institute for Healthcare Engineering and the Department of Organizational Leadership and Supervision's Hub Collaboration Research Team. Pamela studied computer science and worked at IBM for 12 years before coming to Purdue. At IBM she was a file system programmer, a porting consultant working with IBM business partners, a team lead for Linux software development, and most recently, a certified project manager (PMP) with eSupport tools strategy in IBM's Software Group. Pamela aspires to work in corporate research when she completes her degree.



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## APPLYING THE ACCELERATING RADICAL INNOVATION MODEL

DATE: MONDAY, AUGUST 3

TIME: 16:00-17:30

ROOM: PAVILION EAST

**Speakers:** John Dismukes, University of Toledo, USA; John Bers, Vanderbilt University, USA; Lawrence Miller, University of Toledo, USA

Systematic acceleration of breakthrough or radical innovation has been hindered by a lack of articulated theory and tacit knowledge and tools guiding practitioners in achieving profitable commercialization within acceptable bounds of time, cost, and risk. The Accelerated Radical Innovation (ARI) Methodology, introduced at a 2004 Conference on Accelerating the Radical Innovation Process, proposed to change this state of affairs with a conceptual framework and associated techniques and tools. The ARI Methodology has been applied retrospectively to the analysis of radical innovation in energy and health care and was applied in 2007-2008 as the guiding methodology for a health care radical innovation in the White Rose Health Innovation Partnership program funded by the United Kingdom's National Health Service.

This tutorial introduces the key concepts and tools of the ARI methodology, including:

- Ten-Step ARI Methodology Dynamics Process
- Competitive Intelligence Management of Innovation at Each Step

- Ten-Attribute Description of Successful Innovation Factors
- Innovation Scorecard for Monitoring and Accelerating Innovation Progress
- The ARI Methodology Guide Book
- The ARI Methodology Answer Book
- ARI Methodology Status System Workbook

**Participant Involvement:** The tutorial gives participants an opportunity to apply some of these tools to a promising recent radical innovation in cancer diagnosis and therapy. Feedback from attendees on improvements and further applications of the ARI Methodology will be solicited, verbally and via a short questionnaire.

Dr. John P. Dismukes is Professor of the Chemical and Environmental Engineering Department at the University of Toledo (USA) and Director of the International ARI Institute. An internationally recognized material scientist, he has held research positions at the RCA David Sarnoff Center and ExxonMobil's Corporate Research Laboratories. He is the author of 82 technical papers, holds 12 patents, and is a Fellow of the Electrochemical Society. Since 2004, John is a co-founder and principal of the International Accelerated Radical Innovation Institute, where he has taken the lead in organizing conferences and workshops in the new field of Accelerated Radical Innovation.



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Dr. John A. Bers is Associate Professor of the Practice of Engineering Management at Vanderbilt University's School of Engineering, where he teaches technology strategy, policy, marketing, and systems engineering. Previously, he managed analysis and planning at Nortel Networks and the Gas Research Institute. He has been a strategy and marketing consultant to local and national technology companies, and has facilitated workshops and courses for technology executives across the United States. His current research interest is in how to accelerate the commercialization and deployment of radical and disruptive innovation. He is a co-founder and co-principal of the International Accelerated Radical Innovation Institute.



Dr. Lawrence Miller is Assistant Professor of Electrical Engineering and Computer Science at the University of Toledo. He serves as director of the SimNet Laboratory, which is conducting research in fault tolerance, reliabil-

# TUTORIALS

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ity, and traffic engineering for real-time communications over high performance networks. He is Associate Director of the Manufacturing Value Chain Science (MVCS) center, which conducts research in value chain dynamics leading to quantitative models and tools for rapid, real-time analysis and simulation of manufacturing and distribution operations. He is also conducting research in Innovation Process Modeling, Information-Enhancement of Radical Innovation, and Accelerated Radical Innovation. He is a co-founder and co-principal of the International Accelerated Radical Innovation Institute.



## PROJECT STRATEGY: EVOLUTION OF A THEORY

DATE: TUESDAY, AUGUST 4  
TIME: 10:30-12:00  
ROOM: PAVILION EAST

**Speaker: Dr. Michael Poli, Stevens Institute of Technology, USA**

This tutorial is about the evolution of Project Strategy, a theory initially based on a practitioner's belief that there had to be an overarching approach to successful project management.

This epic journey began when as a project team member and later as a project manager this researcher was frustrated at seeing projects fail or only achieve less than full success. To this day, how to make projects more successful is an issue of paramount importance to organizations. After starting his Ph.D. program, Dr. Poli and his advisor decided to tackle the question head-on. They settled on a topic that we named "Project Strategy." They initially collected 92 real-life project case studies which were analyzed and resulted in a number of joint research papers, some of which were presented at previous PICMET conferences. Eventually Dr. Poli completed his Ph.D. dissertation on Project Strategy and has since collected an additional 550 cases. Now that new research in Project Strategy is being done by others, join Dr. Poli as he relates the story of how Project Strategy started, evolved, and where it is heading.

Dr. Michael Poli is Distinguished Associate Professor and Associate Program Director in Project Management at the Stevens Institute of Technology. He earned his doctorate

in May 2006. His dissertation topic, "Project Strategy," was based upon real-life case studies. His Ph.D. advisor was Dr. Aaron J. Shenhar.

Dr. Poli was instrumental in leading and growing the Stevens Project Management program during its formative years. He also created and developed three of the four courses in the program. Prior to Stevens, he was with AT&T as a technical supervisor of software development. Michael also taught the premier, intensive week-long Project Management Workshop where he jump started many AT&T projects. He also championed and developed the AT&T Bell Labs Best Current Practice in Project Management.



Prior to AT&T, Michael held positions in software development, product management, and project management in IBM, EDS, Olivetti and Exxon Systems.

## THE MAGIC OF SIX: SIX TECHNOLOGY MANAGEMENT ACTIVITIES AND SIX TOOLS - PART I

DATE: TUESDAY, AUGUST 4  
TIME: 14:00-15:30  
ROOM: PAVILION EAST

**Speakers: Dilek Cetindamar, Sabanci University, Turkey; Robert Phaal, Cambridge University, UK**

Technological changes are continuously creating new challenges and opportunities for new product, service, process and organizational development. However, these opportunities need to be captured and converted into value through effective and dynamic technology management (TM). This requires a new way of understanding TM that captures its dynamic nature as well as managerial aspects. In this workshop, a new TM framework will be presented. This model is based on the dynamic capabilities theory, emphasizing the development and exploitation of technological capabilities that are changing on an ongoing base. The dynamic capabilities theory is not primarily concerned with fixed assets, but rather aims to explain the way in which a firm allocates resources for innovation over time, how it generates and deploys its existing resources, and where it obtains new resources. This is highly relevant for developing an approach to TM that can explain how combinations of resources and pro-

# TUTORIALS

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cesses can be developed, deployed and protected for each TM activity.

Therefore, the workshop will first introduce a comprehensive process model that includes SIX specific TM activities: identification, selection, acquisition, exploitation, protection, and learning. We argue that the process of TM is essentially generic, although organization and/or market-specific factors will constrain choices and actions. Then, the tutorial will provide descriptions of SIX major TM tools and techniques that are useful to carry out TM activities: patent analysis, portfolio management, roadmapping, S-curve, S-curve, stage-gate, and value analysis. Again, even though it is difficult to delineate tools, we select key tools that are the prevailing ones across TM processes and help to capture internal and external dynamics.

The workshop will present cases from the journal *Research-Technology Management* that is the highly respected practice journal in the field of TM.



Dr. Dilek Cetindamar received her B. S. degree from the Industrial Engineering Department at Bogazici University in 1989, her M.A degree from Economics Department at BU in 1992, and her Ph.D. degree from the Management Department at Istanbul Technical University in 1995. She has been the director of Competitiveness Forum at Sabanci University since 2008. Before her appointment

to the Faculty of Management at Sabanci University in 1999, she worked in the following universities: Bogazici University, Case Western Reserve University (USA), Portland State University (USA), and Chalmers University of Technology (Sweden). She participated in many international projects, including United Nations and European Union projects. She received an “encouragement award” from the Turkish Academy of Sciences in 2003. Her main interest and research topics are technology management, development economics, and entrepreneurship.

Dr. Robert Phaal joined the Centre for Technology Management at the University of Cambridge in 1997 and is currently engaged in a research program to investigate strategic technology management issues in manufacturing organizations. The particular focus of the research project is how to link technology resources to company objectives in order to develop a set of



practical and well-founded tools to support technology strategy and planning initiatives in the firm. Dr. Phaal has a background in mechanical engineering, consulting and contract research, having previously worked for The Welding Institute for six years.

His current research projects are technology management—a process approach, strategic technology management—linking technology resources to company objectives, industrial sustainability, and engineering re-use.

## THE KNOWLEDGE MYOPIA: EVOLUTION AND FUTURE OF KNOWLEDGE MANAGEMENT

DATE: TUESDAY, AUGUST 4  
TIME: 16:00-17:30  
ROOM: COUNCIL SUITE

**Speaker: Eliezer Geisler, Illinois Institute of Technology, USA**

In this era of the knowledge economy and the knowledge society, we are still taking baby steps in our understanding and utilization of knowledge management. What is this notion of knowledge management? How did it evolve to the current state? Are we on the right track in the application of knowledge management systems (KMS) in work organizations? These are the questions addressed in this tutorial. The discussion focuses on the trend of the growth and utilization of knowledge management and the barriers involved in its implementation in work organizations. The issue of the myopic application of KMS will also be explored. Why are we encountering so many difficulties in exploiting the knowledge bases in our organizations? Is KMS just a fad, or a potentially powerful tool for growth and effectiveness? Based on the literature and the experience gained from case studies, some recommendations and practical solutions are offered.



Eliezer (Elie) Geisler is the Distinguished Professor at the Stuart School of Business, Illinois Institute of Technology (IIT) and Director of the IIT Center for the Management of Medical Technology. He holds a doctorate from the Kellogg School at Northwestern University. Dr. Geisler is the author of over 100 papers in the areas of technology and innovation management, the evaluation of R&D, science and technology,

# TUTORIALS

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knowledge management, and the management of health-care and medical technology. He is the author of several books, including: *Managing the Aftermath of Radical Corporate Change* (1997), *The Metrics of Science and Technology* (2000), also translated into Chinese, *Creating Value with Science and Technology* (2001), *Installing and Managing Workable Knowledge Management Systems* (with Rubenstein, 2003), *Knowledge and Knowledge Systems: Learning from the Wonders of the Mind* (2007), and *Principles of Knowledge Management* (with Wickramasinghe, 2009). He consulted for major corporations and for many U.S. federal departments: Defense, Agriculture, Commerce, EPA, Energy, and NASA. Dr. Geisler is the co-founder of the annual conferences on the Hospital of the Future, and the Health Care Technology and Management Association, a joint venture of over a dozen universities in 10 countries. He serves on various editorial boards of major journals. Dr. Geisler founded and was editor of the information technology section of the *IEEE Transactions on Engineering Management*, and was a founding co-editor of the *International Journal of Healthcare Technology and Management*. His current research interests include the nature and metrics of technological innovation and knowledge, and knowledge management in complex systems.

## **THE MAGIC OF SIX: SIX TECHNOLOGY MANAGEMENT ACTIVITIES AND SIX TOOLS – PART II**

DATE: TUESDAY, AUGUST 4  
TIME: 16:00-17:30  
ROOM: PAVILION EAST

**Speakers: Dilek Cetindamar, Sabanci University, Turkey; Robert Phaal, Cambridge University, UK**

Part II of the previously described tutorial

## **“MANAGING CORPORATE TECHNOLOGY THROUGH THE BALANCED BUSINESS SCORECARD AND OTHER METHODS”**

DATE: WEDNESDAY, AUGUST 5  
TIME: 14:00-15:30  
ROOM: PAVILION EAST

**Speaker: Birgit Oberer, ETCOP Europe**

In this tutorial participants will learn how to man-

age corporate technology using the balanced business scorecard. Additionally, other methods for doing corporate technology management will be shown.

It is increasingly becoming crucial to achieve organizational and strategic goals. A framework will be presented for evaluating information and technology management strategies based on balanced business scorecard approach and the way to develop a corporate technology management balanced scorecard is shown.

After attending this tutorial, participants will know how to design an evaluation framework for information and technology management strategies. The presented framework is a strategic management tool that enables management decision makers to follow up the measures and to drive performance based on the goals that were set and agreed upon in advance.

Assoc. Prof. Dr. Birgit J. Oberer is Head of Scientific Research at ETCOP (Education-Training-Consulting-Organization and Process Management) Europe and gives lectures at various universities, mainly in Austria, Turkey, Switzerland and Germany. She has over 12 years of experience in the area of academic education and has authored several books in the area of business management and business informatics; she has contributed to American textbooks in the area of information technology and economics; and she has published over 80 papers in international publications.



## **“MANAGEMENT OF STRATEGIC TECHNOLOGY NETWORKS”**

DATE: WEDNESDAY, AUGUST 5  
TIME: 16:00-17:30  
ROOM: PAVILION EAST

**Speaker: Alptekin Erkollar, ETCOP Europe**

Today in enterprises and businesses the eWorld has become more and more important. Classic planning and control systems cannot deliver the “right” decision every time. This causes a very important problem for international enterprises and project control. In this tutorial the participants will learn how to manage strategic technology networks in the age of increasing importance of cooperation and globalization in the changing of rules.

# TUTORIALS

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The purpose of the presented strategic technology program framework is to support achieving the best practice management of strategic technology networks and optimization of network performance and collaboration for national and international enterprises with different goals and possibilities.

Prof. Dr. Alptekin Erkollar is head of the Department of Business Organization and Business Informatics, ET-COP (Education-Training-Consulting-Organization and Process Management) Europe, and Professor in the area of Business Informatics and Business Management.



He has over 18 years of experience in the area of academic education (universities in Austria, Switzerland, Germany, Liechtenstein, USA, Turkey, Ukraine, New Zealand and Sweden). Prof. Erkollar has several books in the areas of business informatics

and business management. He has over 190 papers published in various international publications.

## **PROJECT MANAGEMENT ALIGNMENT PROGRAM (PMAP) – A COLLABORATIVE METHODOLOGY FOR DELIVERING HIGHLY SUCCESSFUL OUTCOMES**

**DATE:** THURSDAY, AUGUST 6  
**TIME:** 14:00-15:30  
**ROOM:** PAVILION EAST

**Speaker:** Jeffrey S. Busch, PMP

PMAP - What is it? Project financial risks have moved to the forefront of companies' concerns given today's challenging economic climate. Such risks are also continuously influenced by many of today's global project factors, including: the dynamics of sophisticated system and business owners, the complexity of global businesses, aggressive cultures, technological advances, and out-sourcing strategies. The Project Management Alignment Program is based on early principles of partnering in order to slow a litigious environment. Additionally, it is more than a temporary effort; it is an on-going emphasis and strategy for highly successful performance driven projects. It can turn around the most troublesome endeavors and can bring a halt to the adversarial environment which materializes in many aggressive projects. Its focus is high standards, continuous collaboration, active and persistent project participants, enhanced man-

agement processes, project-focused communication, and maintenance of principles and habits of alignment.

PMAP is about people. A world evolving in a paradigm of fundamental changes will challenge how businesses accomplish work. People are most often motivated from within, influenced by their surroundings and personal experiences, which results in unique responses to even the most common project-related challenges. In some cases, people may act unreasonably, feel unjustly criticized, fight back or run away to avoid situations, which can contribute to additional project risk. How people treat each other and respond to events, issues and situations, ties directly to the success or failure of the project. Trust and respect are elusive and need to be continually built upon. Simply put, it is how we do business together that makes the project succeed.

Fundamental changes in how business and technology development will be executed in the future will stretch the business capabilities from both a resource and economic standpoint. Facing the diverse economic challenges, including energy consumption and distribution and environmental demands, will be daunting. As such, why not direct business resources and focus intensely on the technology as the focal point for our change, rather than expend valuable resources addressing distractions and inefficiencies which result in continual project shortcomings.

Jeffrey Busch is a 30+ year veteran in the field of project management with extensive experience in the design/construction, product development and service industries. His areas of expertise include project management, dispute resolution, including mediation and arbitration, partnering facilitation, scheduling, business and management training. His background is characterized by a diversity of experience as a tradesman, project engineer and project manager for projects, construction expert for litigation, and as a senior consultant for businesses.



He is a recognized authority in project management, CPM scheduling and dispute resolution and is widely published on these and related topics. His experience has included presenting seminars and management training for construction, engineering, manufacturing and semiconductor firms throughout North America, with international experience in Asia, Europe, and Mexico as well as project specific work for international construction firms. In association with Cadence Management Corporation, he

# TUTORIALS

has provided both consulting and training for organizations such as Boston Scientific, Nike, Starbucks, AMD, EBay/Pay-Pal, Polaris Industries, Tyson Foods, Network Appliance, Kimberly-Clark, Rockwell Collins, Altera, Spansion, and Edwards Lifesciences.

As a scheduling expert he has served as an expert witness on more than 40 occasions throughout the state court systems, as well as both the US Federal District Court and the US Court of Federal Claims. Known best for his pro-active role as a Partnering facilitator, he has developed tools and techniques that have broken through many of the barriers that have plagued projects. He is active in Partnering facilitation, Intervention Partnering, Project Alignment and serving as an Independent Neutral. In 2006/07 he served as a core-team lead for the revision and re-write of the *Project Management Body of Knowledge - Construction Extension Standard for the Project Management Institute*.



# DOCTORAL COLLOQUIUM

## GETTING YOUR PH.D.... AND BEYOND CRITICAL STAGES AND CAREER PATHS FOR THE PH.D. STUDENT

DATE: SUNDAY, AUGUST 2, 2009  
TIME: 13:00—17:00  
LOCATION: BROADWAY (PLAZA LEVEL)  
REGIST.: YOU CAN REGISTER FOR THE  
PH.D. COLLOQUIUM AT WWW.  
PICMET.ORG.

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?

The colloquium provides a unique opportunity to meet colleagues, share experiences and ideas, and network with students and faculty from different countries and university systems.

Guest lectures will cover the following topics:

### **“Publishing, Promotion, and the Pleasures of an Academic Career”**

*George Farris, Professor of Management and Director of the Technology Management Research Center, Rutgers University; Editor-in-Chief, IEEE Transactions on Engineering Management, USA*

### **“The National Science Foundation – Its Role for Science, Technology, and Research in the USA”**

*Julia Lane, Program Director, Science of Science & Innovation Policy Program, National Science Foundation, USA*

### **“Now That You Have a PhD in Technology Management, How Do You Prepare for and Find a Job in Academia?”**

*Hongyi Chen, Assistant Professor, Mechanical and Industrial Engineering, University of Minnesota at Duluth, USA*

### **“Critical Stages in the PhD process - How Do You Master Them?”**

*Pisek Gerd Sri, Ph.D. in Technology Management 2009, Portland State University, USA*

**George F. Farris** is Professor of Management and Director of the Technology Management Research Center at Rutgers University. He is also Editor-in-Chief of the *IEEE Transactions on Engineering Management*, a Senior Member of the IEEE, and former Division Chair of the Technology and Innovation Management Division of the Academy of Management.

Professor Farris is a Fellow of the American Association for the Advancement of Science (AAAS), the world's largest general scientific society. He was cited “for seminal contributions to the understanding of organizations and personnel practices in the furtherance of technological innovation and the management of technology.” His scholarly publications have appeared in journals such as *Administrative Science Quarterly*, *Journal of Applied Psychology* and *IEEE Transactions on Engineering Management*, and his work has been cited several times in the *Wall Street Journal*.

# DOCTORAL COLLOQUIUM

Previously, Professor Farris was Acting Dean of the Graduate School of Management at Rutgers, Professor of Administrative Studies at York University in Canada, Ford Foundation Professor of Management at the European Institute for Advanced Studies in Management in Belgium, and Associate Professor of Organizational Psychology and Management at the Massachusetts Institute of Technology (MIT). He has held part-time visiting appointments at Xi'an Jiaotong University, Xi'an, China, the National University of Singapore, and he has presented invited lectures at Sungkyunkwan University, Seoul, South Korea. He received his Ph. D. at the University of Michigan and his Bachelor's at Yale University.



**Julia Lane** is the Program Director of the Science of Science & Innovation Policy program at the National Science Foundation. Her previous jobs included Senior Vice President and Director, Economics Department at NORC/University of Chicago, Director of the Employment Dynamics Program at the Urban Institute, Senior Research Fellow at the U.S. Census Bureau, and Assistant, Associate and Full Professor at the American University.

Julia has published over 60 articles in leading economics journals and authored or edited five books. She has been the recipient of over \$20 million in grants from foundations such as the National Science Foundation, the Sloan Foundation, the MacArthur Foundation, the Russell Sage



Foundation, the National Institute of Health; from government agencies such as the Departments of Commerce, Labor, and Health and Human Services in the U.S., the ESRC in the U.K., and the Department of Labour and Statistics New Zealand; as well as from international organizations such as the World Bank. She has organized over 30 national and international conferences, received

several national awards, given keynote speeches all over the world, and serves on a number of national and international advisory boards.

She is one of the founders of the LEHD program at the Census Bureau, which is the first large-scale linked employer-employee dataset in the United States. She is also the PI of the NORC data enclave, a remote access collaborative environment for researcher access to sensitive business micro-data.

A native of England who grew up in New Zealand, Julia has worked in a variety of countries, including Australia, Germany, Malaysia, Madagascar, Mexico, Morocco, Namibia, Sweden, and Tunisia. Her undergraduate degree was in Economics and Japanese from Massey University in New Zealand; her M.A. in Statistics and Ph.D. in Economics are from the University of Missouri in Columbia. She is fluent in Swedish and German and speaks conversational French.

**Hongyi Chen** received her Ph.D. in Systems Science/Engineering Management from the Engineering and Technology Management Department at Portland State University. She is currently an assistant professor in the Mechanical and Industrial Engineering Department at University of Minnesota Duluth (UMD). She teaches courses in both the M.S. in Engineering Management and the B.S. in Industrial Engineering programs at UMD. Her research

interests include multi-criteria decision analysis, technology planning, innovation management, and lean enterprise management. She has published several papers in journals and conferences such as the *IEEE Transactions on Engineering Management*, *European Journal of Operational Research*, PICMET, and the Decision Science Institute annual meeting; and she has given several presentations in the annual meetings of INFORMS and Academy of Management.



As an early career faculty and one who has served on search committees, Dr. Chen will give suggestions on how Ph.D. students should prepare to enter academia, where to search for academic jobs in Engineering Management, and what contributes to successful job interviews.

**Pisek Gerdsri** received his Ph.D. in Technology Management from Portland State University, USA, in spring 2009. Dr. Gerdsri's doctoral research



was on a systematic and comprehensive approach to developing a national technology strategy and policy development for emerging technologies. He validated his approach by applying it to the case study of nanotechnologies for supporting the development of Thailand's agriculture and food industry. Dr. Gerdsri also holds two master's degrees in Mechanical Engineering and Engineering and Technology Management from Portland State University.

# SESSIONS

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## MA-00 PLENARY - 1

**DATE:** MONDAY 8/3/2009  
**TIME:** 08:30 - 10:00  
**ROOM:** PAVILION  
**CHAIR:** RALPH QUINSEY; TRIQUINT  
SEMICONDUCTOR, UNITED STATES

### MA-00.1 [K] Science of Science & Innovation Policy

*Julia I Lane; National Science Foundation, United States*

This keynote describes the current status of the Science of Science & Innovation Policy program at NSF. It explains the current status of awards, and future likely emphasis areas. It also describes the state of the federal Science of Science Policy interagency group, and the associated Roadmap ([scienceofsciencepolicy.net](http://scienceofsciencepolicy.net))

### MA-00.2 [K] Corporate Governance Impacting on Technology Management

*Klaus Brockhoff; Otto Beisheim School of Management, Germany*

New technologies potentially change corporate governance dramatically. The virtual annual general meeting is a case in point. In this presentation, however, we concentrate on the opposite direction of interference. Here, corporate governance influences the kind of new technologies and their characteristics. This happens in interaction with the elements of each national corporate governance system. These interactions can have substantial implications for the choice of corporate technology strategies

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### MB-01 TUTORIAL: Creating Cyber-enabled Environments for Collaborative Discovery Work

**Monday, 8/3/2009, 10:30 - 12:00**

**Room: Pavilion East**

**Speaker(s) Michael M Beyerlein; Purdue University**

**Pamela Morris; Purdue University**

**Susan T Beyerlein; Purdue University**

The digital revolution has changed the way most of us work, especially those involved in creative knowledge work. The internet makes sharing and collaboration possible in research, development, and engineering (R, D, & E) around the globe. As a result, expertise no longer has to be geographically concentrated. Distributed expertise can be synthesized to enhance R, D, & E. However, effective work among people at dispersed locations can be challenging. Differences in work environments, culture, time zones, etc., make collaboration among multiple work sites and disciplines difficult. When it works well, richer perspectives develop and novel solutions emerge. When it works poorly, potential remains unrealized. This tutorial will provide a framework for thinking about cross-boundary collaboration in knowledge work. What does it take to create a virtual work space that minimizes hurdles to effective collaboration and aligns with the way professionals work? The tutorial will then focus on the example of science gateways – a web-based solution to the challenges of collaboration. The nanoHUB gateway will be profiled in depth to show how it functions as a site for collaborative knowledge work that facilitates both learning and discovery. The nanoHUB serves multiple fields. The nanoHUB serves researchers in nanotechnology ([www.nanohub.org](http://www.nanohub.org)).

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### MB-02 2nd Generation Accelerated Radical Innovation - Theory and Application

**Monday, 8/3/2009, 10:30 - 12:00**

**Room: Pavilion West**

**Chair(s) John P Dismukes; University of Toledo**

**John A Bers; Vanderbilt University**

**Lawrence Miller; University of Toledo**

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### MB-02.1 [R] Accelerated Radical Innovation (ARI) Methodology Validation

*John P Dismukes; The University of Toledo, United States*

*Lawrence K Miller; The University of Toledo, United States*

*John A Bers; Vanderbilt University, United States*

*Jai A Sekhar; University of Cincinnati, United States*

*Alec E Shelbrooke; The University of Leeds, United Kingdom*

In-depth historical assessment of innovation over the past several hundred years shows that incremental innovation and cost reduction emphasized in the late 20th Century will prove inadequate and even counterproductive in the 21st Century for achieving sustained, global competitive advantage requiring radical innovation. The Accelerated Radical Innovation (ARI) Methodology, developed systematically over the past 5 years, has further addressed these requirements by utilizing systematic historical and real time case studies to articulate theory, tacit knowledge, techniques and tools for improving the radical innovation process. Ongoing ARI research since the PICMET 07 Conference has further confirmed the validity of the ARI Methodology, and developed improved techniques for measuring and guiding innovation progress, based on focused assessment of 10 Innovation Attributes at each of the 10 ARI steps. A systematic evaluation of successful radical innovation approaches, and quantitative assessment of the dynamics of four major radical innovations over the past 100 years by retrospective application of the ARI theory, have been applied to better understand how to overcome the four types of challenges and hurdles inherent in achieving commercialization of breakthrough innovations. This paper summarizes research on the ARI Methodology at The University of Toledo since 2004, involving collaborators at Vanderbilt University, University of Detroit Mercy, Bowling Green State University, University of Cincinnati and University of Leeds, UK, from mid 2006 to the end of 2008. Approaches and techniques for real-time assessment and management of a potential breakthrough innovation are now validated to address any innovation stage from breakthrough concept to commercialization of a standard design.

### MB-02.2 [R] Accelerated Radical Innovation: The Execution Side

*John A Bers; Vanderbilt University, United States*

*John P Dismukes; University of Toledo, United States*

The Accelerated Radical Innovation (ARI) Methodology is an integrated approach to shepherding radical innovation from initial vision through commercialization and integration into the economy within acceptable levels of risk, cost, and schedule. Extending over the full life cycle of the innovation, the methodology encompasses two major periods, an inception period (identification and assessment of four key challenge areas, comprehensive intelligence gathering and analysis leading to a detailed system vision of the innovation), and an implementation period (execution on the system vision through full commercialization). Most of the ARI methodology development to date has focused on the analytical aspects of the inception period. This paper focuses on the post-vision execution period. To understand how execution is successfully carried out in practice, the authors conducted a detailed study of an investor-funded seed-stage innovation incubation firm (ConduIT Corp.) and four of the seed-stage companies in its portfolio. Six factors were found to underlie ConduIT's success: 1) careful culling of innovation concepts for evidence of market need, manageable technical risk, and alignment of business interests; 2) an ultra-lean operating model to improve survivability through the innovations valley of death; 3) creation of a business model to assure profitable commercialization; 4) internally provided coaching and professional services by ConduITs principals; 5) strict accountability based on attainment of milestones; and 6) concentration within ConduIT's defined ecology (health care IT, digital media, and Web-based applications) so that its expertise and network can be used to greatest effect. ConduIT's experience offers five important lessons for radical innovation. First, an extended process of experimentation with products, strategies, and business models is needed. Second, early infusions of capital can create premature, counterproductive financial pressures on the innovator. Third, on the contrary, ConduIT has demonstrated that the early-stage experimentation process can be accomplished at a low burn rate (the bootstrapping approach), allowing fundamental concepts of the business to gel. Fourth, at the earliest stages of a technology enterprise, a large dose of improvisation is unavoidable. Last, the bootstrapping model forces innovators to go directly to the source of problems (rather than papering over them with cash), leading ultimately to a more agile, resilient, survivable enterprise. The lessons offered by ConduIT are incorporated as best practices into the ARI methodology.

# SESSIONS

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## **MB-02.3 [R] Visualizing Technology Mining Results on Life Cycle Axes: A Text Data Mining Study of Publication Trends in Server Virtualization from Scientific Research to Business Process Improvement**

*Sathiadev Mahesh; University of New Orleans, United States*  
*Cherie Courseault Trumbach; University of New Orleans, United States*  
*Kenneth R Walsh; University of New Orleans, United States*

Text data mining of research abstract databases provides insight into the relationships between researchers and research topics. Text data mining tools like VantagePoint provide insights into the progress of a technology discipline showing the projection of research trends for strategic analysis and displaying the interconnections between researchers and research topics. Research in a technology typically flows from works in the underlying science where theoretical concepts are proposed and tested to a more focused and technical research on devices that apply these theories. Our study tracks the spread of ideas throughout the technology life cycle with an emphasis on technology trends rather than research clusters. The premise is that the manager seeking a strategic view of the technology, and its development over time, needs to be presented a visualization of these trends in a manner that supports effective decision-making. Since there are three dimensions in the development of technology, basic science, technology development, and business process focus, this research presents the results of the text data mining of research abstracts projected in a three-dimensional visualization.

## **MB-02.4 [R] New Relationships between Patents and Technological Innovation: Modeling Patent Activity as a Driver of Innovation**

*Michael C Connelly; University of Cincinnati, United States*  
*John P Dismukes; University of Toledo, United States*  
*Jai A Sekhar; University of Cincinnati, United States*

In a previous publication (Inventions and Innovation: A Case Study in Metals Key Engineering Materials, Vol. 380, 2008) we were able to distinguish four stages of a long life cycle for specific commodities as well as offer a method for correlating innovation with patent activity. In this study, we extend the number of systems studied. The present study builds on the model proposed earlier for quantifying specific technical innovations (within a group) with the yearly patent counts for that group. Some insights into pattern features that may indicate when materials transition from Stage III (innovation and rapid growth) to stage IV (survival) are offered. If the pattern model is as far reaching as it appears, the results then have important implications on adopting the correct innovation strategies during this period of fundamental social change.

## **MB-02.5 [R] Competitive Intelligence Supporting Team Management of 2nd Generation ARI**

*Lawrence K Miller; The University of Toledo, United States*  
*Ruth Miller; University of Detroit Mercy, United States*

This paper describes efforts of the University of Toledo Accelerated Radical Innovation research team (ARI Team) in support of accelerated breakthrough or radical innovation projects by application of the competitive intelligence framework in the center of the 2nd Generation ARI Methodology. This competitive intelligence framework is an essential component of the ARI Methodology, first in Steps 1-6 leading to the establishment of a business plan, and then in Steps 7-10 that implements the commercialization strategy. This paper briefly reviews the history of Competitive Intelligence, focusing on extensions to Prescott's Historical Stages of Competitive Intelligence. The paper then examines the techniques and activities, and the practitioners and systems for engaging in Competitive Intelligence in the context of Open Innovation and Accelerated Radical Innovation. The paper wraps up by examining the phases and steps in conducting Competitive Intelligence in the context of the entire 2nd Generation ARI Methodology.

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## **MB-03 Project / Program Management - 1**

**Monday, 8/3/2009, 10:30 - 12:00** Room: **Broadway-1**  
**Chair(s) Gerald H Williams, Jr.; Portland State University**

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Note: [R] = Research Paper; [A] = Industry Application

## **MB-03.1 [R] Quality, Time, and Cost Tradeoffs in Project Management Decision Making**

*Matthew J Liberatore; Villanova University, United States*  
*Bruce Pollack-Johnson; Villanova University, United States*

This paper presents a mathematical programming model that allows quality to be explicitly considered in project planning and scheduling, while addressing the tradeoffs between quality, time, and cost. A quality function is used to represent the relationships between time, cost, and quality for individual tasks. The initial problem formulation maximizes the minimum quality (weakest link) over all project tasks, subject to bounds on cost and completion time. Using a construction example we show how this model can be adapted to generate quality level curves to illustrate the trade-offs among time, cost, and quality. These level curves can then be used by project managers to make project scheduling decisions that explicitly model and consider quality as well as time and cost, so that better and more appropriate decisions can be made for a particular situation. We also offer some managerial insights for project planning and scheduling that are derived from the analysis through improved understanding of these choices and tradeoffs.

## **MB-03.2 [R] Toward an Understanding of the Dynamic of Project Manager Assignments: An Empirical Study**

*Peerasit Patanakul; Stevens Institute of Technology, United States*

Project manager assignment is an important decision management has to make since a project manager is known as one of the key project success factors. Despite the importance of the decision, research on project manager assignment is very limited. The objective of this study is to empirically investigate the project manager assignment. In particular, it examines the impact of the approaches used in the assignment on the project management effectiveness of an organization. The results of this study reveal the ways management should assign projects to their project managers such that the assignments enhance the resource productivity, organization learning, project success (time, cost, customer satisfaction, and business success), and personal satisfaction (career advancement, reward for performance, and personal learning)

## **MB-03.3 [R] A Decision Support Model for Project Manager Assignments 2.0**

*Woraruthai Choothian; Portland State University, United States*  
*Nausheen Khan; Portland State University, United States*  
*Kabasele Yves Mupemba; Portland State University, United States*  
*Kent Robinson; Portland State University, United States*  
*Venice Tunitisupawong; Portland State University, United States*

Assigning the right project manager to the right project is one of the critical success factors of an organizations mission. The objective of a project in an organization is always to maximize the gain or profit of the organization. This gain can be maximized through cautious resource allocation of an organization to its different projects. Dr. Patanakul, Dr. Anderson and Dr. Milosevic developed an optimization model that can be applied in an organization for this cautious resource allocation. The aim of this model is to align the project assignments made with the strategic goals of the organization by matching the competencies of projects managers to different project requirements. However, the limitation of this model is that a project managers workload is not balanced along the project life cycle. The objective of this paper is to overcome this limitation by extending the model and adding the element of time dimension to it. This extended model would assist top management in balancing and forecasting the workload of each project manager in a given time period.

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## **MB-04 E-Business - 1**

**Monday, 8/3/2009, 10:30 - 12:00** Room: **Broadway-2**  
**Chair(s) Nasir Sheikh; Sharp Corp.**

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## **MB-04.1 [R] Risk Factors of the Long Tail in Mobile Manga Sales**

*Taro Sugihara; Japan Advanced Institute of Science and Technology, Japan*  
*Yoshiya Kobayashi; Japan Advanced Institute of Science and Technology, Japan*

# SESSIONS

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*Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan*

After the Long Tail was proposed by Chris Anderson in 2004, people started believing his theory that internet services, such as Amazon.com, can achieve great success in retailing. Internet stores can sell enormous numbers of books, comics, CDs, and DVDs and make great profits through the reduction in distribution costs that is achieved through this medium. Despite the fact that mobile internet retail is on equal terms with retail through PCs, the properties and modes of usage of a mobile phone, which strongly influence the purchasing aspect, have not been considered as the Long Tail of mobile retail. In this paper, therefore, we have discussed whether the Long Tail of mobile internet retail is profitable, especially in connection with mobile manga sales. Three series of research were conducted in this study: a Pareto analysis for mobile manga sales, two focus group and individual interviews on how to use and purchase mobile manga, and a field experiment to determine the influence of distributors recommender systems. The results we found were that when users searched for novel titles, they did not devote sufficient time toward retrieving the same and mostly depended on best seller rankings. We thus concluded that the Long Tail of mobile manga sales has few prospects of profitability.

## **MB-04.2 [R] The Effects of Utilitarian Shopping and Technology Belief on Perceived E-Service Value**

*Chien-Hsin Lin; Yu Da College of Business, Taiwan*

This study examines the effects of planned purchase and technology readiness (TR) on consumers' perceived online shopping value. A survey questionnaire was designed and distributed to consumers who used to shop online. Three hundred and thirty samples were gathered. Hierarchical regression analyses results indicated that online consumers who conducted planned purchases perceive more online shopping value than did impulsive buyers. Furthermore, the impact of the planned purchase on online shopping value was reinforced by consumers' TR propensity. That is, high-TR consumers who made an online planned purchase will really benefit from the Internet shopping. Research implications for online stores and Internet shoppers are also discussed in this article.

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## **MB-06 Entrepreneurship / Intrapreneurship - 1**

**Monday, 8/3/2009, 10:30 - 12:00**

**Room: Broadway-4**

**Chair(s) Dilek Cetindamar; Sabanci University**

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## **MB-06.1 [R] Technology-Based Business Incubation: A Study of the Differences and Similarities between Private, University, and Government Incubation**

*Cory Hallam; University of Texas at San Antonio, United States*

*Natalia DeVora; University of Texas at San Antonio, United States*

A study of technology-based business incubation was conducted to investigate and contrast the differences and similarities between private, university, and government incubation. Sample operating models from existing universities are explored demonstrating the various permutations and combinations of operating philosophies. The operating models are reviewed in light of their broader fit within the realm of technology entrepreneurship, commercialization, and management in the United States. Using these results, a 9-step checklist for creating an incubator is promulgated with the intention of being used at each stage of incubator development, including the feasibility study stage, the launch stage, and the maintenance, operation, and improvement stage. Finally, a series of recommendations are made for establishing a technology-based incubation program in the Canary Islands in response to their desire to move the region from a purely tourism-based economy to a more diverse economic make-up that includes technology-based business incubation spinning off from Canary Island universities.

## **MB-06.2 [A] Managing the Organizational Maze in Birthing New Corporate Ventures**

*David Wilemon; Syracuse University, United States*

The speed and the degree with which new technologies and markets change create the

need for more effective approaches for dealing with these strategic challenges. Moreover, as industry observers often note, globalization offers as many problems as opportunities. Organizations continually wrestle with the challenge of how to compete in this new competitive landscape. Unfortunately, many organizations are encumbered by cultures, mindsets, and practices that defeat even the best ideas for major new products and new businesses. Astute companies, however, are finding that venture teams can be a useful approach for managing emerging competitive opportunities. How are corporate ventures defined? Zahra defines internal ventures this way: Corporate entrepreneurship may be formal or informal activities aimed at creating new businesses within established companies through product and process innovations, and market developments. These activities may take place at the corporate, division, functional, or project level, with the unifying objective of improving a company's competitive position and financial performance. This presentation offers several perspectives on managing internal corporate ventures. Unfortunately, to create a major new venture is one of the most difficult challenges organizations encounter. Research suggests that there have been far more venture failures than successes. However, the positive news is that we have learned a lot from the rich experiences of companies that have used internal venturing as an avenue for growth and change. In this presentation, the emphasis is on what is required to create and manage new ventures or significant new business opportunities within existing organizations. Topics include: 1) why corporate venturing can be an excellent avenue for growth; 2) forming, chartering, and organizing the venture team; 3) identifying and evaluating growth opportunities; 4) managing & championing the venturing process; 5) the politics of venturing; 6) gaining and maintaining organizational support; and 7) learning from corporate venturing as a form of organizational renewal. Also addressed are the common causes of venture failure as well as what we know about the primary drivers of venture success. The presentation concludes with a number of suggestions for those charged with managing new organizational ventures.

## **MB-06.3 [A] Unlocking the Relationship Between Corporate Entrepreneurship and Performance**

*Fis, Ahmet; Sabanci University, Turkey*

*Cetindamar, Dilek; Sabanci University, Turkey*

Corporate entrepreneurship is the implementation of a value creation process in an organizational setting. Consistent with the Schumpeterian understanding of entrepreneurship, a new combination that should directly affect the performance of the firm is formed; and the process of forming this new combination manifests itself as an outcome of a complex social mechanism affected by internal and external factors. However, in spite of the biasing anecdotal evidence, conventional wisdom, and tendency in favor of entrepreneurship, a black box between firm-level entrepreneurship and performance has pervaded the relationship. Nevertheless, the model proposed in this study brings a new and distinguishing line of sight into the firm-level entrepreneurship literature: rather than being an equivalent, the entrepreneurial orientation construct is treated as an antecedent of corporate entrepreneurship; moreover, the behavioral construct of corporate entrepreneurship is placed in between this strategic posture and performance, to complete the missing link between firm-level entrepreneurship and performance. It is proposed that this formulation of roles and meanings attached to both terms leads to a solid, conclusive, and systematic direct positive relationship between firm-level entrepreneurship and performance. Empirical findings confirm this proposal, making this formulation the most important contribution of this study to the firm-level entrepreneurship literature.

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## **MB-07 Technology Management Education - 1**

**Monday, 8/3/2009, 10:30 - 12:00**

**Room: Forum Suite**

**Chair(s) Cheryl A Hanewicz; Utah Valley State College**

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## **MB-07.1 [A] Resurrecting American Dominance in Science and Engineering: The Demise and Rebirth of the American Doctoral Student in Science and Technology**

*Caleb Roth; University of Texas at San Antonio, United States*

*William T Flannery; University of Texas at San Antonio, United States*

**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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Throughout our history, the ability of the United States to produce new innovative technology has made this country a world power, economically, politically, and technologically. However, the country is losing its dominance as a technological superpower. One of the reasons for this quiet crisis, as identified by Thomas Friedman, is the fact that the United States is losing scientists and engineers faster than can be replaced. There is a troubling shortage of young scientists and engineers to replenish the technical workforce and an even more severe shortage of American students opting to continue graduate education. The shortage is so severe that some view it as a threat to national security. One reason suggested for the shortage of American students in master's and Ph.D. programs is the present structure and philosophy of graduate programs in our universities. The vast majority of Ph.D. granting universities is focused on the traditional model of Ph.D. education: to create graduates for placement in other universities. This paper discusses the genesis of the quiet crisis from economic, political, and technological points of view and suggests an alternative approach to graduate education that broadens the focus to include much close collaboration with the private sector and government.

## **MB-07.2 [A] MOT Entrepreneurs in Second Life**

*W. Austin Spivey; UTSA, United States*

*J. Michael Munson; University of Santa Clara, United States*

Providing insight for MOT students into the difficulties faced by technology entrepreneurs remains a crucial goal for educators. Searching for tools and techniques to accomplish this goal is a never-ending process. One contemporary approach is to immerse MOT students in a metaverse so that they may refine their heuristics for key decisions required by technology startups. This paper describes the results of a continuing experiment with MOT graduate students living in the virtual world of Second Life (SL). The objective of the experiment is the commercialization of technology-based products for residents of SL. To date, four different products have been produced: two transportation devices; an image enhancer; and a website. Results have been mixed. On the one hand, the website (providing new residents with survival tips in three languages) has attracted hits from all over the globe. Also, sales of one transportation device show potential for significant profit. On the other hand, a similar transportation device has been ignored by the residents, as has the image enhancer. Student epiphanies from SL experiences echo the insights from successful technology startups in the European Union and revolve around the difficulties of developing and implementing a marketing mix for any technological innovation.

## **MB-07.3 [R] Technology Management Competences Supporting the Business Strategy**

*Victoria E Erosa; Universidad Autonoma de Tamaulipas, Mexico*

*Pilar E Arroyo; ITESM Campus Toluca, Mexico*

The execution of the business strategy requires the integration of market conditions, organizational capabilities and direction. Under this principle, top management needs to align theirs and the firm's human resources competences with the business strategy and the characteristics of the business environment. Competences represent a dynamic combination of knowledge, expertise, attitudes and responsibilities acquired through professional studies that are used to solve administrative problems, among them those involving technology decisions. This paper identifies the management of technology competences required by junior executives to incorporate technology to their operative tasks under the global business environment characterized by the extensive use of information and communication technology, and an industry base with a low innovation rate but an intensive use of mature technologies to perform standardized process. Junior executives enrolled in MBA programs with an international focus were surveyed, the analysis of the information provided by these managers studying in Peru, Germany, Ecuador and Mexico allow concluding typical managerial competences are the most valued, while competences related to management of technology and technology acquisition do not figure as critical; this calls for a reinforcement about the relevance of technology management education at the MBA level.

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## **MB-08 Technology Management in Semiconductor Industry - 1**

**Monday, 8/3/09, 10:30 - 12:00**

**Room: Council Suite**

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## **Chair(s) Ramin Neshati; Intel Corporation**

### **MB-08.1 [R] A Literature Survey of the Operation Optimization in Chip Shooter Placement Machines**

*Ali F Alkaya; Marmara University, Turkey*

*Ekrem Duman; Dogus University, Turkey*

Computer controlled electronic component placement machines have become major resources in electronic equipment manufacturers. They bring speed and reliability to the assembly operations. However, these machines are quite expensive, and efficient use of them is essential. Unfortunately, finding out the efficient way of using them mostly leads to complex operations research problems. In this study we undertake a type of placement machine which perhaps leads to the most complicated problems. These are the chip shooter machines, and recently they became very popular in the industry. We survey the studies made regarding these machines, state the level of complexity undertaken, the solution algorithms suggested and the results obtained. In doing so we aimed to provide a comprehensive survey and a starting reference for those who are interested in optimizing these machines. The research areas that are open to further improvement are also indicated.

### **MB-08.2 [A] Dynamic Capabilities in Operations Management: An Empirically Grounded Model**

*Charles M Weber; Portland State University, United States*

*Asser Fayed; Portland State University, United States*

Modern manufacturers run product mixes in which different products are subjected to very different economic environments that can fluctuate dramatically over time. Profitability for many manufacturers is thus contingent upon dynamic capabilities - the ability to reconfigure assets rapidly in response to environmental change. An empirically grounded model of a semiconductor manufacturing facility's production plan provides insight into the nature of these dynamic capabilities. The model suggests that a knowledge infrastructure rather than dynamic capabilities is the true source of competitive advantage.

### **MB-08.3 [R] Dynamic Modeling and Simulation of Taiwan's IC Industrial Clustering to China**

*Bi-Huei Tsai; National Chiao Tung University, Taiwan*

In this work, we for the first time utilize numerical methods to computationally clarify the clustering dynamics of the integrated circuit (IC) industry from Taiwan to China. According to the relationship between the foreign direct investment (FDI) and the industrial clustering phenomenon, we first formulate a dynamic growth FDI model for studying the industrial clustering evolutions. The effects of the innovation, imitation and potential investment factors on the clustering behaviors are systematically considered. This examination is further advanced to forecast the trend of Taiwan's IC industrial clustering to China, where the accuracy among the predicted data as well as the collected data is compared and validated. The results indicate the significant internal influence of intra-industry communications on the FDI evolution into China. Taiwan IC firms tend to successively imitate the experienced firms to engage in FDIs in China. Particularly, the internal impact is the strongest for IC manufacturing firms, revealing its greatest clustering effect. The Taiwan IC industrial FDI amount in China is cumulatively predicted to be increasing, which once again supports the clustering tendency of IC industries. Finally, the FDI prediction is more accurate for IC design, packaging and testing industries than for the IC manufacturing industry due to the governmental FDI restrictions of the IC manufacturing industry.

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## **MB-09 Strategic Management of Technology - 1**

**Monday, 8/3/09, 10:30 - 12:00**

**Room: Directors Suite**

**Chair(s) Kumiko Miyazaki; Tokyo Institute of Technology**

### **MB-09.1 [R] Aligning Key Success Factors with Value Activities: Case of the Analog IC Design Industry**

*Jonathan C Ho; Yuan Ze University, Taiwan*

# SESSIONS

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*Yi-Chieh Wang; Tanner Research Taiwan Inc., Taiwan*

Each industry has unique managerial factors that have a critical impact on a firm's success. These factors, known as key success factors, are the characteristics, conditions, or managerial variables that need to be maintained to achieve prosperity in a given industry. Although techniques for identifying KSFs have been developed, the determination of their priorities will help management allocate resources. Furthermore, connecting KSFs to a firm's major value activities will assist management in planning the firm's business. This article proposes an analytic hierarchy process (AHP) which integrates and operationalizes the theories associated with the KSFs and value chain for the above purposes. The proposed process is applied to the analog integrated circuit (IC) design industry to illustrate its efficacy.

## **MB-09.2 [R] Linking R&D Investment Strategies to Business Needs: Strategic Technology Alignment Roadmapping (STAR)**

*Nabil Gindy; University of Nottingham, United Kingdom*

*Husam Arman; University of Nottingham, United Kingdom*

*Shirley Cavin; University of Nottingham, United Kingdom*

The results of many empirical and theoretical research studies highlight the need for a robust and integrated strategic technology planning tools to enable high technology companies to sustain a competitive advantage in an endlessly changing business environment. The objective of the integrated technology roadmapping methodology STAR outlined in this paper is to enable companies to align their technology acquisition programs to meet their business objectives. The STAR methodology is based on closely coupling several techniques and methodologies to provide an integrated framework for guiding and justifying investments in R&D projects to achieve the optimum project portfolio that supports enterprise business drivers. The data and information generated during the roadmapping process are captured and facilitated via in-house developed software tools and stored in a common knowledgebase, which covers business drivers, market drivers, market segments, products, technologies and their relationships and hierarchies. The STAR framework and methodology has been tested in a real industrial environment. Feedback indicates a desire to implement STAR methodology throughout the company to support strategic technology investments. Further case studies have been implemented in aerospace SME companies and encouraging feedback showed a potential of future exploitation in other business sectors.

## **MB-09.3 [R] Systemic Innovation Capability: A Source of Competitive Advantage of Early Technological Followers**

*Marcelo A Machado; Kwantlen Polytechnic University, Canada*

An early technological follower can develop technologically advanced products but not necessarily have to face the ever-rising costs and risks of developing cutting-edge technologies. Also, an early technological follower relies on fewer R&D resources and capabilities, including proprietary technologies. In order to remain competitive an early technological follower must develop better target products while making optimum use of R&D resources and capabilities. Collaborative R&D is a frequent strategy followed by an early technological follower to leverage limited resources and increase their new product development (NPD) effectiveness. A challenge is how to effectively integrate knowledge and technology from various sources into high value products. This paper discusses the concept of systemic innovation capability as an enabler of NPD effectiveness and therefore a source of competitive advantage for an early technological follower. The organization of the paper is as follows: 1) an introduction with contextual information surrounding the topic of the paper; 2) a relevant literature review; 3) the concept of systemic innovative capacity; 4) contextualization of the concept case study; and 5) limitations and recommendations for future research.

## **MB-09.4 [A] Strategic Management of Technology Development Project: The Case of Siemens VDO Electric Motor Co.**

*Song Chen; Tongji University, China*

*Yu Gu; Tongji University, China*

*Zhenghua Zhao; Siemens VDO Electric Motor Co., China*

Technology development has been long considered to be a primary factor for establishing a competitive edge. This paper deals with dynamic patterns of the technology development and strategic changes of Siemens VDO Electric Motor Co. in China, focusing on the technology development project in the company. The purpose of this paper is to find underlying principles in successfully managing technology development projects which involve collaborative efforts in the context of MNC in developing countries. For this purpose, this paper takes a system-analytic approach to the innovation process and strategic changes. From the process perspective, it explains dynamics of the technology development process of Siemens VDO Electric Motor Co. in China and its strategic changes along various development stages. From the strategy perspective, some underlying principles behind the successful technology development process are identified: the focused-and-phased, the buy-for-make, and the harmonized collaboration-and-competition approaches. Finally, strategy implications are discussed.

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## **MB-10 Decision Making in Technology Management - 1**

**Monday, 8/3/09, 10:30 - 12:00**

**Room: Studio Suite**

**Chair(s) Hongyi Chen; University of Minnesota-Duluth**

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## **MB-10.1 [A] DPM and DFID: Interactive Tools for Evidence-Based Decision Making**

*Larry Mallak; Western Michigan University, United States*

As engineering managers, we can learn lessons from the healthcare sector concerning evidence-based tools. When new healthcare facilities are built, providers seek design evidence from their peers to make design decisions that have positive impacts on the patient and on their employees. Two tools are profiled: the Design Performance Matrix (DPM) and the Design Feature Implementation Dashboard (DFID). The DPM uses the House of Quality from Quality Function Deployment (QFD) to map demanded qualities to specific design features. The DFID uses the resulting design features in an interactive web-based (or intranet-based) tool. These tools use the existing evidence base for design decisions and, in the process, continue the cycle of producing evidence for other providers. Managers can set up several scenarios to find the right mix of decisions to suit customer needs and organizational budgets. Case data from a healthcare example are used to demonstrate the DPM and DFID tools. Implications for using these tools in typical engineering management settings are identified.

## **MB-10.2 [R] Investigating Decision Making in IT Outsourcing**

*Rosine H Salman; Portland State University, United States*

This paper describes a proposed methodology for research to provide an in-depth investigation on a conceptual model that helps realize the complexities of offshore outsourcing IT knowledge and service work. This paper builds on a preliminary study that was executed by the authors. The model recognizes the essential challenges that such strategies entail. The model presents a sequential view of building organizational capability in offshore outsourcing in the IT service sector. In the preliminary study, authors examined offshore sourcing decisions at three IT start-ups organizations through interviews with senior business executives. A set of frameworks were developed to explain sourcing alternatives and assist managers in deciding which IT service processes to offshore outsource and which to keep in-house. The proposed methodology will focus on a big number of large and medium companies located in the West of the USA such as Oregon and California.

## **MB-10.3 [A] Broadband Mobile Advertisement: What are the Right Ingredient and Attributes for Mobile Subscribers**

*Peng-Ting Chen; I-Shou University, Taiwan*

*Hsin-Pei Hsieh; I-Shou University, Taiwan*

*Joe Z. Cheng; Telcordia Technologies, Taiwan*

*Yu Sheng Lin; I-Shou University, Taiwan*

With the developing of mobile communications technology, a new business opportunity has been brought to the saturated mobile communications market. The high popularizing rate of the mobile phone leads the mobile phone to be an indispensable implement. Meanwhile, it

# SESSIONS

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is becoming the new passage for sending advertisements and brings a brand new business opportunity for the related companies of advertising and mobile communications service. Previously, traditional mobile advertisements were a short message service without personal-based design. Thus, such advertisements sometimes are regarded as garbage messages. Even more, consumers might have negative attitudes toward advertisers. Under the trend of mobile broadband, 3G and 4G mobile broadband internet gave advertisers the feasibility of providing more diversified and personalized multimedia messages to subscribers. An effective mobile advertising is defined as sending an appropriate message to the most potential subscriber at the best time in the right place. Therefore, judging the appropriate content, time, and place to the right subscriber has been the common issue to mobile advertisers and consumers. In this study, research related to mobile advertising was collected and stated for the purpose of inducting 13 factors of personalized mobile advertising. The 13 factors of personalized mobile advertising are weather, user's activity, location, time, device type, promotion, price, brand, background of user, preference, interest, searching history, and virtual community. Further, the 13 factors were classified into three constructs, which are context, content, and personal profile. By inducting and classifying these factors, companies related to mobile advertising would have judgments for designing mobile advertising. Meanwhile, advertising benefit rate (i.e. effectiveness of advertising) and consumer satisfaction would be expected to increase. Plus, operating profit of mobile communications service companies will be created.

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## **MB-11 Technology Assessment and Evaluation - 1**

**Monday, 8/3/09, 10:30 - 12:00**

**Room: Galleria-1**

**Chair(s) Scott W Cunningham; Delft University of Technology**

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### **MB-11.1 [A] Decision Making Tools in Feasibility Analysis of National R&D Programs**

*Yoon Been Lee; KISTEP, Korea, South*

*Jiyoung Park; KISTEP, Korea, South*

As a part of an evaluation system for R&D programs, the Korean government has applied feasibility analysis since 2007. Various professionals put forth a great effort in order to catch up the high degree of freedom of R&D programs, and make contributions to evolving the feasibility analysis. Research teams analyze diverse R&D programs from various viewpoints, such as technology, policy, and impact, integrate the separate analysis, and finally arrive at a definite result: whether a program is feasible or unfeasible. The analytic hierarchy process (AHP) is used to combine the multiple analyses. This paper delivers the story about feasibility analysis and investigates the efficiency of the AHP in feasibility analysis as a decision-making tool. Also, it presents some suggestions about modifying the AHP and applying other tools such as ANP and fuzzy logic.

### **MB-11.2 [R] Assessment of Nanoscience and Nanotechnology Initiatives in India**

*K.B. Akhilesh; Indian Institute of Science, India*

*Neelima S Watve; Indian Institute of Science, India*

Nanotechnology is a new technology which is generating a lot of interest among academicians, practitioners and scientists. Critical research is being carried out in this area all over the world. Governments are creating policy initiatives to promote developments in the nanoscale science and technology developments. Private investment is also seeing a rising trend. Numerous academic institutions and national laboratories have set up research centers that are working on the multiple applications of nanotechnology. Wide ranges of applications are claimed for nanotechnology. This consists of materials, chemicals, textiles, semiconductors, to wonder drug delivery systems and diagnostics. Nanotechnology is considered to be a next big wave of technology after information technology and biotechnology. In fact, nanotechnology holds the promise of advances that exceed those achieved in recent decades in computers and biotechnology. Much interest in nanotechnology also could be because of the fact that enormous monetary benefits are expected from nanotechnology-based products. According to the NSF, revenues from nanotechnology could touch \$1 trillion by 2015. However, much of the benefits are projected ones. Realizing

claimed benefits requires successful development of nanoscience and nanotechnology research efforts. That is the journey of invention to innovation that has to be completed. For this to happen, the technology has to flow from laboratory to market. Nanoscience and nanotechnology research efforts have to come out in the form of new products, new processes, and new platforms. India has also started its nanoscience and nanotechnology development program in under its 10th Five Year Plan and funds worth Rs. One billion have been allocated for Nanoscience and Nanotechnology R&D. The aim of the paper is to assess Nanoscience and Nanotechnology initiatives in India. We propose a conceptual model derived from the resource-based view of the innovation. We have developed a structured questionnaire to measure the constructs in the conceptual model. Responses have been collected from 115 scientists and engineers working in the field of nanoscience and nanotechnology. The responses have been analyzed further by using principal component analysis, cluster analysis and regression analysis.

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## **MB-12 Competitiveness in Technology Management - 1**

**Monday, 8/3/09, 10:30 - 12:00**

**Room: Galleria-2**

**Chair(s) Paul R Newman; Portland State University**

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### **MB-12.1 [R] Metamorphosis of Cluster for Survival and Keeping Competitiveness in the Global Market: Comparative Research on Japans Tsubame Cluster and Silicon Valley**

*Masanori Namba; Ritsumeikan Asia Pacific University, Japan*

Tsubame-Sanjo (hereafter called Tsubame) is one of the world's top-class precise metalworking clusters located in Nigata prefecture Japan. Tsubame cluster has 400 years of history and changed the major products or processing objects from time to time for at least seven different products for adapting to the domestic or global market needs through various types of innovations. During 1980s Tsubame was in the world's top position as a tableware manufacturing center. After losing the competitiveness toward Asian tableware manufacturers, Tsubame has created a new type of cluster with wide diversification and sub-clusters which have mutual networkings. Some companies have world top-class precise metal processing capabilities which were used for manufacturing 100 million iPod cases. Silicon Valley, on the other hand, boasts 100 years of history and has formed the strongest industrial cluster in the world while implementing substantial changes in its core industries. The results of a historical comparison of the core industries of Silicon Valley and Japans Tsubame cluster show that both are characterized by a different styles of cluster transformation. Silicon Valley promotes cumulative change through product innovation, whereas the Tsubame cluster embraces changes in process technology.

### **MB-12.2 [R] Improving World Competitiveness through Knowledge Management**

*Vinod K Khanna; Galgotia Institute of Management Technology, India*

Knowledge management (KM) the world over has been extensively used to improve the performance of organizations. Though Indian organizations have been following the principles of total quality management (TQM) for last 15 years, still the competitiveness of India has not been able to improve globally. Thus, there is a need for the Indian organizations to implement KM along with TQM. The aim of this research is to assess the status of TQM & KM and suggest the implementation strategy of KM to improve world competitiveness of India. Tata Steel case study has been discussed for better insight of KM. This paper presents the status of TQM & KM in the Indian organizations based on 90 organizations. The literature review reveals that KM has a major bearing on the success of organizations. Based on the survey of big, medium, and small organizations, the KM index has been computed for each category, which is 4.07, 2.88, and 2.08 respectively out of total score of 5. It is concluded statistically based on one-way ANOVA (unstacked) that the weakest link among the three groups of categories are medium and small groups of organizations, which affects the overall world ranking of the Indian organizations on competitiveness. The big category of organizations must take the lead to develop medium and small category of organizations as far as KM is concerned. The investigation and research findings are still exploratory. Future research can focus and study the correlation among KM and TQM sector wise. A broadly

# SESSIONS

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based and larger sample size would provide a better picture of KM and TOM performance status. The study has been able to compute the KM index among the three categories of organizations and has been able to establish the weakest link among three categories and suggest number of steps to improve KM in the organization.

## **MB-12.3 [R] Economic Competitiveness through Cluster Integration: The Development of Innovation Capabilities in the Mexican Software Industry**

*Claudia Diaz-Perez; University of Guadalajara, Mexico*

*Ricardo Arechavala Vargas; University of Guadalajara, Mexico*

*Alejandro Alarcon Ozuna; University of Guadalajara, Mexico*

*America Ayala Arriaga; University of Guadalajara, Mexico*

Different studies relate innovation with the economic dynamism of localities, regions and countries, but developing innovative capabilities is not a quick or easy process. Innovative companies must learn to cooperate with others in order to maintain their leadership and to share the costs and risks involved. Even so, alliances, networks and clusters also enhance competitiveness by accelerating the learning processes involved. The purpose of this work is to describe the early development stages of a software cluster in the Guadalajara Metropolitan Area, the second largest city in Mexico and the first one in terms of investment in the software industry. It is the first phase of a longitudinal study which seeks to understand the factors and processes involved in developing collective innovation capabilities. We document the early stages of inter-organizational collaboration and learning, and the development of innovative capabilities that derives from these interactions, presenting data from a survey applied to 52 software companies and open ended interviews with central actors in the nascent cluster. The paper shows some of the ways in which development of systemic innovation capabilities is linked to factors such as cooperation networks, adequate institutional arrangements, venture capital availability, information flows and spillovers, and inter-organizational learning.

## **MB-12.4 [R] Theoretical Application of Competitive Intelligence on Plant Maintenance**

*Robson P Alves; University of São Paulo - USP, Brazil*

*Orandi M Falsarella; Pontifical University of Campinas, Brazil*

This paper presents an investigation, through a bibliographical research, about the information systems, the tools and the methods of organizational intelligence, with sights to its application in maintenance environments as instruments to empower the management of this important function, inside productive processes. In this direction, the maintenance concepts are initially approached, as its gradual increasing relevance is argued. After that, the concepts of organizational intelligence and its cycle are explored. In addition are examined the importance and relationship among information and maintenance environments, the main applicable types of information systems to this function and, finally, as a contribution and one of the main pointed out results gotten in the research, are presented subsidies to recommend an organizational intelligence conceptual model, applied on plant maintenance.

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## **MB-13 Technology Forecasting - 1**

**Monday, 8/3/09, 10:30 - 12:00**

**Room: Galleria-3**

**Chair(s) Lane Inman; VMware**

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## **MB-13.1 [R] Enhancing Business and Technology Foresight with Electronically Mediated Scenario Process**

*Kalle Piirainen; Lappeenranta University of Technology, Finland*

*Antti Lindqvist; Lappeenranta University of Technology, Finland*

Recent turmoil in the world has brought an interest toward creating business and technology foresight to understand the fundamental changes in business, as well as in the environment, society and technology. Especially technology management in changing markets has to deal with long lead times and high sunken costs, and hence handling the risk requires strategic agility and foresight. Scenarios, as a set of multiple possible future development paths, can inform decision makers of the drivers, which shape the future and thus help open-minded planning of actions. The objective of the study is to discuss the present sce-

nario practice in relation to business and technology management, and to present a fresh alternative; the electronically mediated scenario process. Electronic tools offer an effective way to engage decision makers and stakeholders to the scenario process and facilitate efficient use of the time enabling equal contribution from diverse participants. This paper discusses two group support system (GSS) -mediated scenario methods, one heuristic and the other intuitive-logical, compares them to each other and to previous research. The contribution is a thorough discussion of the two method artifacts, highlighting their strengths, weaknesses and limitations, and positioning them to the present scenario practice.

## **MB-13.2 [R] Combining Scenario Analysis with Delphi and the Technological Substitution Model to Analyze the Development of the OLED TV Market**

*Fang-Mei Tseng; Yuan Ze University, Taiwan*

*Ai-Chia Cheng; Yuan Ze University, Taiwan*

The technological substitution model, proposed in 1971, was designed to analyze the penetration process of new-generation technologies replacing old ones. It was expanded in 1979 to consider more than two generations and the substitution process among various entities in the market. However, this expanded model is often limited by a relative lack of data on the latest-generation technology, and while it presents rich and complex portraits of possible future scenarios, it fails to provide quantifiable forecasts. Therefore, previous researchers have combined these two models to analyze the development of new technologies. The current opinions of seasoned experts should also be taken into account for accurate forecasting. However, because there is often large variation among expert opinion, a method for coming to a consensus, such as the Delphi method, is also necessary. Therefore, we combined the technological substitution model with scenario analysis and the Delphi method to analyze the development of a new technology, namely, the organic light-emitting diode (OLED) TV. We elaborate three possible scenarios, and forecast the market share of OLED TV and four other TV technologies in the global market over the next 10 years: cathode ray tube, rear projection, plasma display panel, and liquid crystal display.

## **MB-13.3 [R] Megatrend Methodology to Identify Development Opportunities**

*David Guemes; ITESM, Campus Monterrey, Mexico*

A megatrend methodology was developed in order to determine the development opportunities for each of the states in Mexico. The methodology consists of the identification of an area of knowledge and then the application of each of the seven steps of the methodology (including literature review, experts' interviews, tracking of emerging technologies, identification of stakeholders, etc.), which allows one to be able to describe a possible scenario. This methodology has already developed 12 technological megatrend reports; these reports have been used for a larger planning exercise using industrial cluster data, as well as geographical, economical, and political data to determine development opportunities for each state. This research focuses on the development of the previously described megatrend methodology.

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## **MD-01 PANEL: Meet the Editors**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Pavilion East**

**Moderator: Timothy R. Anderson; PICMET**

**Panelists: Jeff Butler; R&D Management**

**Tugrul U. Daim; International Journal of Innovation and Technology Management**

**George Farris; IEEE Transactions on Engineering Management**

**Harold A. Linstone; Technological Forecasting and Social Change**

**Jonathan Linton; Technovation**

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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.

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## **MD-02 Innovation Management - 1**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Pavilion West**

**Chair(s) Frank Steiner; RWTH Aachen University**

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# SESSIONS

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## **MD-02.1 [R] Movement of Inventors and the Effect of Knowledge Spillovers on Spread of Innovation: Evidence from Patent Analysis in High-Tech Industries**

*M. Hosein Fallah; Stevens Institute of Technology, United States*  
*Piyasi Choudhury; Stevens Institute of Technology, United States*

Over the past decades, many researchers have attributed growth and evolution of new technologies partly to knowledge spillovers among inventors and corporations. Patents and patent citations are considered as indicators of such knowledge transfer as a citing patent acknowledges the prior knowledge embedded in the cited patent. In this paper, the authors examine the effect of knowledge spillovers on patenting behavior of the inventors. In particular, would an inventor moving from one company to another acquire new knowledge and can this knowledge be transferred implicitly through his/her future innovations? The authors attempt to answer this question by studying the patenting behavior of a sample of inventors in high-tech industries from 1990 to 2005. The study shows a positive relationship between inventors movements to their ability to create patents in patent classes outside the classes they previously patented in. The paper reports the results of this study for inventors in telecommunications, information technology and biopharmaceutical industries throughout the US.

## **MD-02.2 [R] Concept Frame Work of Multi-Spiral Innovation for the Future Market**

*Shotaro Kohtsuki; Ritsumeikan University, Japan*  
*Yoshitsugu Morita; Fukui Murata Manufacturing, Japan*  
*Shinichi Yamaki; Ritsumeikan University, Japan*

The multi-spiral innovation is an innovation concept framework that discovers the future innovative market based on social, market and technology needs by the multi-spiral modeling. This modeling is the conceptual model describing the multilayer construction of technology flow and social trends. The multilayer consists of the field of science, technology, engineering, commerce, economy and policy. This multilayer operates with affecting each other. The multi-spiral is created by the phenomena of friction on the borders of each field. If the friction occurs resulting from a variety of factors, for instance, the economic and the environmental crisis, small spirals are created. The gathering small spirals become a tremendous spiral to give rise to new innovative market. Technology development makes economic active, creates and expands an innovative market. However, the stagnation of innovative activities has a serious impact on society, market and technology. This study shows the framework of foresight of an innovative market by multiplayer modeling of intermittent economic society and progressive technology development. If the friction is discontinued, the creation of a new innovative market is not valid. This paper brings this multi-spiral innovation to demonstrate the value of this conceptual framework for market foresight for realizing the social needs.

## **MD-02.3 [R] Opening the Fuzzy Front End: A Synthesis of Two Theories**

*Antero Kutvonen; Lappeenranta University of Technology, Finland*  
*Marko Torkkeli; Lappeenranta University of Technology, Finland*

Companies must innovate, today and tomorrow. The ability to provide new products and solutions to the markets is critical for maintaining a continuous revenue stream, especially in this age of fundamental changes. Product development processes have been studied since the 1980s and nearing the 1990s academic attention turned to early phases of development, i.e. fuzzy front-end. Activities at the fuzzy front end of the product development process are often chaotic and experimental with rather unpredictable or uncertain commercialization futures. Opportunities are raising, but a firm still cannot do all needed development actions in-house. The theory of open innovation has tackled some of emerged dilemmas. It proposes that one should open knowledge and technology borders of the company for idea exchange because there might be a better business model for the technology that apparently is not valuable for you. In our paper OI and FFE theories are merged to introduce a framework for a parallel business plan and technology development, leading to new discoveries in the relation between FFE and external technology exploitation. The

framework is evaluated by how it can help organizations to improve their product development profitability by coping with in- and out-flows of technology.

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## **MD-03 Technology Roadmapping - 1**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Broadway-1**

**Chair(s) Charles W Thompson; Northwestern University**

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## **MD-03.1 [A] Technology Roadmap: Wood/Bio-energy Pellet Renewable Energy**

*Ann-Marie J Lamb; Portland State University, United States*  
*Tugrul U Daim; Portland State University, United States*  
*Scott A Leavengood; Oregon State University, United States*

The worldwide energy system is projected to evolve through a major transformation from a fossil fuel basis to a renewable basis. Wood pellets are one option increasingly being used and studied as an alternative energy source due to its wide benefits: They can be stored and traded on the regional, national and international level; environmental benefits of reduced greenhouse gas emissions; relatively high energy density; and ease of use. This paper showcases a technology roadmap developed for the wood pellet industry. The roadmap was developed for the Oregon Wood Innovation Center (OWIC), College of Forestry, Oregon State University (OSU) in Corvallis, Oregon, USA. The roadmap includes a strategy layer driven by international market drivers, potential products, the technology and knowledge to support those products, and resources/partnerships needed to drive technological changes for wood-pellet energy. The paper also includes challenges/lessons-learned in developing this technology roadmap; with focus on one tool, called quality function deployment (QFD), which was found to be a gap in technology roadmapping literature and was implemented in this case-study with the result of far-wider implementation possibilities for most industries and future technology roadmaps.

## **MD-03.2 [A] Visualization in Strategic and Technology Roadmapping**

*Richard Albright; The Albright Strategy Group, LLC, United States*

A key objective of strategic and technology roadmapping is the creation and maintenance of a compact but content-rich depiction of future strategic and technology directions. But it is often difficult for a roadmapping team to create and maintain complex visual information while keeping a focus on thinking strategically. This paper describes lightweight tools implemented as extensions of widely used software that help roadmappers visualize and maintain the information of a roadmap in a way that both its creators and reviewers can grasp quickly and which conveys the roadmaps story in rich detail. Three visualizations that form the foundation of a roadmap are described: 1) a Driver Map shows how the roadmapping team can best achieve objectives by linking customers needs or applications to performance and to the technologies that will realize the team's objectives; 2) a time-based Roadmap shows how the market or applications, solutions, and technologies evolve over time and how the roadmapping team will develop or acquire technologies or solutions; and 3) a strategic Investment Map provides a value and sourcing view of the portfolio of future technologies or solutions.

## **MD-03.3 [A] Wind Energy Roadmap**

*Rubyna K Brenden; Portland State University, United States*  
*Wajeeh Hallaj; Portland State University, United States*  
*Ganesh Subramanian; Portland State University, United States*  
*Sony Katoch; Portland State University, United States*

Wind Energy has existed for many centuries and has advanced in both products and technologies. We illustrate how wind energy has evolved and discuss its predicted future in the form of a graphical technological roadmap. We considered the following aspects as the basis of our research: the environment, the rising cost and dependency on oil, the availability of profitable and natural wind resources in the Pacific NW, business opportunities and government involvement. Our research is angled from a business perspective with interests discussed in detail later in this report. We predict that as implementation and the shift towards renewable energy, specifically wind energy, occurs, there will be consider-

# SESSIONS

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able reduction in the fluctuation and high cost of utilities, efforts towards the alarming concern of global warming and the increase of awareness of wind energy and its products as a dependable natural alternative energy resource. We used multiple analytical tools and technology roadmaps to drive our research and to draw comparisons, demands and predictions amongst market drivers, products and technology levels, all in respect towards a set timeline. The design of the roadmap was created with importance emphasized on flexibility to change and comprehension of the objectives driving the roadmap. Various designs of objects and color codes representing products, resources and technologies were used in the design of the roadmap. An in-depth analysis of wind energy at present and its forecasted future potential in the next 20 years was analyzed. Technology roadmaps were created for each stage of our analysis, which constantly changed depending on collective data and scope refinement through a process of elimination and importance. Our report can be used as a foundation for future entrepreneurs in the energy sector that wish to explore new business opportunities and wish to diversify their current energy portfolio with an energy efficient portfolio. It could also serve as an educational tool to consumers and assist governmental organizations to achieve their set target to increase the wind energy usage by 20 percent by the year 2020. Our objective is to identify and present the benefits in utilizing wind energy to residential, commercial and industrial consumers within the Pacific NW, with a basis on renewable energy as a whole with a specific focus on wind energy. Considering the climate and geographic location, we feel that wind energy has the most potential in the Pacific NW.

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## MD-04 Manufacturing Management - 1

Monday, 8/3/09, 14:00 - 15:30

Room: Broadway-2

Chair(s) Gulgun Kayakutlu; Istanbul Commerce University

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### MD-04.1 [R] Towards the Development of an Advanced Manufacturing Technology Implementation Tool for Small Companies

Andrew T Walters; University of Wales Institute Cardiff, United Kingdom

This paper describes the development of a concept for an Advanced Manufacturing Technology (AMT) implementation tool that specifically addresses small company requirements. The tool is produced in response to the implementation experiences of twelve small companies and recognises that such companies do not have access to the sophisticated investment decision making processes available to large companies. In working towards the development of this tool, this paper covers the benefits that the case-study companies have achieved as a result of AMT and talks about the barriers that these companies have had to overcome to access such benefits. The critical factors that informed the development of the implementation tool were drawn from this analysis of positive and negative impacts.

### MD-04.2 [R] Managing Dynamic Facility Layout with Multiple Objectives

Gary Chen; Chung Yuan Christian University, Taiwan

Jamie Rogers; University of Texas - Arlington, United States

The Dynamic Facility Layout Problem (DFLP) has garnered increasing attention in this day and age. Traditionally, the facility layout is usually viewed as static-- that is, once the facility layout is planned and executed, the layout remains unchanged for years. This is not the case in the real world, in which the facility layout may undergo change as frequently as every few months, especially in high-tech industries. Furthermore, current research efforts are primarily into the quantitative aspect of DFLP alone, ignoring the qualitative aspect of facility layout. In light of this issue, a dynamic multi-objective facility layout model is proposed to explore several aspects of facility layout planning including time, distance-based objective as well as the adjacency-based objective. The steps for implementing the dynamic multi-objective facility layout application are also discussed.

### MD-04.3 [R] Order Release and Dispatching in a Sequence Dependent Job Shop

Francesco Gentile; Defense Contract Management Agency, United States

Jamie Rogers; University of Texas at Arlington, United States

Determining when order release should occur and how dispatching should be accomplished

is critical to the success of a manufacturing enterprise. Although a significant amount of job shop production scheduling and control literature exists, a void with respect to order release and dispatching in a sequence dependent setup (SDS) environment remains. This research provides a comprehensive literature review of order review and release simulation based studies in job shop environments, and dispatching techniques in the SDS job shop. The literature review served as the basis for developing order release and dispatching mechanisms for the SDS job shop. The main effects and interactions of order release and dispatching mechanisms in a simulated benchmark job shop model were examined for these mechanisms and select mechanisms from the literature. Analysis of variance results demonstrated that the main effects of both order release and dispatching mechanisms are significant, as is the interaction between these variables. Simulation results also proved that the Work Load Control Machine Center order release and Similar Setup dispatching mechanisms yielded the most favorable and robust performance results.

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## MD-05 Cultural Issues - 1

Monday, 8/3/09, 14:00 - 15:30

Room: Broadway-3

Chair(s) Martin Hoegl; WHU - Otto Beisheim School of Management

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### MD-05.1 [R] Nurturing a Culture of Resiliency in the Age of Fundamental Change

Richard V Weeks; University of Pretoria, South Africa

Siebert Benade; University of Pretoria, South Africa

Increasingly, institutions function within an unprecedented context of fundamental discontinuous change. Karl Weick and Kathleen Sutcliffe, in researching how institutions deal with unexpected trends and events, suggest that managers are not all that skilled therein and events spiral, get worse and disrupt the operations of the institution. The researchers claim that commitment to resilience and an ability to bounce back from those inevitable errors are part of an indeterminate world. Van Opstal suggests that globalization, technological complexity, interdependence, climate and energy volatility are increasing the level of risk that organizations now face. With this in mind the role of organizational culture, in the institutional response to unexpected emergent contextual conditions that impact on an institution and consequently its resilience capability and survival, is the focus of analysis in this paper. It is suggested that organizational culture is complex in nature and emerges in response to a shared learning experience. The role of engineers and managers, using narrative and artifacts in nurturing a culture of resiliency, forms a key theme in the paper. Organizational culture and institutional resiliency are metaphorically intertwined as two strands of a rope flexing under the tremendous contextual strain of an age of fundamental change.

### MD-05.2 [R] Cultural Diversity in Global Innovation Teams: Linking Effects of Cultural Diversity to the Innovation Process

Viviane A Winkler; University of Greifswald, Germany

Ricarda B Bouncken; University of Greifswald, Germany

Global innovation teams have received an increasing importance in internationalizing firms. This study researches the effects of cultural diversity on team and innovation performance. Our qualitative and longitudinal study focuses on the effects through diversity of cultural values and of communication style within global innovation teams. From 105 interviews in five innovation teams at three different points in time, respectively stages of the innovation process, we develop a model containing several new assumptions. We find that diversity in context, time, and power distance play are strongly influential on the performance of global teams. Particularly, the feasibility stage is most strongly affected by cultural diversity.

### MD-05.3 [R] The Relationship between Enterprise Strategy and Employee Workplace Friendship: Taiwan and Mainland China

Chun-Te Lin; Yu Da College of Business, Taiwan

Chun-Ling Lu; Yu Da College of Business, Taiwan

Many literatures showed that workplace friendship has a positive impact on an enterprises performance. Thus, the strategy of an enterprise should focus more on the positive development of workplace friendships. The literature also shows that the strategies of most

# SESSIONS

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enterprises focus on dealing with changes of the external environment, such as marketing activity and financial profit, rather than workplace friendship. This research adopts the organization culture theory to discuss the relationship between positive strategies of an enterprise and workplace friendship, and to expand the existing workplace friendship theory. The samples of this research are full-time employees who work in Taiwan and China. This research collected 247 effective questionnaires in Taiwan, and 250 effective questionnaires in China. This results show that the strategies of an enterprise have great impacts on workplace friendship. In addition, there are differences between strategies of Taiwanese enterprises and strategies of Chinese enterprises.

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## MD-06 E-Business - 2

Monday, 8/3/09, 14:00 - 15:30

Room: Broadway-4

Chair(s) Taro Sugihara; Japan Advanced Institute of Science and Technology

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### MD-06.1 [R] Trust in Online Auction towards Explaining the Use Intention

Chwen-Yea Lin; National Yunlin Univ. of Science and Technology, Taiwan

Chien-Chung Tu; National Yunlin Univ. of Science and Technology, Taiwan

Kwoting Fang; National Yunlin Univ. of Science and Technology, Taiwan

The Internet on economic activity is rapid development, trust and reputation system represent a significant trend in online auction behavior. The purpose of this article is to give an overview of trust and affective variables to fully understand the relationship between e-trust and online auction use intention. Theoretical and implications of findings are discussed.

### MD-06.2 [R] A Study on Internet Auctions using Agent Based Modeling

#### Approach

Yildiz Akkaya; Bogazici University, Turkey

Bertan Badur; Bogazici University, Turkey

Osman N Darcan; Bogazici University, Turkey

With widespread use of the internet, Internet auctions (e-auctions) become more popular in order to trade increasing number of goods as Internet provides both almost perfect market information and an infrastructure for executing auctions at lower administrative costs. The ascending-bid, second-price auction is the most widely used e-auction format. The aim of this study is to present a dynamic model of an e-auction so as to investigate how the welfare of buyers is affected by different ascending-bid types. This problem has been studied theoretically in economics in various static auction mechanisms where perfect rationality of participants is assumed. To overcome the limitations of this approach, the new agent based modeling methodology in which researchers use simulations to investigate the behavior and interactions of autonomous, heterogeneous, bounded rational adaptive population of agents in the social and economical environments, has been emerged. In this paper we adapt the bottom-up agent based modeling methodology to investigate the behavior of participants in electronic markets. On the other hand, since observing the bidding strategies of individuals is almost impossible in laboratory or field experiments, we developed a simulation model to understand the welfare effects of different bidding strategies. To some extent sensitivity of the auction outcome on auction rules and market design parameters are also investigated. In our experiments the strategies where the agents update their bid increments in proportion to the differences between their reservation price and current bid are found to be the winning strategies where the duration of the auction is shorter. As the duration of the auction increases all the strategies converged to the same average payoffs. With widespread use of the Internet, Internet auctions (e-auctions) have become more popular in order to trade increasing number of goods as Internet provides both almost perfect market information and an infrastructure for executing auctions at lower administrative costs. The ascending-bid, second-price auction is the most widely used e-auction format. The aim of this study is to present a dynamic model of an e-auction so as to investigate how the welfare of buyers is affected by different ascending-bid types. This problem has been studied theoretically in economics in various static auction mechanisms where perfect rationality of participants is assumed. To overcome the limitations of this approach, the new agent based modeling methodology, in which researchers use simulations to investigate the behavior

and interactions of autonomous, heterogeneous, bounded rational adaptive population of agents in the social and economical environments, has emerged. In this paper we adapt the bottom-up agent based modeling methodology to investigate the behavior of participants in electronic markets. On the other hand, since observing the bidding strategies of individuals is almost impossible in laboratory or field experiments, we developed a simulation model to understand the welfare effects of different bidding strategies. To some extent, sensitivity of the auction outcome on auction rules and market design parameters are also investigated. In our experiments the strategies where the agents update their bid increments in proportion to the differences between their reservation price and current bid are found to be the winning strategies where the duration of the auction is shorter. As the duration of the auction increases, all the strategies converged to the same average payoffs.

### MD-06.3 [R] Research on the Customers' Dissatisfaction Behavior Types After Product Purchase from the Internet Shopping Mall: Case Analysis for Korea Post Office Shopping

Hangil Sun; The University of Tokyo, Korea, South

This study is to investigate dissatisfaction behavior of customers who purchase products on the Internet shopping mall and to find customers dissatisfaction behavior types for effectively responding to that. Managing dissatisfaction behaviors are related to the customer satisfaction. To conduct this study, call center data was collected and analyzed by qualitative method. The results showed that dissatisfaction of product quality and disappointment has different effects on post-purchase behaviors. Customers who feel more dissatisfaction with product quality showed the aggressive response such as exchange and refund, while customers who feel disappointment are likely to switch shopping malls or cancel the order. These results of customers dissatisfaction behaviors indicate that a company has to manage both product quality and the customer's experience dimension.

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## MD-07 Technology Management Education - 2

Monday, 8/3/09, 14:00 - 15:30

Room: Forum Suite

Chair(s) Pamela R Becker; Eastern Michigan University

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### MD-07.1 [A] Scirus Topic Pages: New Publication Possibilities for MOTI Researchers

Fred Y Phillips; Maastricht School of Management, Netherlands

Elsevier's Scirus is a moderated wiki for encyclopedia-style summaries of scientific topics. The presentation will outline Scirus' possibilities as a scholarly publication outlet. It will compare Scirus with Google's Knol. It will also describe the publisher's efforts to position Scirus as a peer-reviewed outlet that deserves consideration in e.g. university rank promotion decisions. The author is Consulting Editor to Elsevier for the "Management of Technology and Innovation" Scirus Topic Pages.

### MD-07.2 [R] Identifying Student Retention Patterns Using GIS Technology

Cheryl A Hanewicz; Utah Valley State College, United States

Geographic information systems (GIS) have been used successfully by personnel in government, business, and industry to map natural resource data, determine socioeconomic boundaries, and manage fleet routing activities. The diverse applications of GIS have made its use attractive to people in many professions. However, educators have not used this technological tool as extensively even though they acquire a large amount of student data. Similar to business owners, it is helpful for administrators in higher education to understand their student/customer base in order to meet their needs and retain them. The author obtained student addresses at both a Midwestern and Western university and mapped them onto a GIS system. Spatial analysis was used to determine whether there were geographic differences among students who dropped out of school, remained enrolled, or successfully graduated within six years of matriculation. Differences were found among the student groups. Geographic distance did not make a difference for dropouts or graduates. However, living near the universities was significant for students who remained in school. Proximity to classes is important for many students to continue their education and ultimately graduate. Additional research using GIS can assist educators in finding off-site campus locations near

# SESSIONS

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the greatest concentration of students.

## **MD-07.3 [R] Technological Innovation System of University-Industry Cooperation and Technology Transfer of Emerging Economies: Case Study of Taiwans Experience**

*Yao-Jen Liu: Shih Hsin University, Taiwan*

*Shang-Jyh Liu: National Chiao Tung University, Taiwan*

*Chiung-Wen Hsu: The Overseas Chinese Institute of Technology, Taiwan*

In the 21st century, technological innovation is an essential factor for an enhanced competitive edge for industries within the knowledge-based economic system. As Asia is a new economic power in the world, Taiwan has experiences to develop its own approach to become the newly industrial country and be called the Taiwan economic miracle since the 1980s, these experiences should have some means for the other emerging economies. For example, Taiwan has good university-industry cooperation and technology transfer experiences that are effective approaches for promotion of technological innovation and shift from manufacturing to services industry. Taiwan established a good university-industry cooperation and technology transfer system in the last century. It enabled cutting-edge knowledge-based technology diffusion in the industries by way of technology transfer, thus creating successful economic development and become the fundamental basis of Taiwans economic miracle. This article is designed to introduce Taiwans practical approaches and improvement measures while implementing university-industry cooperation and technology transfer and explain Taiwans experience in university-industry cooperation and technology transfer.

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## **MD-08 Technology Management in Semiconductor Industry - 2**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Council Suite**

**Chair(s) Yukihiko Nakata; Ritsumeikan Asia Pacific University**

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### **MD-08.1 [R] Overcoming Technology Uncertainty by Scalable Platform**

*Gen Shimada: Tokyo Institute of Technology, Japan*

*Kumiko Miyazaki: Tokyo Institute of Technology, Japan*

Under the recent volatile consumer electronics (CE) market, product development is becoming difficult. The most remarkable CE product in terms of technology uncertainty is digital TV (DTV) as it has many features that are still increasing. So, the paper focuses on DTV products, particularly its electronics system platform, as it plays a key role in the development. The authors found out that there are several types of technology uncertainty, depending on the product features, and classified them based on the Courtney model. In the past, lots of research was made in the CE system platform. Among them, scalable platform is a new effective solution to develop a wide range of product lines with a short cycle. The research question is whether scalable platform is also effective for the technology uncertainty. Thus, the objective is to investigate how scalable platform contributes to technology uncertainty. As a methodology, numerous interviews with DTV makers were conducted to gather the information on the development. Then, comparative analysis was made among them to see the effectiveness of their solutions in terms of technology uncertainty. As a result of the investigation, scalable platform is effective for a certain type of technology uncertainty in DTV development in the recent market environment.

### **MD-08.2 [R] Quantitative Assessment of Computer Applications in the Development Projects of a High-Tech Sector**

*Samar K Saha: Silterra USA Inc., United States*

This paper provides an overview of technology development using the conventional and computer-aided design (CAD) in microelectronics industry. The major factors in reducing the development cycle time and cost by technology CAD compared to the conventional practice are discussed and a simple model is introduced to assess the potential benefits of CAD in high-tech sectors. In high-tech development projects, the model is shown to predict an increase in the cost advantage of CAD with the increasing technology complexities compared to the conventional development approach.

### **MD-08.3 [R] Knowledge Structure Affect Members Technology Adoption: A Study of Semiconductor Manufacturing Process**

*Yen-Cheng Wang: Feng Chia University, Taiwan*

*Ching-Fang Lee: Shih Chien University, Taiwan*

*Sheng-Tsung Hou: Feng Chia University, Taiwan*

Structure of knowledge exists in peoples brains and affects their actions and learning modes. According to previous studies, humans can embed knowledge into carriers and transfer it to others. Human beings are able to not only acquire knowledge from carriers but also to rebuild it in their minds. Therefore, we analyze structure of knowledge of humans through knowledge carriers, in terms of object, practice, cognition, and interaction. The aim of this study is to provide a perspective of management and psychology and understand how knowledge structure affects technology adoption among engineers in a wafer manufacturing plant. We conducted field studies and observed our subjects approaches in dealing with problems that they faced at work. In addition, these same subjects were interviewed to understand their thoughts, feelings and comments on solving problems. Using data from our qualitative field study, we chose a case from our database and present it to illustrate how a novice becomes an expert. We endeavor to comprehensively describe the entire situation in which the subject developed into a mature engineer and then analyze what kinds of carriers the novice used, as well as what kinds of behavior the novice changed. After analyzing the data collected from the field study, we form three conclusions: 1) structure of knowledge grows mobility upward in dynamic conditions. 2) The growth of structure of knowledge affects ones approach to using technology. 3) The growth of structure of knowledge accelerates the speed of solving problems.

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## **MD-09 Strategic Management of Technology - 2**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Directors Suite**

**Chair(s) Ron Khormaei; Logitech Corp.**

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### **MD-09.1 [R] Dependency between Learning and Profitability in Different Industry Conditions: A System Dynamic Simulation**

*Samuli Kortelainen: Lappeenranta University of Technology, Finland*

*Kalle Piirainen: Lappeenranta University of Technology, Finland*

*Hannu Kärkkäinen: Tampere University of Technology, Finland*

*Markku Tuominen: Lappeenranta University of Technology, Finland*

Technological change and especially radical changes are a major source of uncertainty for strategic management of technology. The traditional approach to this problem has been a race to be the first mover to the markets. We look at this situation through the lens of the Resource Based View, and study how the innovation and imitation strategies pay off under different industry conditions. The resource based view of the firm proposes that the competitiveness of industrial companies depends on their ability to manage portfolios of rare and valuable resources. Learning is an important mechanism in resource development and management. We develop a system dynamic model to understand the linkage between learning and profitability under different conditions set by resource appropriability and transferability. The research problem is to examine how profitable the innovator and imitator are in different industry conditions after the radical innovation is launched to the market. The setting informs the industrial manager whether it is economically feasible to open up the R&D to external influences in a situation of discontinuous change, given the industry parameters. The results show that expected profit varies strongly depending on ability to learn from different sources. Strategies based on external learning performed better in an open and less protected market environment, and internal learning became more interesting when resources could be efficiently protected.

### **MD-09.2 [R] Towards the Link between Technology and Business: A Proposed Business Model Framework**

*Jan-Niklas Keltisch: University of Cambridge, United Kingdom*

*David R Probert: University of Cambridge, United Kingdom*

*Robert Phaal: University of Cambridge, United Kingdom*

Note: [R] = Research Paper; [A] = Industry Application

# SESSIONS

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Companies utilize internal resources in order to yield profits. Technologies and their management are such resources. However, the management of technology requires special alignment with respect to the particular business characteristics because the way companies obtain profits differs. Companies with a broad portfolio face a particular challenge to adapt their technology management system to the individual business conditions of their products and markets. This paper explores the influence of such differences in business characteristics on technology management. The characteristics of the business are analysed and a framework is proposed which distinguishes between different business models. This framework integrates findings from various research domains and is capable of characterising the particular business model. Examples drawn from observations in practice illustrate the application of the framework in business and technology management. By utilizing this framework as a referencing system for technology management frameworks, further research into the linkage between technology and business is supported.

## **MD-09.3 [R] Dynamic and Quantitative Exploration on Technology Evolution Mechanism: The Case of Electrical Conducting Polymer Nanocomposite**

*Hsin-Ning Su; Science and Technology Policy Research Center, Taiwan*  
*Pei-Chun Lee; National ChengChi University, Taiwan*

This study aims to obtain a global overview of electrical conducting polymer nanocomposite development along time horizon as well as to obtain dynamic and quantitative exploration on technology evolution mechanism. A total of 1421 electrical conducting polymer related nanocomposite patents were retrieved from the USPTO patent database and patent citation network was generated by combing both patent citation and social network analysis. A patent citation network can therefore be visually obtained and network properties, e.g. degree centrality, betweenness centrality, closeness centrality, representing several technology evolution mechanisms are calculated. Each patent can be positioned at a specific location of the patent citation network and technology evolution mechanisms for each patent can be quantitatively analyzed.

## **MD-09.4 [R] Simulation of Strategic Alliance Formation Based on Niche Theory**

*Yuying Wu; Beijing University of Technology, China*  
*Meng Tian; Beijing University of Technology, China*  
*Feng Yan; Beijing University of Technology, China*

Corporation niche is an equilibrium in which a corporation is finding itself coexisting harmoniously with the environment. Strategic alliance formation is the process of adaptation to the environment and is closely related with the corporation niche. Strategic alliance formation and symbiosis among members based on the niche theory is a self-organizing evolutionary process of a co-competition dynamic system. There is symbiosis among strategic alliance members through system dynamics simulation under certain condition, and the symbiosis simulation of strategic alliance shows that niche theory is an efficient way to study the strategic alliance formation.

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## **MD-10 Technology Management Framework - 1**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Studio Suite**

**Chair(s) W. A Spivey; University of Texas at San Antonio**

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## **MD-10.1 [R] Rethinking Technology Management and Innovation Strategies during a Financial Crisis**

*Anders P Nielsen; Aalborg University Copenhagen, Denmark*

The current financial crisis is forcing many companies to rethink their innovation strategies and their approach to technology management. The almost automatic response to the crisis has been to increase the efficiency of their innovation processes by downsizing R&D departments, making the innovation processes more lean and focusing more on incremental innovation projects with a more secure payoff. However, while this approach may increase the performance of the company for the short term, it may also inhibit the long-term performance of the company. This paper identifies three different reactions to the financial crisis. Three different reactions are identified: repositioning, which entails that the company seeks

to develop new business models which reduce the exposure of the company to the financial crisis; cost reduction, where the company actively seeks to reduce costs using whatever means are available; continual innovation, where the company uses innovation actively in order to develop the business further and gain market share. These three reactions are analyzed in order to determine how key dimensions of the innovation and technology management strategies of the firm are changed. Finally, the paper will discuss if the balance between exploration and exploitation is influenced by the financial crisis.

## **MD-10.2 [R] Technology and Engineering Management in a Fast Changing World or Creating substance out of Chaos**

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

This paper suggests a model on how we will be able to create substance out of seeming chaos in our quest to manage change in technology and engineering effectively. The authors introduce an integrated management model as a process which has withstood the test of practical application over the last decade, especially in an environment of equivocal change. The suggested methodology/model lends itself to understand and judiciously manipulate the dynamics of the high tech global business environment for sustained competitive advantage in a framework of an environment fraught with constant change. The management model recognizes and enables managers to address the many issues confronting them daily by giving a new strategic perspective with the help of sub-models. These sub-models form the anchors of change management whereby the fluid and complex situation can be managed reasonably, effectively, sustainably and, hopefully, wisely too. Limited results are provided for two case studies in an action research setting. It is the contention of this paper that a mature, analytical and intuitive management approach based on the integrated management model introduced will lead to an effective change management and management of change process in an environment of pervasive, enigmatic and paradigmatic change, when applied with in-sight, whole-sight and consistency.

## **MD-10.3 [R] Balanced Innovation Front End Measurement: Discontinuous Innovation Approach**

*Pekka Berg; Helsinki University of Technology, Finland*  
*Jussi Pihlajamaa; Helsinki University of Technology, Finland*  
*Jarno Poskela; Helsinki University of Technology, Finland*  
*Tea Lempiälä; Helsinki University of Technology, Finland*  
*Udo-Ernst Haner; University of Stuttgart, Germany*  
*Ade Mabogunje; Stanford University, United States*

The front-end phase is in the literature generally regarded as the most critical phase of the innovation process. This is due to its inherent uncertain and ambiguous nature and its significant potential to improve overall innovation capability in industrial firms. The front-end phase precedes and feeds the new product development project phase by creating a continuous stream of new incremental, discontinuous and radical product concepts. Such a comprehensive measurement system dealing with the front-end phase of the innovation process in the discontinuous context makes it possible for the people responsible for the innovation activities to get a picture of the efficiency of the innovation process front-end and effectiveness of outcomes and impacts. This paper describes conceptually the theoretical backgrounds, a tentative idea and first managerial implications of a method, Balanced Innovation Front-End Measurement (BIFEM), which we are going to develop and test in 30 Finnish, German and USA companies during the next two years.

## **MD-10.4 [R] The Factors of Choice of Change Methods: What is Their Impact on Consequences of Change?**

*Roberto Biloslavo; University of Primorska, Slovenia*  
*Anita Trnavcevic; University of Primorska, Slovenia*

The basic purpose of this research is to examine which factors have an influence on the choice of method of change and how they are linked to negative consequences which result from an inappropriate approach towards change. A quantitative approach to research work

# SESSIONS

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is applied. The data was obtained by a questionnaire, and then processed by using the method of factor analysis and multiple regression. Based on research findings we could conclude if between the factors of choice of change methods and negative consequences exists a direct link. The research is especially important for managers in the transition period when they approach different change methods proposed by consulting companies, academics and others. If management during this process will consider inappropriate factors in selection of change methods we believe the probability of failure, understood as lower added value for organization stakeholders, will increase. The research introduces new findings concerning the link between factors of choice of change methods, and the extent of the undesired consequences of change. Research studies of this nature are not presently to be found in the literature on change management.

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## **MD-11 People and Organizations - 1**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Galleria-1**

**Chair(s) Gary W Perman; PermanTech**

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### **MD-11.1 [R] An Activation-Process Management for Technical Organizations and Its Application to Japanese Automobile Company**

*Kunio Shirahada: Japan Advanced Institute of Science and Technology, Japan*  
*Kiyoshi Niwa: The University of Tokyo, Japan*

As an active technical organization has the potential to produce better R&D output, the importance of activating technical organizations is increasing in manufacturing companies. To develop an activation management approach for technical organization, we focused on the process of active organizational state formation. Starting with Weicks organizing model, we developed an activation-process model consisting of four sequential organizational phases: diverse ends, common ends, diverse means, and common means. As an activation-process management, we identified four managerial behaviors for promoting activation, a diagnosis method for understanding subordinates potential, and a managerial rule based on diagnosis for effective use of the behaviors. We tested our management on 187 technical personnel in technology development departments of a Japanese automobile company during two critical periods for determining organizational activation: the annual goal-setting period and the follow-up period after goal setting. We conducted structural equation modeling analysis and multiple linear regression analysis of feedback data gathered after the testing. The results demonstrated that our activation-process management is effective for forming an active organizational state in technical organizations and that it can contribute to advancing technical organization and people management studies.

### **MD-11.2 [A] Trends and Managerial Tools in Technology Standards Development**

*Ramin Neshati: Intel Corporation, United States*

This paper presents a general overview of technology standards development and their ramifications to technology management. It is well established that technology standards foster ecosystems which in turn facilitate opportunities for innovation and product differentiation. How and why are such technology ecosystems created in the first place? What are the rules that govern the various forms of standards development organizations? Can participants protect their intellectual properties while sharing knowledge and expertise with would-be competitors to enable an interoperable pool of technologies and products? After a survey of the present state of technology standards development and a thorough analysis of a case study, we will turn our attention to several emerging trends that portend of disruptions in this equilibrium. Some of these trends include the new dynamics of competition and collaboration in standards development consortia, the tensions between different approaches in technology domains such as computing, consumer electronics and communications, the rising influence of regulations that inform technology standards development and, last but not least, the impact of developing economies as a consequence of globalization.

### **MD-11.3 [R] Care Systematization in Pediatric Nursing Applying Case-based Reasoning**

*Marcio A Mendes: University of Sao Paulo, Brazil*

*Marcia N Shiraishi Kondo: University of Sao Paulo, Brazil*  
*Domingos B Gomes Santos: University of Sao Paulo, Brazil*  
*José Manuel M Cárdenas: University of Sao Paulo, Brazil*  
*Amparito del Rocío Vintimilla Castro: Pediatrics Childrens Institute of FMUSP, Brazil*  
*Marcelo K Zuffo: University of Sao Paulo, Brazil*  
*Pedro Luis P Sanchez: University of Sao Paulo, Brazil*

It is very difficult to find and collect nursing diagnoses in hospitals, where various clinical records and procedures are done by hand and manually stored on paper form. This condition impairs the readability of hospital process documents, and the archival method makes the information recovery very slow, which ultimately frustrates the search which could result in important information to improve the decision making process. The aim of this paper is to present an application to help the nurses in the clinical reasoning, keeping their experiences as a collection of cases for future research. The process is to scan diagnoses of pediatric nursing, and insert them into a case database, in a structure that provides for recovery, adaptation, indexing and comparison of cases, to be used to evaluate the effectiveness of the prototype application in handling these cases. This article presents a computational tool for health care support, employing techniques of case based reasoning, whose performance was satisfactory in the location of cases directly related to the presented test case. This fact suggests that the prototype presented is able to recover diagnoses made previously and it is of great importance for decision-making and improvement of diagnoses.

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## **MD-12 Technology Management in Automotive Industry - 1**

**Monday, 8/3/09, 14:00 - 15:30**

**Room: Galleria-2**

**Chair(s) Cornelis C van Waveren; University of Pretoria**

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### **MD-12.1 [R] The Changing Shape of Networks: Lessons for the Auto Industry**

*Tal Ben-Zvi: Stevens Institute of Technology, United States*

The global financial crisis has hit carmakers relatively hard as the auto industry around the world is experiencing a sharp decrease in sales. Today, carmakers must consider their strategic positioning in the market, relative to the competition. One way to deepen understanding of corporate positioning from this perspective is to investigate this area using a laboratory experiment. This study examines a business simulation game and evaluates several network characteristics. Our analysis reveals the impact those characteristics have on company performance. The findings also show the applicability of network theory in analyzing the auto industry.

### **MD-12.2 [A] Industrial Policy, Technology and the Future of Automotive Manufacturing in South Africa**

*Martin Kagwa: AIDC/University of Pretoria, South Africa*

*Jasper L Steyn: University of Pretoria, South Africa*

*Anastassios Pouris: University of Pretoria, South Africa*

Using selective industrial policy, South Africa succeeded in re-integrating its previously protected automotive manufacturing industry into the global value chain. In the period 1995 to 2006, the industry experienced significant growth in both vehicle production and exports. Despite these successes, the future of automotive manufacturing in South Africa, as in most other developing countries, is not certain without continued government incentives. The paper presents an assessment of South Africa's automotive industry support model in terms of sustaining domestic manufacturing, using a qualitative system dynamics model. A key finding is that the industrial policy did not sufficiently take into account systemic interdependencies and feedback effects within the industry that influence intended outcomes. Technology and innovation were not given prominence in the policy formulation and implementation process. It is concluded that to put South Africa's automotive manufacturing industry on a sustainable growth path, the selective industrial policy has to be complemented with a technology policy.

### **MD-12.3 [R] Application of Technology Development Envelope (TDE) Approach for Future Powertrain Technologies: A Case Study of Ford Otosan**

*Irmak Kockan: Ford Otomotiv Sanayi A.S., Turkey*

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Ahmet M Yildirim; *Ford Otomotiv Sanayi A.S., Turkey*  
Tugrul U Daim; *Portland State University, United States*  
Metin Ergeneman; *Istanbul Technical University, Turkey*  
Nathasil Gerdarsi; *Mahidol University College of Management, Thailand*

This study focuses on future powertrain systems with the aim of defining the most probable implantation road map for the different alternatives to improve powertrain efficiency. A new methodology called Technology Development Envelope (TDE) for transforming the roadmapping approach to the level in which it is dynamic, flexible and operationalizable is applied for a case study of Ford Otosans technological planning concept. In the first section, the technologic roadmapping methodology is explained. As a next step, each powertrain solution is defined. Advantages regarding efficiency, fuel consumption, cost effectiveness, emissions, infrastructure and performance have been listed. In the next sections, TDE methodology and a pre-list of technologies are explained in detail. A series of criteria and sub-factors have been defined with the aim to compare the different powertrain systems to identify the best solutions.

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**ME-01 TUTORIAL: Applying the Accelerating Radical Innovation Model**  
**Monday, 8/3/09, 16:00 - 17:30** Room: Pavilion East  
**Speaker(s) John P Dismukes; University of Toledo**  
**John A Bers; Vanderbilt University**  
**Lawrence Miller; University of Toledo**

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Systematic acceleration of breakthrough or radical innovation has been hindered by a lack of articulated theory and tacit knowledge and tools guiding practitioners in achieving profitable commercialization within acceptable bounds of time, cost, and risk. The Accelerated Radical Innovation (ARI) Methodology, introduced at a 2004 Conference on Accelerating the Radical Innovation Process, proposed to change this state of affairs with a conceptual framework and associated techniques and tools. The ARI Methodology has been applied retrospectively to the analysis of radical innovation in energy and health care and was applied in 2007-2008 as the guiding methodology for a health care radical innovation in the White Rose Health Innovation Partnership program funded by the United Kingdom's National Health Service. This tutorial introduces the key concepts and tools of the ARI methodology, including: • Ten-Step ARI Methodology Dynamics Process • Competitive Intelligence Management of Innovation at Each Step • Ten-Attribute Description of Successful Innovation Factors • Innovation Scorecard for Monitoring and Accelerating Innovation Progress • The ARI Methodology Guide Book • The ARI Methodology Answer Book • ARI Methodology Status System Workbook Participant Involvement: The tutorial gives participants an opportunity to apply some of these tools to a promising recent radical innovation in cancer diagnosis and therapy. Feedback from attendees on improvements and further applications of the ARI Methodology will be solicited, verbally and via a short questionnaire.

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**ME-03 Technology Roadmapping - 2**  
**Monday, 8/3/09, 16:00 - 17:30** Room: Broadway-1  
**Chair(s) Rob Phaal; University of Cambridge**

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**ME-03.1 [A] Learning Methodology of Innovation Architecture Using Case Example of Development of Contactless Palm Vein Pattern Biometric Authentication Technology**

Yoichiro Igarashi; *Fujitsu Laboratories Ltd., Japan*  
Makoto Okada; *Fujitsu Laboratories Ltd., Japan*  
Akihiko Suzuki; *Japan Energy Association, Japan*  
Munehiko Iwase; *Pioneer Corporation, Japan*  
Shigeki Shibagaki; *Nitta Corporation, Japan*  
Shunichi Kolke; *Tokyo Gas Co., Ltd., Japan*  
Hajime Matsubayashi; *Oji Paper Co., Ltd., Japan*  
Hitoshi Abe; *Japan Techno-Economics Society, Japan*

The learning methodology for technology roadmapping (TRM) described in this paper comes out of the work of a Japan Techno-Economics Society group. A practical example of TRM is

the innovation architecture (IA) proposed by H. Tschirky's group at ETH Zurich. A contrasting approach for an IA is to require engineers to learn the theoretical background before they customize the IA for particular applications. The IA users would have to make great efforts to interpret IA theory for their daily tasks, described in the language of their professions. The approach to designing a learning methodology in this paper is to build an IA using a case study. Using the case study, engineers are able to learn how to develop the IA by assuming the roles of project members. The paper covers the implementation of the methodology by describing how an IA is built using a case study on the development of a biometric authentication technology (released by Fujitsu Laboratories Ltd. in 2003). By using the methodology to follow the case example, an R&D organization was able to gain experience with the IA (TRM) and learn how to use it efficiently.

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**ME-03.2 [R] Knowledge Map of Publications in Research Policy**  
*Hsin-Ning Su; Science and Technology Policy Research Center, Taiwan*  
*Pei-Chun Lee; National ChengChi University, Taiwan*

Research Policy, as a leading journal among others in the fields of social science, plays as an important platform for policy researchers to have their research results published, documented and shared internationally. This study uses Research Policy as a window or an indicator to understand an overview of global Sci-Tech and Innovation Policy/Management research, as well as unveil how papers in Research Policy are correlated to each other and how quantitative technology management can be possibly obtained. This study positions research foci in Research Policy by keyword-based network analysis. A keyword-based network, which is also named as research focus parallelship network, can be visually obtained and network properties, e.g. degree centrality, betweenness centrality, closeness centrality, can be calculated. The keyword-based network can be depicted differently to reflect its research focus parallelship as well as knowledge linkage implication by choosing different information as network actors such as keyword, first author, institute, or country. There were a total of 2014 keywords contained in 934 papers published in Research Policy in the period from 1998-2008.

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**ME-03.3 [A] Working Toward Producing Sustainable Biodiesel in the Pacific Northwest: Analysis and Implementation Using the T-Plan Technology Roadmapping Approach**

*Andrew J Blair; Blair Consulting, LLC, United States*

Technology roadmapping is a process that is utilized for purposes of strategically aligning research and development goals across untraditional organizational networks for purposes of managing innovation. In this research a T-Plan approach developed at Cambridge University by Robert Phaal identifies strategic research and development options for sustainable biodiesel production for the Pacific Northwest, United States. The roadmaps developed depict relationships between technologies and knowledge domains that are critical for achieving sustainable biodiesel production in the region. Considered are the development of future markets for sustainable biodiesel and the relative timing of market entry for transitional biodiesel production technologies for prospective commercialization. The technology roadmapping process identifies algae cultivation as a promising feedstock to be used for sustainable biodiesel production.

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**ME-04 Manufacturing Management - 2**  
**Monday, 8/3/09, 16:00 - 17:30** Room: Broadway-2  
**Chair(s) Jamie Rogers; University of Texas at Arlington**

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**ME-04.1 [R] Modular Manufacturing Experience in the South African Clothing Industry: Lessons Learned**

*Kem Ramdass; University of Johannesburg, South Africa*  
*Leon Pretorius; University of Pretoria, South Africa*

The global economy, which is enhanced through changing technologies, is pressurizing organizations to improve productivity of their business processes. Competition is forcing organizations to focus their energy on core competencies. Like many industries, the clothing industry is witnessing changes in technology, diversification of labor, and managerial

# SESSIONS

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implications while competing on the global market. The South African clothing and textile industry has the potential to create jobs, but this potential has been steadily diminishing. The performance of the clothing industry, whether in terms of efficiency, working conditions or degree of social protection, is unstable. The industry's ability to generate sustainable and productive employment varies according to geographical locations. The process improvement methodology that could improve the status quo in the clothing industry is modular manufacturing, which is the focus of this paper. Qualitative results of the implementation of modular manufacturing and its relative experiences at a South African clothing manufacturer are presented through a case history.

## **ME-04.2 [R] An Empirical Study on the Role of CTO in Chinese Manufacturing Enterprises**

*Yong Cao; Huazhong University of Science and Technology, China  
Li Zhao; Huazhong University of Science and Technology, China  
Yan-ju Xing; Huazhong University of Science and Technology, China  
Atsushi Abe; Ritsumeikan University, Japan*

This study presents results from a literature review of papers that discuss task-related issues of CTOs as well as their relations with other groups and their functions within a firm. We discuss a number of questions, which have not been addressed by researchers so far, and present the results of an actual CTO survey conducted in 20 large- and medium-sized enterprises in the mechanical and electrical industries. All interviewees spent their entire working life with the same enterprise, having a cumulated working experience which varied between 20 and 35 years (27.5 years on average). The most frequently mentioned task performed was the supervision of new technology and new product development. All the CTOs were involved with not only technology strategy but also corporate strategy, and also had full responsibility for IP strategy and management. In order to perform tasks, and to give consideration to their responsibilities, the CTOs have technical knowledge and a background in business areas. However, specific skills such as project management skills and problem solving/analyzing skills were less expected. All the CTOs mentioned that specific long-term experience in the R&D area was required. In contrast, very few interviewees mentioned that experience in negotiating with suppliers and third parties, an excellent record as a researcher, or international experience were required qualifications. Our findings are that those companies surveyed filled the CTO position with deeply ingrained technical people, the same as the heads of R&D divisions.

## **ME-04.3 [R] Sustainability Spirit in Manufacturing/Machining Processes**

*Janez Kopac; University of Ljubljana, Slovenia  
Franci Pusavec; University of Ljubljana, Slovenia*

The paper presents methods for achieving production sustainability on a machining technology level. Industry is under increasing pressure from global competition, stricter environmental legislation, and supply-chain demand for improved sustainability performance. In order to tackle these issues, the paper promotes sustainable production via the improvement of machining technologies that have a high potential to cut costs and improve competitiveness by reducing resource consumption and thus creating less waste. In this way the products and processes could yield improved usefulness and have less of an environmental impact. The general issues of sustainable production technologies are in this paper covered through changes in products, systems, and processes based on sustainability issues. The idea is confirmed by a case study on the implementation and sustainability evaluation of innovative cryogenic and high pressure jet assisted machining processes in comparison to conventional machining process.

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## **ME-05 Cultural Issues - 2**

**Monday, 8/3/09, 16:00 - 17:30**

**Room: Broadway-3**

**Chair(s) Jonathan C Ho; Yuan Ze University**

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## **ME-05.1 [R] Subjective Distance in Distributed Teams: A Study of Software Development Teams**

*Frank Siebrat; WHU - Otto Beisheim School of Management, Germany*

*Martin Hoegl; WHU - Otto Beisheim School of Management, Germany  
Holger Ernst; WHU - Otto Beisheim School of Management, Germany*

This paper challenges the conventional wisdom that team members' objective distance (e.g., measured in miles) translates directly and fully into subjective distance (i.e., a team's perception of distance between its members). Drawing on social information processing theory, we argue that the level of subjective distance is likely to predict important team outcomes better than the level of objective distance. Using responses from 678 team leaders and team members pertaining to 161 new product development projects in the software industry, our results show that the subjective perception of distance is affected rather by team members' national diversity than their physical distance. We find that the perception of distance impacts the quality of task and socio-emotional team processes. Measures of objective distance, however, have no impact on these team processes. These results indicate that the physical separation is not the key issue in virtual teams. The way distance is perceived, interpreted, and managed by members, however, seems to be more relevant for the performance of dispersed teams. Implications for theory and practice are discussed.

## **ME-05.2 [R] A Multi-Perspective Analysis of Culture and Technology Management: A Korean Case**

*Chung-Shing Lee; Pacific Lutheran University, United States  
Jonathan C Ho; Yuan Ze University, Taiwan  
Pi-Feng Hsieh; Takming College, Taiwan  
Byung-Seock Ryou; GE Healthcare, United States*

This research applies a multi-perspective decision-making approach and the concept of discounting or planning horizons as a framework to study the influence of culture on technology policy and management in Korea. Korea has invented the world's first metallic type and MP3 player and has had great opportunities to develop them earlier than other technologically advanced countries. However, these two inventions were not commercially successful for Koreans. Many reasons could have attributed to the failure. We argue that the imbalance among the technical, organizational, and personal (TOP) perspectives was a major factor. Business executives and policy makers also need to deal with issues related to discounting and forecasting when planning for commercialization and diffusion of new technologies. In addition, culture also plays an important role that bridges invention and innovation; invention can be transferred to innovation with a culture which can support the invention, and invention can be inspired by an innovative culture. In sum, the balance of multiple perspectives of decision-making, the applications of the principles of discounting and technology forecasting and planning, and the roles of diversity and government policy are all crucial for the success of an innovation in a global context.

## **ME-05.3 [R] Evaluating the Consumer Cosmopolitanism: Taiwanese Consumer Behavior in Choosing Local or Foreign Banks**

*Yi-Hsien Tu; Minghsin University of Science & Technology, Taiwan  
Ke-ming Hung; u-Da College of Business, Taiwan*

The aim of this paper is to investigate bank selection behavior by analyzing its global mindset. More specifically, this study also analyzes the consumer cosmopolitanism while they face the decision in choosing local or foreign banks. Following the literature review, the paper proposed four variables, which were past experience, localism, cosmopolitanism, and consumer ethnocentrism. Research data were analyzed by structure equation model. The result of the research indicated that consumers were showing no differences between local and foreign banks. Furthermore, in this research the evaluation of past experience included four dimensions: travels, expatriate stays, cross-cultural training, and social status seeking. The result indicated that there is no difference between local and foreign banks for the consumer in expatriate stays, cross-cultural training, and social status seeking. Travels were the only factor which influences a consumer's choice in choosing local and foreign banks. However, it may be due to the need to use a financial service while in another country. Insights derived from this study will provide bank managers and advertising executives with the building blocks for understanding consumer choice criteria of banks in Taiwan.

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## **ME-06 Science and Technology Policy - 1**

# SESSIONS

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**Monday, 8/3/09, 16:00 - 17:30**

**Room: Broadway-4**

**Chair(s) Jasper L Steyn ; University of Pretoria**

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## **ME-06.1 [A] Acquisition and Development Methodology of Aircraft, Systems and Materials of the Brazilian Air Force**

*Manuel A Fagundes Perez; Instituto Tecnológico de Aeronautica, Brazil*

*Ligia Maria S Urbina; Instituto Tecnológico de Aeronautica, Brazil*

*José Henrique S Damiani; Instituto Tecnológico de Aeronautica, Brazil*

In the Air Force Command of Brazil's Ministry of Defense, there is a document that establishes the procedure for acquisition or development, as the planning and implementation of the phases and the main events in the life cycle of systems and equipment, aircraft and its systems onboard. This document, the DCA (Guideline of the Air Command) 400-6, is a sequence of events or activities that have the flexibility and integration as features and is organized into nine stages: design, feasibility, definition, development, production, deployment, use, revitalization and deactivation. These phases are divided into sub-phases, and they, in turn, are organized in blocks, which are a set of ordered steps to be followed that detail the sub-phases. Thus, the whole process of acquisition or development, emerged from an operational need, is already pre-defined and clear, allowing for both the primary customer, the Air Force, as for suppliers, companies in the aerospace industry, a profile of all necessary steps and requirements to fill the need detected.

## **ME-06.2 [R] The Innovation Dynamics of Zhejiang Model: The Case of Wenzhou**

*Song Chen; Tongji University, China*

*Sheng Wang; Tongji University, China*

*Yu Gu; Tongji University, China*

Since China's reform and opening to the outside world, the performance of Zhejiang Model in promoting the local economic development has attracted worldwide attention. Zhejiang's private enterprises gradually reduce production costs and improve product quality with incremental innovation, and have gained great competitive advantages. However, with the depleting incremental innovation opportunities, Zhejiang's economy is confronted with the transition from incremental innovation to radical innovation. This paper takes Wenzhou City, the most typical and early mature economy in Zhejiang, as an example, to analyze the influence of the production model of enterprises cluster with highly specialized division of labor and the laissez-faire policy of local government upon the transition of innovation.

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## **ME-07 Technology Management Education - 3**

**Monday, 8/3/09, 16:00 - 17:30**

**Room: Forum Suite**

**Chair(s) Cheryl A Hanewicz; Utah Valley State College**

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## **ME-07.1 [R] Systems Engineering and Technology Management Education for the 21st Century**

*L. Ken Keys; Cleveland State University, United States*

The fields of systems engineering and technology management have developed rapidly in the last 40 years to evolve a discipline with considerable breadth and depth. Educational institutions around the world report significant student interest in this broad field. It is this author's experience and perspective that they have become an integrated focus area. The increased complexity, increased mix of different integrated technologies (e.g., Mechatronics and software engineering), reduced time to market of higher performance quality and reliability, and to budget and cost targets, products, increases the importance, and sophistication, of the management of the engineering and technologies process for developing these new products. Global business competition is forcing the need for a continuous stream of new products. The above listed challenges have driven the increased numbers and importance of academic programs that address and respond to this systems engineer, SE&TM, education need. This paper will present some background history and describe the MS in Systems Engineering and Technology focus area in the Fenn College of Engineering at Cleveland State University, Cleveland, Ohio, as an example. Students from over 30 major

northeast Ohio companies and agencies (including NASA) have participated in this program over the past six years.

## **ME-07.2 [A] Teaching Sustainability: Course, Program and Degree Considerations**

*Patricia L Fox; IUPUI, United States*

*Stephen Hundley; IUPUI, United States*

*Jan Cowan; IUPUI, United States*

*Joe Tabas; IUPUI, United States*

*David Goodman; IUPUI, United States*

In recent years within the United States, sustainability has gained importance in higher education, government agencies, business and industry, and in the general public's consciousness. The goal of meeting today's needs without harming future generation's ability to realize their potential is the hallmark of sustainable practices, and there is widespread interest from many disciplines and sectors in developing, enhancing, and integrating sustainability into aspects of products, services, and solutions. Thus, the need to equip students with the knowledge, skills, and perspectives to make contributions to sustainability initiatives and processes has never been greater. Sustainability can be taught in many disciplines, including, but not limited to: design, engineering, manufacturing, technology, and management. This paper outlines how sustainability can be taught in these areas, and how sustainability might be integrated into the curriculum from three perspectives: course, program and degree. At the course level, examples of how to integrate the concepts and applications of sustainability into existing material will be discussed. Program-level considerations for teaching sustainability will also be examined. The current situation and the demand for a sustainable knowledge in the workplace and how that might lead to a sustainable degree will be addressed. An inventory of green jobs and careers will be investigated and how sustainable courses, programs and degrees can support the future global workforce and address stakeholders' needs, wants and expectations in a sustainable, low carbon world.

## **ME-07.3 [R] Technology Management Degree Programs: Meeting the Needs of Employers**

*Pamela R Becker; Eastern Michigan University, United States*

A profound need exists for employees with expertise in technology management in today's rapidly changing technologically based environment. The competencies, skills, and abilities of graduates of technology management programs should reflect and meet the needs of the employers of these graduates. It is imperative that the design and development of technology management curricula consider the needs of business and industry, yet very little research has addressed this aspect. The author conducted a study using a purposive sample population of technology managers from four industry sectors (business services, education, government, and manufacturing) in addition to economic developers. The primary purpose of this study was to determine the core curricular elements of effective undergraduate technology management academic programs. The relative perceived importance of each of the following eight core-competency areas was addressed in the study: (a) technology project management, (b) management of technological change, (c) information and knowledge management, (d) management of organizational change, (e) strategic management of technology, (f) assessment and evaluation of technology, (g) quality management of technology, and (h) innovation and product development. The results of this study demonstrated that inclusion of specific technology management core competencies in undergraduate technology management programs is essential in order to meet the needs of employers.

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## **ME-08 Technology Management in Semiconductor Industry - 3**

**Monday, 8/3/09, 16:00 - 17:30**

**Room: Council Suite**

**Chair(s) Samar K Saha; Silterra USA Inc.**

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## **ME-08.1 [R] The Connection between Patent Litigation and Patent Portfolio: An Empirical Study of U.S. Semiconductor Industry**

# SESSIONS

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*Yun Ken; National Yunlin University of Science & Technology, Taiwan*  
*Tung-Yu Tsai; National Yunlin University of Science & Technology, Taiwan*  
*Wen-Ling Hsu; National Yunlin University of Science & Technology, Taiwan*

The strategy of patent portfolio is employed by patentees to protect and prolong their innovative achievements, which is prevailed among the intellectual property community. Furthermore, patent litigation is the terminal manner against infringers. Behind the inventors strategy of patent portfolio that involving about legal and managed purposes. Following the trajectory of the previous studies with regard to patent litigation in management and economic fields, the correlation between the patent portfolio and patent infringement litigation is what we are anxious to explore in this paper. By sorting out the material of patent portfolio of the defendants and plaintiffs of patent infringement suits in US semiconductor industry and collecting the involving patent data that form the verdicts and adjudications in federal courts. Our results will significantly manifest that some characteristics of patentee's patent portfolio will influence the competence and will of their patent lawsuits against the competitors.

## **ME-08.2 [R] Business Architecture and Dynamics of Interdependences Analyzed by Design Structure Matrix: Comparing Liquid Crystal Display and Semiconductor Industries**

*Yukihiko Nakata; Ritsumeikan Asia Pacific University, Japan*

Liquid crystal displays (LCDs) and semiconductor devices, such as large scale integrated (LSI) circuits, are key devices supporting the information society and are becoming more complex. Baldwin et al. emphasized the power of modularity using the design structure matrix (DSM) with regards to complexity. There is no research on interdependences among companies by using the DSM; therefore, I conducted such research. Companies in the LCD industry want to produce larger LCD panels than each other by using customized equipments. According to the analysis by the DSM, the higher the interdependences among the companies, the higher the degree of integral business architecture of the industry. In contrast, the LSI industry uses a standard silicon wafer size as a design rule, which reduces the interdependences as shown by the DSM analysis results. Therefore, the lower the interdependences among the companies, the higher the degree of modular business architecture of the industry. In addition, the dynamics of the interdependences was analyzed. The results showed that by following a process from planning to operation, the interdependences in an industry with integral business architecture are reduced. By DSM analysis, I found the business architecture and dynamics of interdependences in the LCD and LSI industries.

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## **ME-09 Strategic Management of Technology - 3**

**Monday, 8/3/09, 16:00 - 17:30**

**Room: Directors Suite**

**Chair(s) Richard V Weeks; University of Pretoria**

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## **ME-09.1 [A] Chaos, Strategy, and Action: How Not to Fiddle While Rome Burns**

*Fred Y Phillips; Maastricht School of Management, Netherlands*

The US financial meltdown has changed companies situations not just fundamentally but pervasively. Institutions and channels of supply and communication have disappeared or become unreliable; we are literally managing in chaos, and traditional notions of strategy, planning, and implementation must be (temporarily, it is to be hoped) discarded. This presentation draws on classic management theory and newer ideas, to outline principles for managing for survival in times of chaos. It introduces new management cycles as alternatives to Fayols classic management cycle, and a corresponding taxonomy of organizational situations, including Stable, Chaos, Edge of Chaos, and Disaster.

## **ME-09.2 [R] The Strategy-Technology Firm Fit Audit**

*Steven Walsh; University of New Mexico, United States*

*Jonathan Linton; University of Ottawa, Canada*

The importance of technology in firm strategy is now well established. Yet a comprehensive opportunity evaluation process that objectively incorporates the multiple technology man-

agement aspects remains elusive. The majority of models or tools that do include technological dimensions mainly do so from a normative, point in time, market based perspective. Both strategic researchers and those researchers focused on innovation and technology management have developed tools that are either limited by their age or the scope of their respective fields knowledge basis. The result is a set of opportunity evaluation tools that are ineffectual. If this is true then there is cause for concern. Established as well as entrepreneurial firm opportunity evaluation processes are dominated by opportunity recognition techniques and respective histories of success in taking any opportunity to market. These processes do not focus on decomposition or objective strategic and technological aspects. This has led to serious problems and spectacular failures in the commercialization of opportunities by entrepreneurs, small and medium sized enterprises, and large firms. Here the authors address this problem. We employ seminal and recent advances in the fields of management of technology, strategy and entrepreneurship to produce a multi-dimensional decomposition based model for opportunity evaluation. We utilize the case study method to verify the model. The resultant is Strategy-Technology Firm Fit Audit model. The model provides established firm decision makers a resource for the investigation of potential opportunities. It also provides an entrepreneurial team, institutional investor, angel or venture capitalists a manner to investigate potential venture success.

## **ME-09.3 [R] Evaluating International Business Model Portability: A Framework for Integrating Economic, Strategic, and Cultural Perspectives**

*Tim J Clark; Portland State University, United States*

This paper proposes a new, comprehensive framework for identifying and evaluating economic, cultural, and strategic dimensions of business models, then assessing international portability: how well a given business model is likely to perform in overseas markets. Its goal is to define and explore a potentially useful method whereby entrepreneurs, managers, and investors can evaluate a business models likely effectiveness outside of its market of origin. The paper posits that the strategic and economic logic by which an enterprise profitably acquires and serves customers its business model is, like a person, imprinted by the distinctive national environment in which it was developed. Therefore, business models, like expatriate businesspeople, achieve greater or lesser degrees of success when transplanted to foreign environments. Specifically, the paper defines a pyramid-shaped, tiered scheme for examining three distinct layers of a business model: Firm, Culture, and Economic. The bottom Economic layer comprises a typological infrastructure of 16 mutually exclusive, collectively exhaustive ways firms can make, sell, lease, or broker assets. The middle Culture tier identifies explicit and tacit assumptions of the model specific to national origin that may affect the models international portability. The topmost Firm tier represents a models individual personality-specific innovations or plot twists designed to overcome competitors and/or meet unserved customer needs.

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## **ME-11 Technology Adoption - 1**

**Monday, 8/3/09, 16:00 - 17:30**

**Room: Galleria-1**

**Chair(s) Richard Albright; The Albright Strategy Group, LLC**

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## **ME-11.1 [R] The Effects of Media Characteristics on IPTV Adoption**

*Imsook Ha; Information and Communication University, Korea, South*

*Seungyun Yook; Michigan State University, United States*

This paper examines the factors that influence user adoption of IPTV. Early studies lacked comprehensive approaches to both technological and broadcasting aspects of IPTV adoption. This study therefore incorporates additional theoretical construct, user gratifications, to reflect media characteristics using the Technology Adoption Model (TAM). Although originally the TAM is believed to be more parsimonious, predictive, and robust, looking at the two key components (perceived usefulness (PU) and perceived ease of use (PEU)) of the TAM is not enough to explain user adoption of IPTV. This is because this model did not reflect the psychological perspective of media on IPTV. Therefore, to examine the effect of media characteristics on IPTV adoption, this study incorporates additional theoretical variables spanning the uses and gratifications theory rather than focusing only on the TAM. This research also examines the effect of habitual TV and Internet media use on IPTV adop-

**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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tion. Overall, the results revealed that the effect of perceived affective gratification was very important and Internet use habits can be key determinants of IPTV adoption.

## **ME-11.2 [R] Deciding to Change: An Event Sequence Analysis of Consumer Adoption Behavior**

*Brent A Zenobia; Portland State University, United States*  
*Charles M Weber; Portland State University, United States*

A qualitative empirical study explores the behavioral decision process by which transportation consumers adopt alternatives to single occupancy vehicles. The study's findings give rise to a theoretical framework that explains consumer adoption behavior in terms of interplay between three conscious, cognitively distinct processes: selecting is the process of choosing a technology in response to an immediate need; evaluating is the process of forming beliefs about a technology; maintaining is the process of determining the functional status of a technology. Selecting is a relatively simple process, but it requires the decision maker to maintain a train of thought; interrupting the selecting process requires it to be restarted from the beginning. Evaluating and maintaining constitute event-driven behavior that may be interrupted any number of times without disruption. The primary contribution of the paper is a theory of technology adoption that is solidly grounded in empirical observations and prior literature. It is the first theory to explain some of the inner mental decision processes associated with adoption, and it lays the foundation for a more comprehensive causal theory of the consumer technology adoption process.

## **ME-11.3 [R] Modeling of Price Effects for the Adoption of LCD TV**

*Bi-Huei Tsai; National Chiao Tung University, Taiwan*  
*Yiming Li; National Chiao Tung University, Taiwan*  
*Guan-Hua Lee; Industrial Technology Research Institute, Taiwan*

Liquid crystal display televisions (LCD TVs) have properties of durable and high-technological commodities. In this work, we relax the restrictive assumptions of constant internal influence in the conventional growth model for diffusion of innovation for LCD TVs worldwide. Based upon the price impact on the imitating behaviors, we incorporate the price factor into the well-known Bass model to study evolutions of the LCD TV market. Effects of innovation, imitation, price elasticity and potential market factors are systematically considered. Two different models, the Bass model and the modified one, are thus numerically solved and optimized to estimate the market dynamics of LCD TVs, where the results among the models and collected data in the past decade are compared and validated for the best accuracy. The model considering the effect of price performs better in fitness, prediction capability and parameter stability than that of the conventional one. The results of this study imply that the positive internal influence is mainly through consumers word of mouth. Previous LCD TV adopters persuade the potential ones to imitate the former in the TV transaction decisions. Our model particularly illustrates that LCD TV price reduction stimulates the successive LCD TV consumers, which indicates the significance of the modeled price effect in LCD TV adoptions. Empirical results for the past decade of data show that the 32-inch LCD TV remains the mainstream due to a largest size of potential market.

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## **ME-12 Technology Management in Automotive Industry - 2**

**Monday, 8/3/09, 16:00 - 17:30**

**Room: Galleria-2**

**Chair(s) Kiyoshi Niwa; The University of Tokyo**

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### **ME-12.1 [R] Extended Implementation of a Highly Autonomous R&D Management Model in a Japanese Electronics Company**

*Kazuhiko Itaya; University of Tokyo, Japan*  
*Kiyoshi Niwa; University of Tokyo, Japan*

In this paper, we broadly apply a highly autonomous R&D management model, which we presented in PICMET '07, to an R&D center of a Japanese electronics company and statistically analyze the effect of this model. We applied the model to as many as five groups from two divisions of this R&D center, where exploratory research is being conducted. We set up two types of teams: teams with the highly autonomous management model and those as controls, which were under the usual management. After several months of the experiment,

we analyzed the effects, using questionnaires, on the researchers' intention and tendency from diversified points of view including which management they were applied to, and which division they belonged to. As a result, it was confirmed that there were significant differences in the answers regarding the effects on the researchers' intention and tendency between the two types of teams above. It was also confirmed that this was not contingent on their attributes such as their divisions. Additionally, interviews of the group leaders were also conducted and it was suggested from the results that our model was successfully applied as a management model to promote exploratory research in a company.

### **ME-12.2 [A] The Case of Magneti Marelli Brazil: Endogenous and Exogenous Factors in Local Dominant Technology Development**

*Paulo T de Souza Nascimento; FEA - USP, Brazil*  
*Abraham S O. Yu; FEA - USP, Brazil*  
*Francisco E.B. Nigro; Escola Politécnica - USP, Brazil*  
*Robson Quinello; FEA - USP, Brazil*  
*Rosaria F S. M. Russo; FEA - USP, Brazil*  
*Nilton C Lima; FEA - USP, Brazil*

Countries and automotive companies are searching for ways to reduce vehicle dependence on oil and its environmental impacts. Hybrid engines, as well as hydrogen, natural gas, alcohol, and other fuels, have been proposed and tested as options to the currently dominant gasoline paradigm. Through a case study, this paper presents the endogenous and exogenous factors that allowed Magneti Marelli Sistemas Automotivos (Brazil) to develop a flexfuel technology architecture, launched commercially in 2003, with which customers can choose gasoline, alcohol, or any mix thereof. This software-based technological architecture is now the dominant flexfuel design in the Brazilian auto market. The main contribution of this article is thus to document the emergence of a local dominant design in a specific car sub-system. The paper describes how a local dominant technological design emerges through the sharing of capabilities and interaction among the key market players (suppliers of flexfuel technology, automakers, and alcohol producers) and the Brazilian government's Pr-Icool program. Another contribution is the tentative idea of a local dominant design/technology.

### **ME-12.3 [R] Flexible Strategic Framework for Managing Forces of Continuity and Change: A Status Study of Outbound Supply Chain Management of Automotive Industry in India**

*V K Gupta; IMT, India*

Continuity and change are the main parameters of any strategy paradigm. Traditionally, these have been treated on an either or basis. A lot of work has been done on managing continuity with incremental improvements. In the recent past, significant changes have taken place in the automotive sector in the world and India is no exception. Most of the literature has focused on strategic change and gradual transformation. However, dealing with flexibility, continuity and change has been an area of growing interest as a large number of organizations in the auto sector are faced with turbulence. This research work focuses on study of Outbound Supply Chain Management of a leading Auto Company in India and brings out how they are coping with the forces of continuity and change. A study using secondary research and primary research with a structured questionnaire survey of a number of leading automotive dealers in India was carried out to find out the exact state of outbound supply chain management of the Auto MNC operating in India. Based on this research, the aim was to develop a flexible framework for effectively managing continuity and change in managing automotive supply chains.

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## **ME-13 Technology Diffusion - 1**

**Monday, 8/3/09, 16:00 - 17:30**

**Room: Galleria-3**

**Chair(s) Jan Kwakkel; Delft University of Technology**

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### **ME-13.1 [R] National Innovative Capacity in the International Technology Diffusion: The Perspective of Network Contagion Effects**

*Hung Chun Huang; National Chi Nan University, Taiwan*

Note: [R] = Research Paper; [A] = Industry Application

# SESSIONS

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*Hsin Yu Shih; National Chi Nan University, Taiwan*

Effectively promoting national innovative capacity performance tends to be a critical policy for a country. This study examines network contagion effects on international diffusion of an embodied and disembodied technology by two different social network models: cohesion models, which are based on diffusion by direct communication, and structural equivalence models, which are based on diffusion by network position similarity. This study then utilizes the data of 42 countries from 1997 to 2002 to empirically examine their relational influences. The analytical results show international technology diffusion influences the performance of national innovative capacity through contagion effects; however, the mimetic behavior is predicted better by network position than by interactions with others. This result provides a broader consideration for science and technology policy.

## **ME-13.2 [R] Technology Diffusion with Strategy of the Technological Information of Japanese Companies**

*Satoshi Yoshida; Advanced Institute of Industrial Technology, Japan*

The processes involved in each aspect of every new product development project are structured in several ways. Areas such as design information, production control, and diffusion are adjusted by the organization to conform to the fundamental product concept. However, it is difficult to achieve this because many elements influence the system for creating the processes for developing each product. The characteristics of the industry the product comes under, the peculiarity of the organizational culture, and past successes all influence the creation system. This can make each aspect differ from the fundamental concept of the product. This paper focuses on the relationship between the fundamental concept and the diffusion of each product. It analyzes the strategy applied by some Japanese companies. The difficulty and the importance of arranging every aspect of a project are studied, and diffusion related to technological information is considered.

## **ME-13.3 [R] Exploring the Interdependencies Among Mechanisms Underlying Innovation Diffusion Dynamics**

*Gonenc Yucel; Delft University of Technology, Netherlands*

*Els C van Daalen; Delft University of Technology, Netherlands*

Understanding the dynamic nature of the innovation diffusion processes, and the mechanism underlying these dynamics, is crucial in both corporate strategy and public policy contexts. However, the dynamic complexity of the diffusion processes due to the intrinsic non-linearity and feedback relations make this a challenging task. As an attempt to develop a better comprehension, a set of basic simulation models that incorporate relevant mechanisms such as information diffusion, word-of-mouth, increasing returns due to network externalities, learning-by-doing, learning-by-using, etc. is used as experimental grounds. This paper discusses the results obtained as a result of an exploration process conducted using one of these models focusing on the information diffusion via learning processes. The model can be characterized as a dynamic internal influence model, which incorporates imperfect information on both potential adopters and adopters sides. The model is used to explore the way diffusion dynamics and learning processes interact under different scenarios related to the state of the knowledge about the innovation. Experiments reveal some conditions where these simple lead up to counterintuitive diffusion dynamics as a consequence of the interdependencies between these mechanisms. Although the study does not focus on a specific diffusion case, the results obtained from the extensive experiments provide valuable insight regarding the potential of learning and information diffusion processes in strongly influencing the overall dynamics of a diffusion process.

## **ME-13.4 [R] Windmills & CSFs for ERP-Diffusion of Technovation in Academia-Industry: A Qualitative Analysis**

*Asif M Rashid; PAF, Support Branch, Pakistan*

*Zekeriya Nas; NUML, Turkey*

*Muiz ud Din Shami; CAE, National University of S&T (NUST), Pakistan*

*Uzma R Mahmud; Innovapost Canada, Canada*

*Naila Gul; NUML, Pakistan*

*Ceylan Oklu; Trakya University Turkey, Turkey*

The enterprise resource planning (ERP) is one of the strategic considerations in any multifaceted manufacturing industry. In the past decade, globally the requirement of ERP for academia and industry has experienced exceptional augmentation. Globally, the aviation industry has adopted ERP-software packages in pursuit of competitive advantage over rival industries. The innovation in material and manufacturing management systems has altered the dynamics of the shop-floor scene. The induction of advanced manufacturing technologies, nanotechnology, composite materials and psychometric testing of highly skilled labor in a target-focused team environment has enormously enhanced the prospect from 5Ms (these 5M-resources are namely Man, Machine, Material, Money and Minute (time)). The resource management and supply chain management are becoming extremely complex and require dedicated ERP modules for better management and effective control over the industrial and financial activities through integrated business intelligence (BI) software. While most of the companies have shifted from conventional manufacturing operations to MRP supported operations, the rate of success for adaptation of ERP is far less than expectations. Hence, it has become more critical to observe the methodology for diffusion of ERP technology in a complex manufacturing industry. Conversely, in the absence of sufficient knowledge areas, the critical variables responsible for diffusion of ERP have emerged as inevitable for implementation of ERP in an industry. In the contemporary competitive global village the ERP implementation is a cumbersome process and takes years before it yields and reveals its effectiveness. A number of working principles and guidelines have already been developed in other industries and can be employed in a variety of ways in the aerospace manufacturing industry for optimum performance and to earn competitiveness through ERP suites. This paper provides critical success factors (CSFs) for diffusion of ERP knowledge areas, i.e, technovation (technological innovation), equally applicable to a multifaceted industry or an university aerospace department involved in R&D programs.

## **TA-00 PLENARY - 2**

**DATE: TUESDAY 8/4/2009**

**TIME: 08:30 - 10:00**

**ROOM: PAVILION**

**CHAIR: JON CLEMENS, PRESIDENT  
SHARP TECHNOLOGY VENTURES**

## **TA-00.1 [K] The Sustainable Knowledge Management**

*Naim Hamdia Afgan; Instituto Superior Tecnico, Portugal*

The sustainable knowledge management paradigm is a structure of characteristic indicators describing specific properties of the system. Sustainable knowledge development encompasses economic, social, and ecological perspectives of the system. It is generally defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable knowledge management comprises the tacit and explicit knowledge expressed in a form to be used as guidance in the realization of a specific task. The management is organization of the rules defined. A management system is a structured organization aimed to monitor and control performance, configuration, accounting, faults and security of the system. Elements of the organizational structure are interacting among themselves, leading to changes of the characteristic parameter of the system. A management knowledge organization is composed of three main pillars, namely: economic knowledge, social knowledge and environment knowledge. A knowledge society is based on the need for knowledge distribution, access to information and capability to transfer information into knowledge. Knowledge distribution is one of the essential requirements of a knowledge society. The demonstration of a sustainable knowledge management organization is presented in the form of agglomerated indicators defined for the specific process. The quality of the management system is an imminent property which requires a specific procedure and methodology to be measured. One of the most reliable methods is the Multi-criteria Sustainability Index measurement.

**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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## **TA-00.2 [K] Confluence of Energy, Environment and Sustainable Development**

*Ibrahim Dincer; University of Ontario Institute of Technology, Canada*

Energy is a key element of the interactions between nature and society and is considered crucial for the environment and sustainable development. Many environmental issues are caused by or relate to the production, transportation, conversion, and consumption of energy, for example, acid rain, stratospheric ozone depletion, and global warming/climate change. Recently, a variety of potential solutions ranging from renewable to hydrogen energy to the current environmental problems, particularly associated with the greenhouse gas emissions, has evolved. One thing is very true that achieving sustainable solutions to today's energy and environmental problems requires long-term planning and actions. A secure supply of energy resources is generally necessary but not sufficient for societal development. Sustainable societal development, however, requires a sustainable supply of energy resources, i.e., a secure supply that is readily and sustainably available in the long term at reasonable cost and that can be utilized for all required tasks without causing negative societal impacts. Effective and efficient utilization of energy resources and systems/processes can also contribute to sustainable development. Energy issues are particularly prevalent at present and renewable energy resources appear to provide one component of an effective sustainable solution. An understanding of the thermodynamic aspects of sustainable development can help in taking sustainable actions regarding energy. This presentation will introduce some key pillars as the main targets for current and future local and global problems, such as better efficiency, better cost effectiveness, better use of energy resources, better energy security, better environment and better sustainability, and discuss these thoroughly for implementation. It will also discuss various other key aspects, e.g., global warming, green energy, energy-utilization patterns, policy and strategy development, energetic and environmental measures, technology developments, infrastructure, alternatives, as well as life cycle assessment and its role.

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## **TB-01 SPECIAL SESSION: Engineering and Technology Management Education and Research**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Pavilion East**

**Speaker(s) Dundar F Kocaoglu; Portland State University**

**Tugrul U Daim; Portland State University**

**Jiting Yang; Portland State University**

**Ibrahim Iskin; Portland State University**

**Siriphan Lersviriyachit; Portland State University**

**Turgut Turan; Portland State University**

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Strategic issues of research and education in the Engineering & Technology Management discipline will be discussed in this session. The results of a worldwide study on educational programs and research publications will be presented. All Engineering and Technology Management educators are welcome.

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## **TB-02 Innovation Management - 2**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Pavilion West**

**Chair(s) Ron Khormaei; Logitech Corp.**

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### **TB-02.1 [A] Chief Technology Officers Views and Behaviors in the Dual Innovation Management System**

*Yasuyuki Suzuki; Japan Techno-Economics Society/Ritsumeikan Univ., Japan*

The aims of this paper are to describe the concepts of a Dual Innovation Management System, which consists of an innovation management system for dealing with existing business areas and one for creating new business areas, and make clear CTO's views and behaviors in a dual innovation management system from 13 kinds of evaluation points based on technology evaluation capabilities, management capabilities, and entrepreneurship. This discussion is based on the results of a questionnaire for 50 CTOs in large companies in Japan. Judging from the results of the questionnaires, a CTO who successfully executes dual innovation management energetically endeavors to acquire a sort of technical information

and information on the social surroundings of his or her company; considers and conducts actions based on his or her philosophy and knowledge integrating such information; and possesses strong intuitive power and insight, bolstered by such information. Moreover, he or she always shows great solicitude in nurturing human resources.

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### **TB-02.2 [R] Learning from the Customer: Identifying Changing User Needs during Product Usage through Embedded Toolkits for User Innovation**

*Frank Steiner; RWTH Aachen University, Germany*

*Refik Tarcan Tarman; Daimler Trucks North America LLC, United States*

*Jan Christoph Ihl; TIM-Group at RWTH Aachen University, Germany*

*Frank T Piller;*

*TIM-Group at RWTH Aachen University, Germany*

A main challenge in new product development (NPD) is to match a new design to customer preferences. Recent reviews show large failure rates in the commercialization of new designs. In most of the cases, the reason of failure has been not a lack of technological capability of the firm, but a wrong understanding of the customer needs and demands. One strategy that has been proposed in the literature to reduce the risk of flops in NPD is postponement. The idea of a postponement strategy is to delay a design decision until there is better information on the parameters of this decision. The idea of this paper is to investigate a new approach to reduce the NPD risk by postponing some design decisions into the customer domain. Our concept of embedded open toolkits for user innovation plans for manufacturers to design products with built-in flexibility by embedding knowledge and rules about possible product differentiations into the product. This shall enable users directly to modify a product according to their individual needs, freeing the manufacturer to perfectly acquire concrete customer needs before the product is designed. The objective of this paper is to study the feasibility of such an embedded open toolkit conceptually and experimentally. Our paper contributes to the literature by discussing the contingency factors and the tactical and strategic implications of embedded open toolkits for user innovation.

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### **TB-02.3 [R] Making Your R&D Future Proof: The Roles of Corporate Foresight in Innovation Management**

*Rene Rohrbeck; Technische Universitat Berlin, Germany*

*Hans Georg Gemunden; Technische Universitat Berlin, Germany*

In the strategic management literature it is emphasized that in order to ensure long term survival and competitiveness, companies need to develop ambidextrous capabilities. Such capabilities should enable companies to develop both incremental innovation and radical innovation. In innovation management, scholars and practitioners alike have engaged with great interest in understanding how large companies can develop radical innovation, concluding that separate organizational structures and processes need to be put in place. In this article we explore how companies use corporate foresight to enhance their ability to develop both radical and incremental innovation. Using empirical evidence from 18 case studies in multinational enterprises and over 100 interviews, we identify three roles of corporate foresight systems for innovation management: The Initiator, the Strategist and the Opponent.

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### **TB-03 TUTORIAL: Project Strategy: Evolution of a Theory**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Broadway-1**

**Speaker(s) Michael Poli; Stevens Institute of Technology**

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This tutorial is about the evolution of Project Strategy, a theory initially based on a practitioner's belief that there had to be an overarching approach to successful project management. This epic journey began when as a project team member and later as a project manager this researcher was frustrated at seeing projects fail or only achieve less than full success. To this day, how to make projects more successful is an issue of paramount importance to organizations. After starting his Ph.D. program, Dr. Poli and his advisor decided to tackle the question head-on. They settled on a topic that we named "Project Strategy." They initially collected 92 real-life project case studies which were analyzed and resulted in a number of joint research papers, some of which were presented at previous PICMET

# SESSIONS

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conferences. Eventually Dr. Poli completed his Ph.D. dissertation on Project Strategy and has since collected an additional 550 cases. Now that new research in Project Strategy is being done by others, join Dr. Poli as he relates the story of how Project Strategy started, evolved, and where it is heading.

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## **TB-04 Manufacturing Management - 3**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Broadway-2**

**Chair(s) Kathryn Stecke; University of Texas at Dallas**

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### **TB-04.1 [A] Manufacturing Technology Management to Accelerate Design For Manufacturability**

*Takehisa Seino; Toshiba Corporation, Japan*

*Satoru Honda; Toshiba Corporation, Japan*

*Toru Tanaka; Toshiba Corporation, Japan*

One of the most important issues in technology management at manufacturing companies is realizing value innovations, which create new value for customers by producing new products, systems and services. However, realizing process innovations, which improve current activities and business processes in order to produce high-quality, low-cost products with a short lead time, are as important as realizing value innovations. One of the famous methodologies for realizing process innovations is DFM (design for manufacturability). Many research studies concerning DFM have been reported from many kinds of viewpoints, such as the necessity of product design guidelines, effectiveness, IT systems and tools. However, in these research studies, technology management methods and approaches from the viewpoint of manufacturing technology were not fully discussed. In this paper, practical management methods for accelerating DFM from the viewpoint of manufacturing technology are discussed and proposed with references to actual applications, as one of the methodologies of manufacturing technology management for strengthening the competitiveness of manufacturing industries.

### **TB-04.2 [A] Lean Production for Technology Management: Increasing Production, Reducing Waste and Quality Improvement Strategies in a Plastic Bags Manufacturing Facility**

*Cory Hallam; University of Texas at San Antonio, United States*

*William T Flannery; University of Texas at San Antonio, United States*

*Shih-Chia Liu; University of Texas at San Antonio, United States*

Given the pressures generated by the global economy, the manufacturing sector is faced with the problem of continually improving production rates and quality while cutting costs. The pressures are especially keen in the smaller manufacturing plants where resources are scant, margins are small, and skilled labor is in short supply. The introduction of Programmable Logic Controllers (PLCs) in recent years has proven to be an important innovation to the production process, resulting in improved production and quality. However, any manufacturing process is subject to a large number of factors that are not necessarily sensitive to or controlled by a PLC. The application of relatively simple algorithms reflecting the complexity of a given production process is not likely. This project focused on a small manufacturer of plastic bags to identify the critical and non-critical factors of production and develop a strategy for the firm to manage those critical factors in order to improve production rates and quality while decreasing waste. This required the mapping of the production process, the identification of those elements that have the greatest impact on production rate and quality, and the development of a technology management system to monitor and control these sensitive elements. A systems dynamics model describing the production system abstract relationships was also developed as a tool for determining cost, quality, and schedule impacts and an enterprise perspective of the ROIC of the production system. The results of the project demonstrated a strategy that could achieve all three objectives for the company, namely increased productivity, quality, and reduced waste, all of which drive bottom line financial improvements, a key performance outcome in any lean enterprise.

### **TB-04.3 [R] Co-existing Environment and Economy of Manufacturing Industry in Japan**

*Tadao Sumi; Shoin University, Japan*

All manufacturing enterprises over the world today are faced with overcoming environmental barriers and financial crisis. Generally, resolution of environmental issue to manufacturing companies would be in need of additional cost and trade-off in financial aspects. Service functions and utilization of IT for manufacturing companies should be essential, providing environmental solution by co-existing environment and economy. First, this paper surveyed business models of the manufacturing industry from the past industrial age to today's information and service age. Second, three cases of study show successful achievements by a co-existing environment and economy. In case A, an excellent construction machinery company realized saving energy, productivity, cost saving and security system using global IT solution and GPS network. In case B, an integrated systems supplier expands their new business for environmental solution and carbon credit management. In case C, a total solution provider changed its direction from supplier of computer and communication products to service and solution business provider. As a conclusion, the philosophy of "good for the environment is good for the economy" will realize "win-win relations for customer, provider and society."

### **TB-04.4 [R] On Some Aspects of Developing an Effective Model for the Implementation of Six Sigma Concept in Small and Medium Sized Manufacturing Enterprises**

*Nagraj L Hiregoudar; BV Bhoomaraddi College of Engineering & Technology, India*

*Bhimasen Soragaon; BV Bhoomaraddi College of Engineering & Technology, India*

About four million industrial undertakings in India are under the small- and medium-sized enterprises (SMEs) category, and their contribution to the gross domestic product (GDP) of the nation is very much significant. However, the ever-increasing influx of foreign goods and services in the Indian market, either imported or manufactured by multi-national companies (MNCs) within India, has rendered many SMEs unviable to compete, especially in terms of cost. For survival and growth of SMEs, it has become highly imperative for them to adapt cost effective manufacturing strategies by eliminating defects from every one of the company's products, process, and business transactions. Defects or rejections from a process may be due to the human element, equipment, or material. The focus of this paper is on the human element since for most Indian SMEs the human element is an important business asset and is an important process element. A study has been undertaken of a sample of manufacturing SMEs to know which process elements, namely, human element, equipment, and material have become the cause of rejections. For this, a survey (personal interview and questionnaire) is conducted of about 73 local small manufacturing firms. The findings of the study point at the human element to be the major cause of rejections in SMEs. Based on the findings, a conceptual model is proposed for SMEs to take up Six Sigma as an improvement strategy. It is found from the existing literature that there is little focus on the issue of implementing Six Sigma in Indian SMEs and on developing an implementation model. The conceptual model of Six Sigma implementation proposed in this paper from the viewpoint of human element is believed to help most small manufacturing firms to apply Six Sigma to their business processes and enable them to compete successfully in the globalized market. The model also takes into account the necessary process aspects such as process capability.

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## **TB-05 Technology Transfer - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Broadway-3**

**Chair(s) Thien A Tran; Portland State University**

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### **TB-05.1 [A] Implementing ERP in China: Lessons from Family-Owned Chinese Enterprises**

*Hong S Woo; Middlesex University Business School, United Kingdom*

Enterprise resource planning (ERP) systems is one of the most popular organization-wide software packages to emerge in recent years, mainly because of the benefits of successful implementation that a wide range of businesses can experience. This paper adopts a case study approach to examine the ERP implementation experiences of two family-owned Chi-

# SESSIONS

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nese enterprises. Relatively new to Chinese enterprises, and not easily accepted in smaller family-owned businesses, ERP uptake is, in general, on the increase as Chinese enterprises look towards this system to help them modernise their business, and enact change in their management model. The major findings of this paper are that the success factors for ERP implementation in family-owned Chinese enterprises is fundamentally the same as that of other Chinese enterprises, provided a key champion is in place. Furthermore, the success factors are fundamentally the same as those found in Western enterprises, as long as Chinese cultural characteristics are considered.

## **TB-05.2 [R] Design and Management of an Innovative Software Enterprise: A Case Study of a Spin-Off from University**

*Petra Hockova; Masaryk University, Czech Republic*  
*Joao Falcao e Cunha; University of Porto, Portugal*  
*Zdenko Stanicek; Masaryk University, Czech Republic*

Nowadays, there is a visible shift from a product-oriented economy towards a service-oriented economy. This shift relates to a huge pressure on innovation in services and new offerings to the market. Concurrently with this shift, capabilities of IT/software tools are increasing rapidly. Such movements are opening new space in the dynamic market and are encouraging new ventures to be founded. A challenge for managers and leaders is to design processes and set/manage an internal environment that inherently supports creativity and cooperation between team members in new ventures. In this paper, we characterize a management model named INnovation&COoperation (INCO) suitable for innovative software start-ups. We propose that the management processes and leadership of such enterprises have to have six distinctive qualities to support innovation and cooperation of team members. Proposed qualities are as follows: 1) network-hierarchical organizational structure; 2) assessment function of added value; 3) context awareness; 4) equal opportunities; 5) portfolio project management and uniformity; and 6) embedded feedback. We believe that these qualities are essential for setting up a dynamic and flexible enterprise in the long-term perspective. A case study of a spin-off from Masaryk University, Czech Republic, is used to illustrate and validate this proposal in practice. This IT/software SME follows a network-hierarchical organizational structure; project team members are assigned dynamic roles and continuous feedback is provided to control and enhance collaboration and creativity.

## **TB-05.3 [R] What Makes an Academic Environment Friendly for Academic Spin-Off Creation: The Employees' View at Two Different European Universities**

*Igor Prodan; University of Ljubljana, Slovenia*  
*Alenka Slavec; University of Ljubljana, Slovenia*

The academic environment should be supportive for the establishment of academic spin-offs, which are important mechanisms for technology transfer from universities to industry. Using the sample of 377 academics from the University of Ljubljana (Slovenia) and the sample of 218 academics from the University of Cambridge (United Kingdom), this study investigates which environmental factors could, in the eyes of academics, contribute to the establishment of academic spin-offs. The studied environmental factors are related to: 1) facilities and access to research equipment, 2) process of establishing a spin-off within the university, 3) availability of venture capital, 4) seminars and workshops on entrepreneurship, 5) sources of assistance, 6) marketing skills of support staff, 7) bureaucracy of support staff, 8) technical skills of support staff, 9) inflexibility of support staff, and 10) negotiating skills of support staff. This study also investigates which environmental factors should be tackled first at the University of Ljubljana in order to catch up to the University of Cambridge in terms of having a friendly environment for academic spin-off creation.

## **TB-05.4 [R] The Role for the Government in Information Technology: The Case of Iran**

*Amir Nasser Akhavan; Amirkabir University of Technology, Iran*  
*Asghar Barezi Sabrejan; Qheshm Voltage Company, Iran*

The author believes that developing countries (DC), in particular Iran, need to urgently de-

velop a culturally appropriate national strategy if they wish information technology (IT) to have a positive impact on their overall socio-economic development. While countries like Singapore claim to have very successful national strategies, the long-term impact on the country's social development may have been overlooked. Left unchecked the technological marketplace will impose a hard-to-reverse negative role on small countries like Iran. This will make it increasingly difficult for Iran to decide its own long-term preferences for social and economic development. Put bluntly, these countries need to decide what they want from the global technology marketplace and then work out how they are going to achieve it. It is believed that hard technological determinism can only be countered by very real and well thought out national strategies. The paper argues that the national IT strategy will need to address the issues of resistance to change due to cultural, personal and infrastructure factors, be very culturally sensitive and, given the rate change of the technology, will need to be constructed as an evolving, and learning, system. The first stage in the development of such a system is to design an appropriate forum for discussion, and a well-constituted and ongoing decision-making protocol. It seems appropriate that in countries with a less than thriving technology marketplace, it is incumbent on their Government to provide a lead in this complex undertaking.

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### **TB-06 Design Issues - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Broadway-4**

**Chair(s) David Wyrick; Texas Tech University**

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#### **TB-06.1 [A] Joint Cognitive System Design and Process Control**

*Murat K Yurtseven; Yeditepe University, Turkey*  
*Walter W Buchanan; Texas A&M University, United States*  
*Melek Basak; Yeditepe University, Turkey*

The aim in this paper is to look at some important issues involved in the design of human-machine systems for process control and automation, and discuss the significance of Joint Cognitive Systems (JCS) paradigm in the design process. The discussion is presented within the framework of Cognitive Systems Engineering (CSE) in particular, and in Socio-Technical System (STS) design framework, in general. The discussion is focused on process control problems in process and manufacturing industries. As a relatively new paradigm in human-machine system design, the potential benefits offered by the JCS will be elaborated. Also, a comparative view of Design for Simplicity and Design for Complexity is provided as two alternative approaches in the JCS paradigm in relation to process control and automation. The use of decision support systems in JCS design will also be discussed briefly.

#### **TB-06.2 [R] Collaborative Architecture Framework for the Design and Manufacturing of Medical Devices**

*Celestine C Aguwa; Wayne State University, United States*  
*Leslie Monplaisir; Wayne State University, United States*

The purpose of this project is to develop a modular architecture framework for the design and manufacture of medical devices. This modular framework aims to incorporate design variables and criteria that are unique to the medical domain to facilitate reliable operation, easier maintenance, and faster product development time. Central to this research effort is the need for inputs from range of stakeholders. The specific goals for this effort are: to determine design criteria by collaborating with users and manufacturers of medical equipment and literature search; to translate user inputs to specific design targets; to develop a preliminary modular design framework using multi criteria optimization methods; to test preliminary modular architecture using a simple medical device such as a glucometer. The importance of the research with respect to its application in the medical arena can be very significant. With the product interaction with humans, both on the manufacturing level and the user level, the issue of safety is paramount. Some of the other significant contributions are in the improvement of the following: product quality and reliability; product life cycle issues; an enabler for the medical community.

#### **TB-06.3 [R] Managing Embedded Software Development in a Competitive World: A Challenge from Digital Broadcasting**

# SESSIONS

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*Valerie Thorn; University of Cambridge, United Kingdom*  
*David R Probert; University of Cambridge, United Kingdom*

Advances in sensor technology and digital signal processing have spawned innovative products in contexts as diverse as the automotive, medical and broadcast industries. These products rely on embedded software to provide enhanced functionality such as data streaming, digital to analogue conversion and display driving. In this sense embedded software can be seen as a powerful enabler for the emergence of new technologies and of the industries in which they are deployed. For technologists, the question of how best to manage the development and commercialization of the embedded software inevitably arises. Traditionally, techniques used for developing and managing software in general have also been applied to embedded software. However, this ignores certain characteristics that are unique to embedded software. In particular, it has been argued that dependencies on the physical world mean that embedded software should be treated differently. This paper explores one case from digital broadcasting and reports on the development and management methods used. The challenges faced by the managers are examined in the context of the proposed means of commercialization. The characteristics of the approaches adopted are compared against those reported in literature, and learning from this experience will be used to assist the development of methods specially tailored to embedded software.

## **TB-06.4 [R] A Design Method for Configuration and Setup of a RFID System in a Warehouse**

*King Lun Choy; The Hong Kong Polytechnic University, Hong Kong*

In this paper, a design method is proposed and aided to assist warehouse designers to form a RFID set up and configurations in a cost effective way. The proposed method incorporates the methodology of RFID experiment and mathematical model for the cost and benefit analysis of RFID set up. The proposed model is used to investigate the contribution of the RFID system under different parameters including reliability of the RFID system, tagging strategy, risk of inventory lost and value of tagged objects. With the help of the proposed method, the result can be served as indication for RFID setup in a warehouse.

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## **TB-07 Technology Management in Energy Sector - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Forum Suite**

**Chair(s) Hosein Fallah; Stevens Institute of Technology**

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### **TB-07.1 [R] Forecasting the Adoption of Emerging Energy Technologies: Managing Climate Change and Evolving Social Values**

*Kelly R Cowan; Portland State University, United States*  
*Tugrul U Daim; Portland State University, United States*  
*Wayne Wakeland; Portland State University, United States*  
*Hosein M Fallah; Stevens Institute of Technology, United States*  
*Gerald Sheble; Portland State University, United States*  
*Loren Lutzenhiser; Portland State University, United States*  
*Aaron Ingle; Portland State University, United States*  
*Robert Hammond; Portland State University, United States*  
*Matthew Nguyen; Portland State University, United States*

With the linkage between fossil fuel use and climate change now almost universally accepted, addressing greenhouse gas (GHG) emissions has become a subject of great social urgency and technological challenge. Varieties of models exist or are under development for analyzing the role of more sustainable systems, such as renewable energy technologies, in mitigating climate change. However, the direct cost of these technologies is generally higher than that of fossil fuel systems. Methods are needed to more fully account for externalities, societal impacts, and social values associated with fossil fuels versus sustainable energy systems. This paper presents a conceptual model targeted to better inform energy policy and management of energy resources to optimize for climate change. The model builds on Linstone's multiple perspective technical, organizational and personally attempting to forecast technology development along these perspectives. Thus, factors enabling faster and better adoption by consumers, and faster and efficient development by organizations, are evaluated by taking the potential technological improvements into account.

### **TB-07.2 [A] Using Patent Data to Analyze the Development of the Next Generation of Solar Cells**

*Fang-Mei Tseng; Yuan Ze University, Taiwan*  
*Yi-Wei Chu; Yuan Ze University, Taiwan*  
*Ya-Ni Peng; Yuan Ze University, Taiwan*

With the shortage of raw materials for the production of crystalline silicon solar cells, the next generation of solar cells has reached the perfect stage for development. While in the past researchers have laid emphasis on the development of crystalline silicon solar cells, the application of the next generation of crystalline silicon solar cells is different. Among the thin film solar cells, the most widely-recognized is the a-Si thin film solar cell with the greatest potential to be developed and many manufacturers have already invested in R&D. In this study, we employ the patent portfolio proposed by Ernst to embark on the analysis of technology development regarding the a-Si thin film solar cell and find that the major technology field has reached the mature stage in the technology life cycle; moreover, four patent strategic clusters are obtained. The results regarding the company level and technology level of the clusters are integrated with the profile data and the development focus to realize the patent performance, technology capacity and R&D background concerning the technological fields of the a-Si thin film solar cell and to propose patent strategies to companies.

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## **TB-08 Convergence of Technologies - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Council Suite**

**Chair(s) Antonie J Jetter; Portland State University**

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### **TB-08.1 [R] Seeing the Next iPhone Coming Your Way: How to Anticipate Converging Industries**

*Clive-Steven Curran; University of Muenster, Germany*  
*Jens Leker; University of Muenster, Germany*

The blurring of boundaries between hitherto distinct scientific disciplines, technologies or markets is a common and powerful phenomenon. Traditionally, it has been discussed in respect to telecommunications, information technologies and electronics. Subjects of this convergence often change what and where customers buy, with Apples renowned iPhone being one current example for customers tendency towards products with multiple benefits. More recently also the chemical and its related industries find themselves affected by a larger convergence process. Concentrating on developments at the outposts of the chemical industry, we discuss indications of convergence with an example from the area of Nutraceuticals and Cosmeceuticals. Furthermore, we present and discuss a multiple indicator concept for monitoring convergence in an R&D-intensive field on the basis of publicly available data. We analyze 7,455 scientific and patent references on phytoosterols with the aid of SciFinder Scholar and 3,836 documents employing STN AnaVist. Our results show clear indications for convergence and a proof of principle for our monitoring concept. A closer look at convergence and effective tools for spotting weak signals appears to be necessary. Particularly for practitioners, the opportunity to get a head start on their current and future competitors is of high strategic importance.

### **TB-08.2 [R] Managing Technological Convergence: Evidence from Printed Intelligence Industry**

*Matti Karvonen; Technology Business Research Center, Finland*  
*Matti Lehtovaara; Lappeenranta University of Technology, Finland*  
*Tuomo Kässi; Lappeenranta University of Technology, Finland*

The field of technological convergence is relatively unexplored, even though its growing impact is widely recognized. The objective of this paper is to analyze how industry convergence and technological trajectories affect the evolution of industries. The paper identifies different convergence types and utilizes the framework to analyze the evolution of printed intelligence markets and RFID markets. Research material is based on the main RFID industry players, patent data, and 12 semi-structured interviews made by the research group. RFID companies were characterized into four different clusters within the following headings: vertically integrated players, upstream focused players, downstream players,

**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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and PPI & printing companies. The results reveal that the emerging industry is in the early stages of the evolution where market dynamics is driven by complementary technological convergence. Patent and market data analysis also reveal that previously distinct technological trajectories of the industries have started to overlap and merge together to form new products based on integrated technologies. We found, however, that the process of technological convergence in the supply side does not mean market diversification. In parallel with convergence with printed, electronic and hybrid media industries, a restructuring of industries is taking place in the near future. The paper industry will have an opportunity to take a significant role in the development through technology expansion and succeeding in the complementary innovations as well as cooperation with new entrants.

## **TB-08.3 [R] Success Factors for Technology Integration Convergence Collaborations: Empirical Assessment**

*Andrei Rikkiev; Tampere University of Technology, Finland*

*Saku J Makinen; Tampere University of Technology, Finland*

Convergence is a popular term in the business environment and is especially frequently used in relation to technology integration in the ICT industry. Recent advances in electronics, digitalization of media, de-regulation of markets and changes in consumer preferences have led technologies and markets that previously followed distinct trajectories to overlap and merge. As a result, the number of product features grows, the technology base of the companies becomes more diverse, products enter adjacent markets, and markets are enlarging. To adapt to new technologies and cope with the obsolescence of current capabilities, companies are forced to acquire new competencies by means of inter-company collaborations. A dynamic environment affected by convergent technologies has specific implications for managing technology collaborations, and factors determining partnering success are different from other environments. In this paper, first we review definitions and implications of convergence in existing literature in relation to its success factors. Secondly, we select technology integration convergence type for empirical analysis. Thirdly, we outline the list of technology collaboration success factors and conduct a survey in a multinational ICT company and among its partners to rate and define the most important success factors for technology integration convergence type. Finally, we provide managerial implications for technology management in the technology integration convergence environment.

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### **TB-09 Global Issue - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Directors Suite**

**Chair(s) Ramin Neshati; Intel Corp.**

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### **TB-09.1 [R] Cross-Border Capacity Building: Selected Examples of Portland State University's Involvement in Tertiary Level Educational Reform in Vietnam**

*Gil Latz; Portland State University, United States*

*Marcus Ingle; Portland State University, United States*

*Marcia Fischer; Portland State University, United States*

This paper presents an initial case study assessment of cross-border capacity building approaches to educational reform in Vietnam. Three educational projects, connected but distinct, will be profiled, each linking Portland State University to the tertiary educational system in Vietnam. Two case studies center on the Vietnam National University, Ho Chi Minh City, and address the challenges of urban environmental education and computer science curriculum reform; the third is an effort led by Intel Corporation that links tertiary education in Vietnam to workforce development. As part of its review of the history and current status of each project, the paper assesses the challenges and opportunities inherent to each. Market forces related to globalization, industrialization and urbanization are clearly at work in each cross-border capacity building effort to reform higher education in Vietnam. Yet, the diffusion process under review represents initiatives with different definitions of educational reform, accountability standards, and measures of success.

### **TB-09.2 [R] Globalization with Guanxi for Taiwanese High-tech Industry to China: Panacea or Pandoras Box?**

Note: [R] = Research Paper; [A] = Industry Application

*Dian Yan Liou; Yu Da College of Business, Taiwan*

The importance of developing Guanxi in order to conduct business in China (and elsewhere in Asia) has been well documented. While the western concepts of networking and building strategic alliances often depend heavily on specific legal contracts, Guanxi in China depends more on face and reciprocity. This research queries whether a system of Guanxi networks has application on the considerable globalization in today's China. Interview data collected from multinational corporate business (MNCs) in Taiwan is used to assess the relevance of Guanxi for effective international operations with China from the perspective of Taiwanese expatriate managers. Provided by empirical evidence, the author claims that Guanxi utilization is heterogeneous across firms and tests the effect of Guanxi on performance, complementing findings of Yeung and Tung that Guanxi leads to higher firm performance, with a stronger impact on market expansion and sales growth than on financial returns.

### **TB-09.3 [R] Research on the Technology Level Evaluation Methodology Using a Technology Growth Model**

*Soon Cheon Byeon, KISTEP, Korea, South*

*Jiyeon Ryu, KISTEP, Korea, South*

*Seokho Son, KISTEP, Korea, South*

*Kwoung Hee Choi, KISTEP, Korea, South*

*Kiha Hwang, KISTEP, Korea, South*

*Byoung Soo Kim, KISTEP, Korea, South*

*Young Gi Kim, KISTEP, Korea, South*

It is important to evaluate exact technology level for the establishment of strategic national R&D policy. In the 2nd S&T basic plan of Korea, 90 core technologies were selected, which are important for Korea to enhance its S&T capability. As a first step to develop proper R&D strategies for these core technologies, Korean government evaluated the technology level using a different methodology and verified the effectiveness of the applied methodology.

Typically relative technology level is measured compared to the world best level. But in this research, a dynamic method was applied to evaluate exact technology level. A dynamic method applied in this research using a technology growth model measures absolute technology level relative to the possible maximum level of the technology. Also using an appropriate growth model, rate of technology growth and change in technology gap could be utilized to estimate possibilities of catching-up a technology and propose a proper R&D strategy, if any. In this paper the dynamic evaluation process and the effectiveness of this methodology with an evaluation example are described.

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### **TB-10 Technology Management in Wireless Technology - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Studio Suite**

**Chair(s) Ann-Marie J Lamb; Portland State University**

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### **TB-10.1 [A] The Study of Deploying RFID into the Steel Industry**

*La-or Kovavisaruch; NECTEC, Thailand*

*Putchapun Laochan; NECTEC, Thailand*

Steel and iron play important roles in many major industries since steel is a significant component in many forms of infrastructure. According to the statistics of the International Iron and Steel Institute (IISI), the value of the global crude steel consumption in 2006 exceeded a billion metric tons in 2006; meanwhile, the Iron and Steel institute of Thailand (ISIT) reported that steel usage in Thailand is around 16 million metric tons. However, the global economic downturn is having a severe impact on the steel sector. Currently, many steel-related industries in North America, Europe and the Middle East have slowed down; even the steel consumption in China, which is expected to be around 35 percent of the global consumption of steel, is also showing signs of slowing down. This is expected to be the down time of the market for steel. With the current economic downturn, it is necessary to reduce processing costs in order to survive. In this paper, we study the feasibility of deploying RFID in the steel industry as a tool to reduce the cost of production. In terms of the technology, it is a challenge to deploy the radio frequency in a metal environment. Furthermore, the price of the technology is still considered to be expensive compared to the

# SESSIONS

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barcode system. This paper considers all factors and identifies RFID systems that would be suitable for deployment in the steel industry.

## **TB-10.2 [A] Effects of Adaptivity and Other External Variables on Mobile Service Adoption**

*Ebru Polat; Bogazici University, Turkey*

*Nuri A Basoglu; Bogazici University, Turkey*

This paper explores user interface between user and information systems in system adoption. Acceptance of a system is defined as a function of perceived usefulness and perceived ease of use. There are several external variables that have an impact on perceived usefulness and perceived ease of use. Therefore, the content and interface design of every single application should be addressed accordingly to enhance users' intention to use the system. The paper proposes that adding adaptive features into systems may be one of the approaches to address this phenomenon. We identified external variables including adaptive behavior impacting acceptance of a mobile reservation system through three prototypes.

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## **TB-11 Technology Adoption - 2**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Galleria-1**

**Chair(s) Charles M Weber; Portland State University**

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## **TB-11.1 [A] Key Factors Driving the Success of Technology Adoption: Case Examples of ERP Adoption**

*Chonyacha Suebsin; Mahidol University, Thailand*

*Nathasit Gerdarsi; Mahidol University, Thailand*

This paper addresses the issues that impact technology adoption within an organization. Several factors influencing the technology adoption process are identified from the literature review. Case examples of the adoption of a new management technology, enterprise resource planning (ERP), are presented to illustrate the situations of technology adoption in organizations. From the case examples, the factors influencing technology adoption in organizations are consistent with the factors identified from the literature. The further discussion also reveals the additional determinants, including the clarification of project scope, individual commitment, and communication, which should be taken into consideration when an organization adopts a new technology.

## **TB-11.2 [R] Opening the Black Box of Technology Adoption: The Motive-Technology-Belief Framework**

*Brent A Zenobia; Portland State University, United States*

*Charles M Weber; Portland State University, United States*

A qualitative empirical study explores the psychological process by which transportation consumers adopt alternatives to single occupancy vehicles. The study's findings give rise to the Motive-Technology-Belief (MTB) framework, a theory that conceives of technology adoption in terms of three mental structures: motives are inner mental reasons; technologies are tools that pertain to motives; and beliefs are associations between motives and/or technologies. Their behavioral interactions are governed by three conscious processes: selecting is the process of choosing a tool in response to an immediate need; evaluating is the process of forming beliefs about tools; and maintaining is the process of determining the functional status of tools. They are augmented by five unconscious auxiliary processes: perceiving, focusing, framing, consolidating, and acting. The primary contribution of the paper is a framework for a causal adoption process theory that is solidly grounded in empirical observations and prior literature, and is well-suited to guide the construction of simulated consumer agents. The theory establishes a foundation for agent-based market simulation that gives new product development and service innovation managers improved ability to forecast emerging market conditions.

## **TB-11.3 [R] Enterprise 2.0 Readiness Index**

*Jorge Ramirez; EGADE Tecnológico de Monterrey, Mexico*

Enterprise 2.0 (E2.0) is the usage of web 2.0 practices and technologies by enterprises within a corporate context. The basic concept of E2.0 is one of end user empowerment, and

even though several authors argue that the movement of E2.0 into enterprise is inevitable, many of the enterprise managers of the enterprises have strong concerns about it. Many companies are not yet ready to E2.0. This is why it is important to have a tool that may reveal how ready companies are to exploit and get the best advantage of E2.0. The goal of this study is to identify the readiness of enterprises for E2.0 and design a measurement system for quantification. Based on the literature study a theoretical framework is proposed suggesting the underlying constructs and links between them. From this, a multiple-item scale was developed and evaluated in 30 companies from Mexico and Ecuador. The resulting findings could provide enterprises with a guideline for measuring their readiness for these technologies and from this establish strategies to meet the challenges and benefits of exploiting E2.0.

## **TB-11.4 [R] Technology Illiteracy in Retail SMEs: Exploring Late Adopters Characteristics**

*Victoria E Erosa; Universidad Autonoma de Tamaulipas, Mexico*

In the first decade of the 21st Century, technology use in all types of business is taken for granted. This is not necessarily true in some developing countries where small retail businesses (SME) are the source of employment for more than one third of their population. For some of this business, technology adoption is not only a matter of financial resources availability, but a matter of competencies as well. As the competitive environment in the retail industry turns more aggressive and integrative practices of supply chain management are growing, there is an important segment of SMEs that has not absorbed yet a fundamental change: they are still illiterate in terms of technology use. In spite of the vulnerability present on the air for these firms, and the fact that they are high distribution cost consumers for some highly technology based suppliers, customers are still walking into this type of store. In order to gain understanding of the technology late adopters characteristics, a research project was conducted with around 200 participant firms in a border state of Mexico with the USA. Results reveal a wide spectrum of technology illiteracy in the retail segment that includes Pop & Mom stores, independent pharmacies, flower shops, wine shops, hardware stores, beauty parlors and apparel stores. An interesting issue emerges from the results in a form of a contradiction because in this technology illiteracy context, the micro store owners have a positive attitude as in the theoretical concepts of technology perceived usefulness and technology ease of use. An additional phenomenon is identified in this business context in which technology is not considered an attraction factor to develop customers' preferences for micro and small independent stores.

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## **TB-12 Productivity Management - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Galleria-2**

**Chair(s) Richard M Franza; Kennesaw State University**

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## **TB-12.1 [R] An Implementation Model for Six Sigma Programs**

*Richard M Franza; Kennesaw State University, United States*

*Satya S Chakravorty; Kennesaw State University, United States*

Despite the pervasiveness of Six Sigma programs, there is a rising concern regarding implementation failures. One reason many of these implementations fail is because rigorous research is lacking on how to effectively guide implementation. Using a successful Six Sigma program in a network technology company as a case study, this research develops a six-step implementation model. The first step is to perform market-driven strategic analysis. The second is to establish a cross-functional team to drive the initiative. The third step is to identify overall improvement tools. The fourth is to perform process mapping and prioritize improvement opportunities. The fifth step is to develop a detailed plan for low-level improvement teams, and the final step is to implement, document, and revise as needed. We identify key managerial implications of our implementation experience and provide several directions for future research.

## **TB-12.2 [A] Measuring the Management Efficiency of Korean 3PL Providers with Financial Measurements**

*Bunghak Leem; Pusan University of Foreign Studies, Korea, South*

# SESSIONS

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*Sangwon Yi; Incheon Logistics Research Society, Korea, South*

The objective of this study is to measure relative efficiencies of 3PL providers with financial statements and benchmarking analysis. It also suggested a three-level DEA model to measure management efficiencies precisely. This paper used such factors including the number of employees, operating expenses, fixed assets, liabilities and capitals, net profits, earning per share, sales, corporate values, and returns on investments (ROI). After analyzing technical and scale efficiencies of third party logistics companies in each level and using linkage of two levels, it put them one by one in one of four categories, called Star, Dog, Cow and Sleeper. And it found out which one is the financial weak points of Korean logistics providers which do not belong to Star and what they should do to move into the realm of Star.

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## **TB-13 Supply Chain Management - 1**

**Tuesday, 8/4/09, 10:30 - 12:00**

**Room: Galleria-3**

**Chair(s) Gulgun Kayakutlu; Istanbul Commerce University**

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### **TB-13.1 [R] Exploring the Effect of Vendor Managed Inventory on the Supply Chain Partner Using Simulation**

*Siri-on Setamanit; Chulalongkorn University, Thailand*

To manage a supply chain efficiently and effectively, the members of the supply chain should collaborate and cooperate. It is known that information sharing and visibility are important factors that contribute to supply chain coordination. The visibility in real customer demand can help reduce the bullwhip effect, improve customer service, and reduce costs. Vendor managed inventory (VMI) is an approach that allows suppliers/vendors to access their customer's inventory and demand information. The benefits of VMI have been reported in many studies. However, the gain that each member of the supply chain realizes could be different. Some studies show that upstream members benefit more than the downstream ones, while some studies show the opposite results. Therefore, some members of the supply chain are still reluctant to adopt the VMI practice since they are not sure whether the benefits gained will justify the costs incurred. In this paper, a simulation model is used to explore the effect of VMI implementation on supply chain costs both at the system-wide level and at the member level. It was found that VMI helps reduce total supply chain costs. However, the level of cost reduction differs significantly among members depending on the types of implementations. As a result, it is important to establish the level of investment required and benefit shared for each member before implementing VMI. The members that may experience less cost reduction should be offered higher benefit share (or require less investment). Otherwise, the whole supply chain may lose the opportunity to gain additional benefits from implementing VMI. In addition, the benefits gained from VMI also vary depending on the supply chain environment. The simulation model can be used as a guiding tool for establishing an appropriate investment and benefits sharing structure for VMI implementation in different supply chain conditions.

### **TB-13.2 [R] Supply Chain Contingencies: Up-stream Directives' Effect on Suppliers Performance**

*Ricarda B Bouncken; University of Greifswald, Germany*

*Viviane A Winkler; University of Greifswald, Germany*

Supply chain management is set up to increase value at less cost to the supply chain as a whole by improved up- and downstream coordination. When improving upstream seamless fit, manufacturers exert precepts such as objectives, orders, and guidelines related to technology, design, interfaces, and product logics to their suppliers. We refer to formal precepts as upstream directives. Through the definition and contracting of upstream directives, manufacturers coordinate each supplier's and sub-supplier's contributions more easily and re-integrate information from downstream supply chains. However, there is a research gap so far on up-stream directives and their performance effects. The results of our empirical study in the IT industry show that upstream directives are more strongly experienced in environments of high uncertainty. Moreover, the deliberate planning is a performance increasing vehicle in lower uncertainty conditions. Emergent planning only improves

performance under high uncertainty but is only slightly influenced by upstream directives.

### **TB-13.3 [A] Logistics Service Provider as a Business Growth Raiser of Small and Medium Sized Companies**

*Ari Happonen; Lappeenranta University of Technology, Finland*

*Erno Salmela; Lappeenranta University of Technology, Finland*

This study focuses on a company network that develops, produces, markets, sells and delivers windmills for consumers. The hub company of the network has concentrated on R&D and marketing, and its subcontractors and logistics service provider performs other functions. The company had outsourced exclusively of its operational and tactical level operations and its ICT systems (e.g. financial administration, logistics operations and item assembly set management systems) and support processes for logistics operators' responsibility. This study examined this network business model, focusing on operator supported ICT and functional solutions for total management of the supply chain. The service model provided by the logistics operator is considered quite a new concept in the field of high tech industries in Finland. The research was conducted as a qualitative study of one case. The study revealed new operational, business arrangements and financial aspects, which are administered by the operators that have been traditionally kept inside organization. This new model can give a small company a completely new potential to grow rapidly as part of traditional financial limitations do not apply to this case. The case is considered a good example of how high tech industry is not limited to only large size companies and how it is possible for a small company to grow with the logistics operator and subcontractors. The operator was identified as an enabler of growth and a demand and supply chain synchronizer.

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## **TD-01 TUTORIAL: The Magic of Six: Six Technology Management Activities and Six Tools - Part I**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Pavilion East**

**Speaker(s) Dilek Cetindamar; Sabanci University**

**Robert Phaal; University of Cambridge**

**David Probert; University of Cambridge**

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Technological changes are continuously creating new challenges and opportunities for new product, service, process and organizational development. However, these opportunities need to be captured and converted into value through effective and dynamic technology management (TM). This requires a new way of understanding TM that captures its dynamic nature as well as managerial aspects. In this workshop, a new TM framework will be presented. This model is based on the dynamic capabilities theory, emphasizing the development and exploitation of technological capabilities that are changing on an ongoing base. The dynamic capabilities theory is not primarily concerned with fixed assets, but rather aims to explain the way in which a firm allocates resources for innovation over time, how it generates and deploys its existing resources, and where it obtains new resources. This is highly relevant for developing an approach to TM that can explain how combinations of resources and processes can be developed, deployed and protected for each TM activity. Therefore, the workshop will first introduce a comprehensive process model that includes SIX specific TM activities: identification, selection, acquisition, exploitation, protection, and learning. We argue that the process of TM is essentially generic, although organization and/or market-specific factors will constrain choices and actions. Then, the tutorial will provide descriptions of SIX major TM tools and techniques that are useful to carry out TM activities: patent analysis, portfolio management, roadmapping, S-curve, S-curve, stage-gate, and value analysis. Again, even though it is difficult to delineate tools, we select key tools that are the prevailing ones across TM processes and help to capture internal and external dynamics. The workshop will present cases from the journal Research-Technology Management that is the highly respected practice journal in the field of TM.

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## **TD-02 Innovation Management - 3**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Pavilion West**

**Chair(s) Hongyi Chen; University of Minnesota Duluth**

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**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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## **TD-02.1 [R] Exploring the Impact of Lean Management on Innovation Capability**

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

Lean management and innovation are two driving forces of today's business success. However, with fundamentally different concepts, some aspects of lean management may negatively affect a company's capability to be successful with certain types of innovations. This paper develops a framework to analyze such impacts. With comparisons between the lean culture, lean design, lean supply chain management and lean human resource management with the characteristics and contributing factors of different types of innovations, five propositions are presented. Each proposition can be tested through several hypothesis tests in future work. In addition, different strategies for a company to achieve the balance and maintain lean and innovation at the same time are also discussed. Advantages, disadvantages, and suitable situations for each strategy are analyzed.

## **TD-02.2 [R] The Innovation Profiles of Outstanding Companies in Taiwan**

*Celine Mei-Ya Wang; Shih Hsin University, Taiwan*  
*Ju-Miao Yen; TIM, NCCU, Taiwan*  
*Yi-Wen Chen; TIM, NCCU, Taiwan*

In this new century, people all realize how important a role innovation plays in competitiveness and pay close attention to capture it. In the 1990s, European academia built up a consensus on the definition and measurement of innovation and promoted the Community Innovation Surveys (CIS) in several western countries to capture the firm-level data about innovation. However, different from most innovation surveys which mainly try to gather the whole innovation picture in some industry or country, we outline the specific innovation profiles of outstanding companies to offer a benchmark effect in this study. Based on the most updated CIS4 questionnaire, this study chose the nominated companies of Taiwan Industrial Technology Advancement Awards as samples, and a total of 61 responses were collected. The results show that these outstanding companies pursue an obviously higher frequency in adopting multiple innovations. Organizational, marketing and strategic innovations also bring significant benefits to performance. On the other side, when these outstanding companies are urged to enhance their innovation capability, they choose to invest in R&D by themselves and centralize in Taiwan instead of cooperating with outside resources. Internationalization and open innovation are contemporary world trends. It might be a warning for Taiwan's government and industry to note.

## **TD-02.3 [R] Rethinking the Obvious: Two Cases on How Ethnographic Research Enhances New Product Development in the Context of B2B and B2C Customer Integration**

*Annika Schroeder; Deutsche Telekom Laboratories, Germany*  
*Fee Steinhoff; Deutsche Telekom Laboratories, Germany*

This article addresses how ethnographic research tools can 1) support customer integration into new product development and 2) foster the identification of latent needs in order to develop new ideas in technology oriented businesses. It is widely acknowledged that users are important actors in innovation projects. Going beyond traditional market research and integrating the customer directly into the innovation process is suggested to be an important measure for market-oriented innovation management. In particular, this paper reports on research in the context of innovation management, especially using ethnographic approaches. The cases presented will illustrate the realization of ethnographic approaches in the business-to-business market. Within innovation market research at Deutsche Telekom Laboratories, cross-functional teams engage in such studies. Within this case, observers followed heavy users for mobile email in the business context. They documented their usual workweek and their user behavior with mobile email applications in order to understand usage habits as well as usage barriers. The article will provide a praxis oriented overview on the application of ethnographic research as a tool of customer integration in innovation management of Deutsche Telekom Laboratories and the adaptation of new methodological approaches according to specific research settings.

## **TD-02.4 [R] Planning and Identification of Marketable Technology from the Research Area**

*Fernando A Kohrs; Instituto de Investigaciones Electricas, Mexico*

Many research institutes in the world have experienced the commercialization of their developed technologies. Approaches and contexts vary from place to place depending on their technological level and type, the kind of institute and especially depending on the long-term goals they pursue. This presentation expresses the importance of the technology marketing process in research and development institutes, the identification of success factors, strategies & variables, as a case study presents an analysis of the technology commercialization experience at the Electrical Research Institute (Mexico).

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## **TD-03 Project / Program Management - 2**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Broadway-1**

**Chair(s) Matthew J Liberatore; Villanova University**

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## **TD-03.1 [R] Project Control and Risk Management for Project Success: A South African Case Study**

*Ronald Mudau; University of Pretoria, South Africa*  
*Leon Pretorius; University of Pretoria, South Africa*

The objective of the paper is to assess the extent to which project control and risk management contribute to and can be used effectively in ensuring project success and identify the factors that contribute to project success. This research is a qualitative study in which descriptive methods were strongly used. The data for the empirical part was collected by means of a questionnaire. Engineering, project management and project controls departments were involved in the survey. A total of 67 completed questionnaires were obtained. The results of the questionnaires were processed and analyzed by using a spreadsheet application. The main findings indicated that project controlling and risk management have a significant influence on performance of a project and, therefore, on the success of the company. It was also found that effective earned value management contributes positively to the project success. By strengthening and focusing more on project controlling and risk management methods and processes, the performance of projects should improve.

## **TD-03.2 [R] Strategic Issues in Global R&D Projects**

*Hans J Thamhain; Bentley University, United States*  
*Marcos R Piscopo; Bentley University, United States*

The internationalization of Research and Development (R&D) has been extensively studied from an economical, industrial, and organizational perspective. However, at the R&D project level little has been reported in the literature. This paper presents the findings of a study of strategic issues and their influence on R&D project performance in transnational companies headquartered in Brazil or the US. The paper suggests that changes in our business environment have led to more multinational R&D programs with implications for organizational process, leadership and business strategy. We identified five major shifts in R&D-based business environment that affect project planning and execution, and the way people work in teams. These paradigm shifts must be understood for managing and leading R&D organizations effectively, and for defining appropriate policy guidelines for aligning the R&D projects appropriately with the overall enterprise strategy. Further, the results suggest a need for structuring management processes that deal with these changes and strategic issues. A better understanding of the dynamics and degree to which these issues impact project performance should help managers in fine-tuning their business processes, support systems and management styles to achieve increased resource effectiveness and competitiveness.

## **TD-03.3 [A] Information Technology in Using Project Management Methodologies**

*Kirit Patel; Middlesex University, United Kingdom*

The increasing role of project management methodologies in managing large or small projects remains a key challenge for many organizations. In the UK, PRINCE2 is the most used

# SESSIONS

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methodology. Its use is prolific in the private and public sectors, while the voluntary sector has yet to catch up. Like most methodologies it offers a set of procedures and guidance on how to implement it to manage projects. However, like many such methodologies it offers little guidance in the way information technology (IT) can be utilized to fully exploit its implementation to manage projects. This paper analyzes the issues in IT when using project management methodologies to deliver projects. The key issues in managing at strategic and operational levels within these methodologies will be analyzed. Is there a link between having an organizational strategy to manage technologies and its effectiveness within adopted project management methodologies? How is IT managed within the different phases of the project lifecycle when using these types of methodologies? What are the critical success factors which inform the effective management of technology here and are there any inhibiting factors? A case study approach will be used to examine all the above issues.

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## **TD-04 Technology Management in Service Sector - 1**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Broadway-2**

**Chair(s) Antonie J Jetter; Portland State University**

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### **TD-04.1 [R] Innovators, Performers and the Economic Sectors: Technology Management Implications**

*Daniel Berg; Rensselaer Polytechnic Institute, United States*

*Norman G Einspruch; University of Miami, United States*

Data surface mining was applied in a further analysis of previously published data on The Worlds 50 Most Innovative Companies and The Best Fifty Performers to ascertain the relative presence of the goods and services sectors and the overlap of the two data sets. Earlier data sets, previously analyzed, were examined to determine the persistence of listed companies. In addition, the issues of technology management in the services sector, an academically neglected area, are examined.

### **TD-04.2 [R] Multidisciplinary Framework-Based Service Modeling Applied to Service Coursework and Business Planner Interaction**

*Kotaro Nakamura; Japan Advanced Institute of Science and Technology, Japan*

*Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan*

Launching new high-value-added services calls for systematic methodologies based on multidisciplinary framework enabling the transformation from service concept to real service. The collaboration of business planners from various kinds of service and the sharing and assignment among individuals/organization, goods/infrastructure, technology/system require the establishment of a common framework and service modeling approaches based on multidisciplinary studies. The present paper applies the service modeling approach proposed by the authors to service coursework for undergraduate, graduate and post-graduate carrier-track students from some universities. The analysis of planning process and results demonstrate the potential for application to various service areas. The authors interviewed key service planners in real IT service businesses, with a focus on the service modeling processes and their results. The interviews confirmed the potential for application to actual service planning and provided leads for refining the service modeling approach.

### **TD-04.3 [A] New Service Development: Linking Resources, Processes, and the Customer**

*Marisa H Reinoso; Portland State University, United States*

*Siriphan Lersviriyajitt; Portland State University, United States*

*Nausheen Khan; Portland State University, United States*

*Woraruthai Choothian; Portland State University, United States*

*Phuwadet Laosiripornwattana; Portland State University, United States*

New service concepts are at the heart of success, and the process can be optimized by implementing new service development (NSD) models. NSD models are rarely used in practice, however. Many companies use historically successful new product development (NPD) models to develop services, and ultimately ignore the challenges and opportunities specific to services. The objective of this research paper is to determine the key success variables of an NSD model. Several NSD models are reviewed to mine the key traits of a successful NSD

model. After a comprehensive literature review, three hypotheses proposed in the paper are: a well-structured NSD model is necessary for the success of a new service; resources should be given equal attention to the processes involved in a NSD model; and customer involvement is a vital component of the NSD model. Finally, an extended NSD model is proposed, one which is based on Froehle and Roth's work. This extended model integrates the resource and process oriented practices of NSD with a new customer dimension. We show how this model can be applied, using the airline industry as an example.

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## **TD-05 Technology Transfer - 2**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Broadway-3**

**Chair(s) Hong S Woo; Middlesex University Business School**

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### **TD-05.1 [R] Technology Licensing Contracts and Private Information**

*Shinji Kobayashi; Nihon University, Japan*

*Shigemi Ohba; Nihon University, Japan*

This paper examines technology licensing contracts under both adverse selection and moral hazard. We characterize the optimal licensing contract for the model in which the licensee has private information on demand and can exert efforts to increase the probability of having high demand. Specifically, we analyze a contract game in which first, a patent holding laboratory offers a licensing contract to the firm, and then the firm determines an effort to increase the probability of having high demand and finally the state is realized. We show that for the inefficient type of the firm, the second-best output is lower than lower the first-best and that the second-best effort level is lower the first-best. We also discuss fixed fee and two part tariff contracts. Furthermore we examine a setting in which the limited liability constraints can depend on the licensee's type and demonstrate that countervailing incentives can arise.

### **TD-05.2 [R] Literature Review on Technology Transfer from Government Laboratories to Industry**

*Thien A Tran; Portland State University, United States*

*Dundar F Kocaoglu; Portland State University, United States*

Technology transfer is a broad field that ranges from internal corporate technology transfer to international technology transfer. While technology transfer among corporations and between universities and companies has been well documented, technology transfer from government owned R&D institutions to the private sector has not. Governments throughout the world are spending more and more of their national budgets on R&D with the goal to enhance national competitiveness and develop their economies. With increasing global competition, governments in both developed and developing countries place more emphasis on public R&D investments. Nevertheless, the question of how to translate this enormous public spending to the achievement of the countrys economic goals is still not answered adequately and thus requires more investigation. A thorough review of the literature is the first step needed to gain an overall picture of the research done in this field. It also helps highlight many of the research gaps that remain to be filled by future work.

### **TD-05.3 [R] Analysis of the Factors to Affect Technology Transfer Fee in the Intellectual Property Management**

*JungWook Byun; Sungkyunkwan University, Korea, South*

*YunBae Kim; Sungkyunkwan University, Korea, South*

*ByungChol Lee; Sungkyunkwan University, Korea, South*

*Bodum Choi; Sungkyunkwan University, Korea, South*

*Chanmin Park; Sungkyunkwan University, Korea, South*

In the knowledge-based global economy, securing technologies through investment in technology innovation is essential in order to gain more sustainable competitive advantage. R&D activities required for such a purpose may be recognized when they can result in economic value ultimately. This study focuses on the revenue from technology transfer as an achievement of national R&D projects and develops an intellectual property management index to measure such revenue. In this regard, not only intellectual property management activities at the laboratory level but also the characteristics of the subject as well as sup-

# SESSIONS

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ports from research institutes have an important role in improvement of investment efficiency of national R&D projects.

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## TD-06 Software Process Management - 1

Tuesday, 8/4/09, 14:00 - 15:30

Room: Broadway-4

Chair(s) Siri-on Setamanit; Chulalongkorn University

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### TD-06.1 [R] The Key Barriers for Global Software Product Development Organizations

*Najmul Huda; Tallinn Technical University, Estonia*

*Nazmun Nahar; University of Jyväskylä, Finland*

*Jaak Tepandi; Tallinn Technical University, Estonia*

*Prosenjit S Deo; S.N. Bose National Centre for Basic Sciences, India*

Increasingly, software products development companies are attempting to make the transition from traditional centralized local development to global development. This transition is taking place due to intense competition, availability of high quality and low cost software professionals in various countries, and the advent of communication and information technologies to link the disperse groups. Due to a significant lack of research on global software product (GSP) development organization by using an adhoc global project organization, companies are commonly attempting to develop standardized software products. In making the transition from local development of software product to global development, developers are facing great difficulties in setting up an appropriate GSP development organization and executing GSP development. Most of the companies are not obtaining the expected benefits for their GSP development efforts, and some of them are failing completely. The research was carried out by reviewing literature and conducting a multiple case study. This study introduces a GSP development organization and identifies the key barriers that are encountered by the GSP development organization. The research will guide companies that are involved in the development of GSP to implement appropriate organizations, to avoid the challenges and to achieve the GSP goals. This research also suggests future research directions.

### TD-06.2 [R] An Approach to Characterize a Software Process

*Markus Suula; Tampere University of Technology, Finland*

*Timo K Mäkinen; Tampere University of Technology, Finland*

*Timo K Varkoi; Tampere University of Technology, Finland*

Process improvement is a cyclic activity consisting of several phases. According to the Quality Improvement Paradigm, the first phase is characterization. This paper presents a developed methodology for characterizing a software process. The methods include software process assessment and modeling. Using an assessment driven process modeling methodology we can create a descriptive model that characterizes the current process, and a prescriptive model containing improvement suggestions. The selected processes are reviewed and the process components are gathered according to a software engineering process meta-model. The SPICE assessment model is utilized in process reviews. In a case study the methodology is applied to characterize the software process of a small enterprise. The current process is defined and its process capability and product quality are determined. The enterprises process guide, the produced work products and the projects workload are analyzed. This paper reports the experiences of using the methodology and presents a way to analyze the implications caused by the differences between the existing process guidance and the actually implemented process.

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## TD-07 R&D Management - 1

Tuesday, 8/4/09, 14:00 - 15:30

Room: Forum Suite

Chair(s) Jeff Butler; University of Manchester

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### TD-07.1 [A] In-depth Evaluation of Horizontal Genomics R&D Programs in Korea.

*Seung Jun Yoo; KISTEP, Korea, South*

*Seongjin Kim; KISTEP, Korea, South*

*Boojong Kil; KISTEP, Korea, South*

In the present study, the authors performed an in-depth evaluation of the horizontal genomics R&D programs carried out by five ministries (MEST, MW, MLTM, RDA, KFDA) as a way of R&D program (or technology) management. In the evaluation, they focused on three evaluation aspects: 1) relevance, 2) efficiency (or cost-effectiveness), and 3) success (or goal achievement) after designing a logic model, which was complemented with cause and effect map using the system dynamics concept to show a better relationship between R&D activity and its performance/impact. First, we evaluated relevance issue as follows: investment portfolio analysis by 2 x 2 matrix based on market uncertainty, technology risk (or difficulty), technology level, commercialization possibility, etc. Second, we evaluated the efficiency issue as follows: quantitative analysis of SCI papers and patents derived from public R&D investment and qualitative analyses of SCI paper using impact factor (IF) and citation index and of patents using citation index and patent value assessment. Lastly, we evaluated the success issue by addressing the achievement of the final goal of each R&D program and by suggesting a guide to achieve the goals. Taken together, we suggested the efficient program delivery alternatives and guideline to budget allocation, according to the long-term aspects of genomics R&D and current status of R&D capability.

### TD-07.2 [A] Competing for Public Research Funding: A Strategic Approach for the Institute of Advanced Studies at the Brazilian Aerospace Technology Center

*Ligia Maria S. Urbina; Aeronautical Institute of Technology - ITA, Brazil*

*Wilson J Vieira; Institute for Advanced Studies, Brazil*

Since the last decade, budget constraint problems led the Brazilian government to establish a new approach to financing research, development and innovation (R&D&I). It created public funds, which are designed either to promote specific sectors or to finance the development of a broader spectrum of R&D&I. This new approach for funding has stimulated a healthy competition among research institutions. In this context, public research institutions must develop a strategy that strengthens their abilities to compete with sustainable advantages in this new financial resources market. Thus, the main objective of this paper is to propose a strategic approach to planning the attraction of these public resources for the case of the Institute for Advanced Studies, a public Brazilian aerospace research center. At first, it is argued that the financing strategy adopted by the Institute has to be aligned to the main institutional strategic planning and has to help to implement the strategic R&D&I project portfolio. Additionally, it is discussed that the competition strategy for public research funding should be mission-oriented, focusing on those funds that allow implementation of strategic projects while supporting the development of the Institutes core competencies, by improving internal competencies, and by building partnerships with other research centers.

### TD-07.3 [A] Functioning of Strategic Decision Making Systems: Case Study of an R&D Organization in India

*Santanu Roy; Institute of Management Technology (IMT), India*

*Sunita S Upadhyaya; Schneider Electric, United States*

Strategic decision-making bodies and systems are supposed to provide strategic guidance to an enterprise. Although theorists have recognized the strategic importance of organizational learning as a means of providing a sustainable competitive advantage, case studies from the perspective of strategic renewal have been few. The present study looks into the issue of strategic renewal of laboratories functioning under the Council of Scientific and Industrial Research (CSIR), India, a publicly funded R&D system, in terms of strategic vision and strategic involvement of the Research Councils of these laboratories while serving as their advisory and regulatory bodies in all matters pertaining to their R&D activities. It aims to investigate the functioning of Research Councils of five CSIR laboratories located in different parts of India and working on different thrust areas of research with reference to the functions and powers envisaged for these bodies in the CSIR bylaws. The results of the examination into the role of the Research Councils in fostering organizational learning and in guiding strategic renewal of CSIR laboratories working in different functional areas have significant implications for management of such publicly funded laboratories in India

# SESSIONS

as well as other nations.

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## TD-08 People and Organizations - 2

Tuesday, 8/4/09, 14:00 - 15:30

Room: Council Suite

Chair(s) Kunio Shirahada; Japan Advanced Institute of Science and Technology

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### TD-08.1 [R] Virtual Engineering Design Teams: A Cost Analysis Perspective

Adji Cisse; Texas Tech University, United States

David Wyrick; Texas Tech University, United States

Virtual worlds, such as Second Life, are gradually evolving as common business practices. Some companies, e.g. IBM, use the medium to conduct meetings and others, e.g. Nissan, use its 3D design capabilities to build prototypes. Virtual engineering teams may be dominant in a future where globalization and competitiveness will require faster and more international team settings. This rise will be facilitated by the gradual ascendance of digital natives into the workforce, along with advances in technology. Research on virtual teams has concentrated mainly on the technological, management, and cultural aspects. However, very little, if any, research has concentrated on the economic aspect. Cost is one of main drivers for the progressive switch to virtual teams; it accounts for a majority of the reasons for companies developing virtual teams. Despite that, research on virtual engineering teams has rarely focused on cost. This preliminary investigation will look at life cycle costing of virtual teams. A cost structure and categorization will be developed and a framework for life cycle costing of virtual teams will be elaborated.

### TD-08.2 [R] Team Psychological Empowerment as a Mediator of the Relationship between Transformational Leadership, Team Effectiveness and Innovation: Moderating Effect of Team Task Interdependence

Linda Lin; Kun Shan University, Taiwan

Nowadays, transformational leadership has been rated as the most effective leadership behavior in this changeable industry environment. It can promote members involvement or commitment. Moreover, the importance of transformational leadership can even encourage the followers to achieve higher achievements goals. Numerous studies have found transformational leadership to be positively associated with subordinate performance at the individual and organizational levels of analysis, and research is accumulating on factors that mediate the relationship between transformational leadership and performance (Conger, 1999; Judge & Piccolo, 2004). Thus, psychological empowerment could be among the most important characteristics of the relationship between transformational leadership, team performance and innovation. The purpose of this research is an attempt to look at how transformational leaders influence team effectiveness and innovation by focusing on team psychological empowerment. Specifically, this research will explore the moderating role of collectivism on the relationship between transformational leadership, followers effectiveness and innovation.

### TD-08.3 [R] Organizational Memory Versus a Possible Unplugged IT: Case Research from a Textile Commodity Chain

Jose Manuel M Cardenas; University of Sao Paulo, Brazil

Ana Villanueva; University of Sao Paulo, Brazil

Mauro M Spinola; University of Sao Paulo, Brazil

Nowadays, information technology is used for storage of information generated around organizations, but in a dyadic view, it is also considered to be a support tool for knowledge transfer activities and a facilitator when knowledge diffusion is necessary. All this is comprised in a conceptual organizational memory that includes a human component whose behavior is the key to success in enhancing this memory creation process. Nevertheless, within the organizations, relationships create learning per se, but it is so difficult to understand how the process happens. Thus, the difficulty to explain: a) the manner of management of memories embedded into peoples minds, and b) the capability to link themselves with other factors. This paper shows a case research about

governance through a Peruvian textile commodity chain, trying to explain a strategic behavior in keeping governance within an environment called unplugged IT where the most important knowledge is about what the technology cannot do. The discovery includes new insights with regard to our perception about information technology as a knowledge management tool and describes the existence of knowledge flows from the eventuality of being unsupported by it.

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## TD-09 Collaborations in Technology Management - 1

Tuesday, 8/4/09, 14:00 - 15:30

Room: Directors Suite

Chair(s) Jisun Kim; Portland State University

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### TD-09.1 [A] Changing the Rules of the Game for Future Agriculture, the University Innovation Centre (UIC) Model

Bruce D Grieve; University of Manchester, United Kingdom

Mike Bushell; Syngenta Plc, United Kingdom

Mike Lant; Syngenta Plc, United Kingdom

Luke Georghiou; University of Manchester, United Kingdom

Khaleel Malik; University of Manchester, United Kingdom

The increasing demands placed on sustainable food, feed and fuel production from world population growth and climate change are driving the need for improved agricultural productivity from the limited fertile land-bank and natural resources. The open innovation concept offers opportunities to swiftly create novel products, services and techniques which can deliver a paradigm shift in farming practice and food supply management. To identify and realise these new agricultural approaches requires the integration of an in-depth understanding of future customer needs (potential market pull) alongside a knowledge of emerging technological possibilities arising from parallel industrial and non-agri research sectors (potential technology push). This paper describes a three-year process undertaken by the science led agribusiness, Syngenta Plc, in partnership with the University of Manchester, UK, which has culminated in the University Innovation Centre (UIC) concept. This is exemplified through a case study based upon the first of these UICs, which addresses the introduction of sensors and informatics into agriculture (agri-electronics). The paper covers the consolidation in the agri-industry which has laid the foundation for the UICs, the rationale for selecting agri-electronics as a strategic enabling technology, the mechanism applied for landscaping the business opportunities that it may offer across a 15-year horizon, the learning drawn from academic partnering models exploited by unrelated business sectors, and the adaptation of these concepts into the current framework agreement between the university, company and other potential third parties.

### TD-09.2 [R] The Formation and Performance of University Technological Collaboration: A Case of National Science and Technology Program for Telecommunication in Taiwan

Chien-Tzu Tsai; FengChia University, Taiwan

Wan-Fen Liao; FengChia University/WuFeng Institute of Technology, Taiwan

University is considered as a critical actor to drive and to nurture a knowledge and technology network. In the open innovation trend, the formation of network and its performance get more attention by researchers. This paper explores how universities form a technological network and contribute to technological development. Addressing a social network analysis (SNA) perspective, this paper proposes that an organization's technological capacity is highly related to its network position. The data analyzed in this paper includes 963 collaborative research plans from a telecommunication project sponsored by National Science Councils in Taiwan from 1998 to 2007. There are 88 nationwide educational departments participating in this project. Their publications and patents are accumulated as performance indicators. The measurement from SNA, degree centrality and betweenness, are taken as variables. Four of the findings are: first, the geographic effect on network formation is less. Next, an organization plays an intermediate in research collaboration would be likely to gain more funding. Then, an organization performs better while it takes an active approach to collaboration. Last, the collaborative research in universities is academic oriented. The gap of transformation publications into patents needs more attention to make up.

# SESSIONS

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## **TD-09.3 [R] The Role and Dynamic Development of Innomediaries in Open Innovation Dynamics**

*Chia-Han Yang; National Chiao Tung University, Taiwan*  
*Joseph Z. Shyu; National Chiao Tung University, Taiwan*

This research focuses on providing a dynamic model for collaborative R&D based on the open innovation concept. Particularly, a symbiosis model of Lotka-Volterra approach is used to analyze the cooperative R&D relationship between the innomediaries (innovation intermediaries) and their technology clients, the patent seekers, to share their technology portfolio in the open innovation process. The study will discuss the role of innomediaries in open innovation and develop a symbiosis model to assume the growth rate, growth limitation, and positive interaction effect of both technology seekers and innomediaries, for best discussing the market dynamics in four scenarios with different initial market values. Simple numerical examples will also be adopted to demonstrate the utility of this model and propose the strategic suggestion of different mutualism relationship between a technology seeker and an innomediary.

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## **TD-10 Technology Management Framework - 2**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Studio Suite**

**Chair(s) Cherie Courseault Trumbach; University of New Orleans**

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## **TD-10.1 [R] Typology and Evolution of Technology Clusters: Evidences from the Hi-tech Industries**

*Jiang He; Stevens Institute of Technology, United States*  
*M. Hosein Fallah; Stevens Institute of Technology, United States*

Clustering is one of the key drivers for regional economic growth. Development of technology clusters is a dynamic process, which is influenced by a variety of internal and external factors. Availability of skilled labor, presence of functioning networks and partnerships, and evolution of the industry are among the key factors. According to Ann Markusen, technology clusters can be distinguished from one another based on their fundamental typology: the Marshallian form, Hub-and-Spoke form, Satellite form, and State-centered form. However, the effect of cluster typology on the development of clusters has not been studied. In this paper, we investigate 15 metropolitan-based technology clusters in the United States, covering communications equipment manufacturing, information technology, and biopharmaceutical sectors. By examining the composition of these high-tech clusters, we observe: 1) how these technology structures have changed their typology over time; and 2) differences in cluster typology among different industries. Our analysis results suggest that the map of cluster typology varies significantly for different industries. In addition, our analysis results suggest that the long-term sustainability of a cluster is largely determined by the prosperity of small- and medium-sized firms within the cluster.

## **TD-10.2 [R] Remining PICMET: 1997-2008**

*Jan Kwakkel; Delft University of Technology, Netherlands*  
*Scott Cunningham; Delft University of Technology, Netherlands*  
*Timothy R Anderson; Portland State University, United States*

The Engineering and Technology Management Research Council (ETMERC) is an international association for professionals in the field of management of technology. ETMERC encourages education in the field of management of technology, and serves as a central information resource for practitioners. As part of its mission the association facilitates the exchange of information, supports the expansion of engineering and technology management, and assists in benchmarking for educational standards. Understandably, the organization is interested in metrics of knowledge creation and diffusion in support of its mission. The Portland International Center for Management of Engineering and Technology (PICMET) hosted nine conferences on the field of management of technology. The proceedings of the conferences serve as a knowledge base for further analysis in this paper. There are three key contributions of this paper: the paper updates previous efforts to mine PICMET; provides key indicators in support of the ETMERC mission; and examines new approaches to modeling and forecasting trends in knowledge. The paper employs a loglets approach for

understanding waves of concepts emerging over time. The paper also employs a hierarchical random graph technique for analyzing the architectural and combinatorial character of these emergent concepts. The paper concludes with a reflection on the relevance of the findings for supporting the educational and informational mission of ETMERC.

## **TD-10.3 [R] Exploring the Use of Biological Metaphor upon Technology Management Research within the New Paradigm of Ongoing Change**

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

A new paradigm characterized by ongoing changes at all levels is currently emerging; adaptation is the key here, rather than contingency preparation. Technology Management is not foreign to such trends and thus its assimilation and rapid response ability must become potentialized to ensure its evolution and strengthening with adaptation-orientated tools and trends of thought. This paper deals with the concept of biological metaphor which has been present in Organizational Management for many decades; it is analyzed as a Technology Management development option, taking into account its high level of interaction with other disciplines. The results show that this impact is relevant, going beyond academic and theoretical fields since its application is seen in real contexts, especially regarding Manufacturing Management. This paper concludes that industrialized countries have made important advances in learning and using biological concepts in Technology Management; however, emerging economies (such as those in Latin-American countries) have also established an appropriate framework regarding topics such as complexity, evolutionary theory and intelligence for analyzing and implementing Technology Management and adopting technological strategies according to their own particular settings.

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## **TD-11 Technology Management in Healthcare Sector - 1**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Galleria-1**

**Chair(s) Yuya Kajikawa; University of Tokyo**

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## **TD-11.1 [R] Health Technology Assessment in the Context of Private and Public Models of National Health Systems**

*Giuseppe Turchetti; Scuola Superiore Sant'Anna, Italy*  
*Eliezer Geisler; Illinois Institute of Technology, United States*

The increasing costs of healthcare delivery in all industrialized countries are raising serious concerns about the financial sustainability of national and regional healthcare delivery systems. Studies have shown that innovations in medical technology are one of the stronger factors that drive the upward trend of healthcare delivery costs. Many national and regional healthcare agencies and policy makers are recognizing the need for more accurate knowledge on the generation and diffusion of innovations in healthcare technologies. The focus of this paper is a comparison of the assessment of health and medical technologies in two different models of national health delivery systems: Italy and the United States. The role of health technology as a significant driver of the rising costs of healthcare delivery is well documented. Less studied is the manner in which health technologies are acquired and adopted by providers in different national systems. The authors frame the issues and compare the factors that impinge upon the diffusion of medical technologies from industry to providers in a publicly planned and funded health system and in a mostly privately funded national health system. As the two national systems seem to converge in many aspects of national policy making, the authors explore the assessment of healthcare technologies in the short and longer terms. Are there differences and similarities in the assessment methodologies used by the different systems and, if so, how do these affect the healthcare delivery system? The authors suggest some possible answers.

## **TD-11.2 [R] Detecting Emerging Research Fronts in Regenerative Medicine by Citation Network Analysis of Scientific Publications**

*Naoki Shibata; The University of Tokyo, Japan*  
*Yuya Kajikawa; The University of Tokyo, Japan*  
*Yoshiyuki Takeda; The University of Tokyo, Japan*  
*Ichiro Sakata; The University of Tokyo, Japan*

**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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*Katsumori Matsushima; The University of Tokyo, Japan*

In today's increasingly global and knowledge-based economy, competitiveness and growth depend on the ability of an economy to meet fast-changing market needs quickly and efficiently through management of new science and technology. Therefore, for both R&D managers and policy makers, noticing emerging research domains among numerous academic papers has become a significant task. However, such a task becomes highly laborious and difficult as each research domain becomes specialized and segmented. In this paper, we detect emerging research front from a huge number of academic papers related regenerative medicine, which is a case of radically innovative research. We divide citation networks into clusters using the topological clustering method, track the positions of papers in each cluster, and visualize citation networks with characteristic terms for each cluster. Analyzing the clustering results with the average age and parent-children relationship of each cluster could be helpful in detecting emergence. In addition, tracking topological measures, within-cluster degree  $z$  and participation coefficient  $P$ , enable us to determine whether there are emerging knowledge clusters. Our results show that our method succeeds to detect emerging research fronts in regenerative medicine and these results are confirmed as reasonable ones by experts.

## **TD-11.3 [R] Method of Patent Analysis to Determine the Speed of Progress in Blood Pressure Monitors**

*George M Bacioiu; University of Windsor, Ontario, Canada*  
*Zbigniew J Pasek; University of Windsor, Ontario, Canada*

Blood pressure measuring/monitoring devices (BPMs) are one of the most popular home health diagnostic tools. A contemporary line of these products available to consumers today has considerable range of variety and functionality. The BPMs evolved into their present form from the 18th century sphygmomanometer, and their design went through a number of innovations and improvements, a process still continuing today. The first sphygmomanometer patent was issued in 1855, a practical method established only in 1896, and since then over 1,300 patents of relevance have been granted by USPTO. Analysis reveals that the number of patents over time follows a cubic curve that can be broken into three temporal segments (pre-1960, 1960-1990, 1990-present), related to specific technological breakthroughs. The approach presented in this paper blends statistical analysis (e.g., patent frequency over time) with a user satisfaction index. Such an index captures how closely a metric based on key functional characteristics of patented devices follows an ideal solution, satisfying all user expectations, and provides an insight into the size of the gap between consumer needs and current technology. Combining it with technological progress curve can provide a clear picture of where and how soon new developments in BPMs can be expected.

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## **TD-12 Environmental Issues - 1**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Galleria-2**

**Chair(s) Nasir Sheikh; Sharp Corp.**

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## **TD-12.1 [A] The Case of Municipal Policy Enhancing SMEs through an Environmental Approach**

*Nobutaka Odake; Nagoya Institute of Technology, Japan*

As interest in the impacts of business activities on the environment has grown, environmental policy is now shifting from the end of pipe stage to the next stage. In the environmental departments of municipal governments in Austria, an increasing number of cases is observed where the department has outgrown its restriction-based environmental measures. The program aims to reduce environmental burdens, not through forcing SMEs to follow governments measures, but rather through supporting SMEs' own efforts to decrease the burdens. This can be categorized as a diffusion-oriented policy. The goal of this paper is to extract the conveyed meanings of partnerships and the role that public sectors through the activities of local authorities or intermediaries need to play in fostering environmental conservation. The focus of discussion is on the partnerships among the parties involved in the program and on the program operation. The program is composed of various elements

such as the legal system and control, financial methods, the consulting system, multifaceted partnerships and so forth. This comprehensive program, which is appropriate for local areas, can be a model of community-empowering policy in an attempt for local governments to implement bottom-up type measures for boosting local industries.

## **TD-12.2 [R] Empirical Analysis of Energy Saving and Pollution Reduction and Regional Competitiveness in China**

*Ning Ma; Beijing University of Technology, China*  
*Wei Wu; Beijing University of Technology, China*

This study examines the relationship between energy saving and pollution reduction and regional competitiveness by using provincial regional level data in China. The analytical results indicate that the improvement of energy efficiency has a significantly positive effect on regional competitiveness. Both technology investment intensity and pollution-governance investment intensity have a positive effect on regional competitiveness, but not significantly. The chemical oxygen demand per unit area (COD) has a significantly negative effect on regional competitiveness. We also investigate the role played by energy saving and pollution reduction. These results provide support for the hypothesis that energy saving, technology investment and pollution-governance investment can lead to greater regional competitiveness. The empirical test results for the present situation of China's energy saving and pollution reduction were analyzed.

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## **TD-13 Supply Chain Management - 2**

**Tuesday, 8/4/09, 14:00 - 15:30**

**Room: Galleria-3**

**Chair(s) Kathryn Stecke; University of Texas at Dallas**

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## **TD-13.1 [R] The Implementation of TQM in the Component Supply Chain: A Case Study in the South African Motor Industry**

*Faheem Hussain; University of Pretoria, South Africa*  
*Cornelis C van Waveren; University of Pretoria, South Africa*

The South African motor industry has flourished over the past two decades. During these years, many Original Equipment Manufacturers (OEMs) have chosen South Africa as one of the countries to establish their plants. Local vehicle sales are not the driving factor of this large investment in South Africa, as many vehicles are exported to other countries. South African assembled vehicles are now competing in a global market. A study was conducted in the automotive industry of South Africa, utilizing the National Association of Automotive Component and Allied Manufacturers (NAACAM) database in South Africa, to investigate the differences in first tier and second tier suppliers in terms of the organizational profiles of these companies, the implementation of Total Quality Management (TQM) principles in their plants and how the companies' missions and goals are structured around the customers' needs. The research methodology comprised a literature review, and an empirical study based on a questionnaire forwarded to automotive companies in South Africa. A number of conclusions could be reached from the study as differences between first and second tier supplier in general irrespective of whether the suppliers use TQM or not.

## **TD-13.2 [R] Dyadic Buyer-Supplier Relationship Management from the Buyer's Perspective**

*Monika M Pawlak; The University of Warwick, United Kingdom*

This thesis investigates how buyers can successfully manage dyadic buyer-supplier relationships. Research has provided solutions for managers about which relationship type is the most appropriate and beneficial for buyers in particular circumstances. Different relationship types were examined and key factors affecting relationship management and their effect on it were investigated. A deductive approach was undertaken, i.e. an innovative framework of relationship management and related hypotheses were generated on the basis of a thorough literature review. Then these hypotheses were tested with the use of case studies. An original framework filled the gaps in the literature and contributed to the body of knowledge since its dimensions are based on the most important influencing factors; namely, the availability of alternative sources of supply and the purchased product contribution to current and future profit. The framework is unique because it proposes rela-

# SESSIONS

relationship types and takes into account the power issue. The framework encourages managers to plan into the future and assess influencing factors, taking into account changes in the external and internal business environment, which have been ignored by established writers. The results have shed new light on relationship management. It was found that the relationship management of any product category cannot be ignored, since seemingly unimportant purchasing may bring significant savings related to a buyers high bargaining power if relationships are appropriately managed. Importantly, it was concluded that closer relationships should be developed when product development time is longer, higher volumes are purchased from a single supplier, purchases are more complex and/or critical, their functionality and quality are more important and can be influenced, and if responsiveness to changing consumer tastes is required. Finally, using the results obtained, an improved framework of relationship management has been developed, in which two best for the given situation relationship types are proposed for a particular scenario based on the factors listed above. The application of the framework will help to: increase a company's profitability, improve relationship management, improve the functionality of purchases, improve the performance of organizations and of its suppliers, as well as increase efficiency and effectiveness.

## **TD-13.3 [R] Supplier Involvement in Flex-Fuel Technology Development: The General Motors and Volkswagen Brazilian Cases**

*Abraham S.O. Yu; Universidade de São Paulo, Brazil*

*Paulo T. de Souza Nascimento; Universidade de São Paulo, Brazil*

*Francisco E.B. Nigro; Universidade de São Paulo, Brazil*

*Bjorn W.B. Frederick; Universidade de São Paulo, Brazil*

*Willian Gatti Junior; Universidade de São Paulo, Brazil*

*Karine Gargioni Pereira C. de Mello; Universidade de São Paulo, Brazil*

The development of the flex-fuel vehicle, capable of operating with any blend of gasoline and ethanol between E25 and E100, has reached a huge commercial success in Brazil since 2003. 9 out of 10 cars sold are now equipped with flex-fuel technology. This success is based on several factors such as the creation of the Brazilian Pro-Itcool Program and the introduction of the electronic injection. The introduction of this technology in the beginning of 2003 by Brazilian automakers illustrates two different strategies of supplier involvement in technology development: black box and co-design. This paper presents a cases study of how two mature automakers installed in Brazil developed flex-fuel technologies. We discuss the relationship between the technology platforms (engine management system which include sensors, control systems, data processing units, etc.) upon which the flex-fuel technology has been developed and competitive capabilities both in the automakers and its suppliers. We then analyze the implications for the development of flex-fuel technologies in Brazil as technology dominance on the motor control electronics and software. Black box e and co design strategies provide differing routes in time to market and cost but may have differential results concerning long term buyer supplier relationships.

## **TD-13.4 [R] A Study on Risk of Knowledge Management for the Supply Chain in Mergers and Acquisitions: An Empirical Analysis in Yangtze River Delta of China**

*Lin Ma; Ningbo University, China*

*Fengying Nie; Ningbo University, China*

In the current financial crisis, the business risk has been exacerbated. Mergers and acquisitions have become a hot issue. In the knowledge management process of the mergers and acquisitions, corporate concerns are about the risks of knowledge management in the supply chain. This paper aims to develop a qualitative risk model with the data of the Yangtze River Delta of China, to empirically identify the important risk factors of knowledge management for the supply chain logistics in mergers and acquisitions. Starting with the importance of knowledge management risks in supply chain logistics, then, the paper proposes an optimization of the risk management process, a new paradigm for risk of knowledge management in supply chain planning and logistics control system is required in mergers based on risk management theory.

## **TE-01 TUTORIAL: The Magic of Six: Six Technology Management Activities and Six Tools - Part II**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Pavilion East**

**Speaker(s) Dilek Cetindamar; Sabanci University**

**Robert Phaal; University of Cambridge**

**David Probert; University of Cambridge**

Technological changes are continuously creating new challenges and opportunities for new product, service, process and organizational development. However, these opportunities need to be captured and converted into value through effective and dynamic technology management (TM). This requires a new way of understanding TM that captures its dynamic nature as well as managerial aspects. In this workshop, a new TM framework will be presented. This model is based on the dynamic capabilities theory, emphasizing the development and exploitation of technological capabilities that are changing on an ongoing base. The dynamic capabilities theory is not primarily concerned with fixed assets, but rather aims to explain the way in which a firm allocates resources for innovation over time, how it generates and deploys its existing resources, and where it obtains new resources. This is highly relevant for developing an approach to TM that can explain how combinations of resources and processes can be developed, deployed and protected for each TM activity. Therefore, the workshop will first introduce a comprehensive process model that includes SIX specific TM activities: identification, selection, acquisition, exploitation, protection, and learning. We argue that the process of TM is essentially generic, although organization and/or market-specific factors will constrain choices and actions. Then, the tutorial will provide descriptions of SIX major TM tools and techniques that are useful to carry out TM activities: patent analysis, portfolio management, roadmapping, S-curve, S-curve, stage-gate, and value analysis. Again, even though it is difficult to delineate tools, we select key tools that are the prevailing ones across TM processes and help to capture internal and external dynamics. The workshop will present cases from the journal Research-Technology Management that is the highly respected practice journal in the field of TM.

## **TE-02 Innovation Management - 4**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Pavilion West**

**Chair(s) Gideon Samid; Case Western Reserve University**

### **TE-02.1 [R] Clustering the Open Ended Future Needs**

*Didem Cinar; Istanbul Technical University, Turkey*

*Gulgun Kayakutlu; Istanbul Technical University, Turkey*

This paper aims to propose a solution for clustering the trends in vague conditions by comparing the results of hard c-means and fuzzy c-means algorithms. An application is done on an SME survey indicating the future needs for the improvements in regional innovation. Application results indicate that fuzzy c-means clustering algorithm gives significantly achievable results that guide innovation experts in their regional development perspective.

### **TE-02.2 [A] Divergent Innovation: Fostering and Managing the Fuzzy Front End of Innovation**

*Henning Breuer; Deutsche Telekom Laboratories, Germany*

*Martin Hewing; Technische Universität Berlin, Germany*

*Fee Steinhoff; Technische Universität Berlin, Germany*

Early phases of innovation are hardly ever being addressed in a systematic way. We tend to assume that ideas fall like raindrops from the sky. Within the concept of open innovation, the number of input channels has been increased, but the assumption remains that new ideas pop up by chance or brainstorming. The process of generating new ideas in engineering, science and design is usually considered ill-defined, or even random. In contrast to this view we describe approaches of divergent innovation and search field analysis and three alternative methods that may be applied within: 1) futures-oriented approaches, 2) contextual approaches and 3) the resource-oriented derivation of product attributes from value propositions. We exemplify a divergent approach by showing a project to allocate potentially disruptive innovation for the telecommunication industry. Finally, we derive implications and

# SESSIONS

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guidelines for future market research within a divergent innovation approach.

## **TE-02.3 [R] Innovation in Operational Excellence in a Complex Environment**

*Rene Pellissier; University of South Africa, South Africa*

Innovation and complexity are interlinked with respect to their impact on service, structure, process or product. Process/product/service organizational innovation within a complex environment allows for excellence whilst acknowledging possibly divergent environmental, social, economic and business drivers and continued instability. Modern management thinking implies that any innovation or design activity be undertaken within a complex reality while maintaining alignment to the strategic intent and objectives. Innovation, in the design of operations in complex environments, is challenging and is as yet relatively unexplored. This research is based on a literature review and the resultant gap between the accepted linear modeling and the emerging complexities experienced. A framework for the development of an operational excellence model is presented that highlights the growing importance of operations and operational excellence in design. The model links the strategic intent, the product/service definition and the organizational structure in order to develop resilient organizations in terms of function and form. The framework looks at the structure design, the consequent job specification and the alignment to the people. Planning, design, improvement and measurement systems are in place. One deliverable of the model is continued business intelligence that has feedback and output. The focus is on innovation that results in resilience and information flows within a complex setting.

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## **TE-03 Project / Program Management - 3**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Broadway-1**

**Chair(s) Michael Poli; Stevens Institute of Technology**

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## **TE-03.1 [R] Emotional Intelligence as a Facilitator of Project Leader Effectiveness**

*Joann F Quinn; JFQ Consulting, United States*

*David Wilemon; Syracuse University, United States*

This paper presents a framework that examines how emotional intelligence can contribute to the success of project leaders and their teams. We review the interaction of project leaders with their teams and how emotional intelligence can improve interpersonal effectiveness, provides the skills to deal with sponsors and stakeholders, and how the emotionally intelligent project leaders can utilize their resources to achieve high performance levels. Specific attention is given to the impact of emotional intelligence upon team development, conflict resolution, leadership, and how emotional intelligence is fundamental to effective leadership as well as in gaining support from team members and stakeholders. Finally, we explore areas for further research such as the potential effect of an emotionally intelligent project leader upon a team that does not possess emotional intelligence, as well as how teams with high emotional intelligence have a propensity for increased innovation.

## **TE-03.2 [R] Project Strategy: A Template for Analyzing Real Life Projects**

*Michael Poli; Stevens Institute of Technology, United States*

This paper is about an industry independent template used to analyze real life project case studies. This template has been used by graduate students post-project to analyze over 650 case studies. Any project can be analyzed with this thorough template. The design is flexible and comprehensive. Scale is easily integrated into but does not influence the analytical outcome. There are over 70 analytical metrics. Some are highly vectored where a single aspect is analyzed in depth and detail. Company processes, methodologies, risks, cultures, leadership, and organization, as well as customer, user deliverables, needs, and risks, are included. The alignment of corporate, business, project, and customer strategies are defined, described, and analyzed to see how they contribute to competitive advantage/value. This analysis provides students with an in-depth look at project management in their company and allows them to compare their company's project management practice to those of the other students. When used as a pre-project tool, development of the projects Strategic Focus and Success Dimensions contributes to a unified Project Strategy and an effective Project Plan that strategically aligns company, process, customer, and deliver-

ables leading to project success and increased competitive advantage/value.

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## **TE-04 Technology Management in Service Sector - 2**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Broadway-2**

**Chair(s) Norman G Einspruch; University of Miami**

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## **TE-04.1 [R] A Challenge for Service Concept Modeling by the Innovation Support Technology (IST)**

*Hiroshi Abe; Japan Techno-Economics Society, Japan*

*Masahiro Ibaragi; Yokogawa Electric Corporation, Japan*

*Masahide Mitsuoaka; Sony Corporation, Japan*

*Junji Nagata; OKI Electric Industry, Japan*

*Fumio Jinno; Ojipaper Corporation, Japan*

*Yoichiro Igarashi; Fujitsu Laboratories Ltd., Japan*

*Gaston Trauffler; NRW Japan KK, Japan*

Since the autumn of 2002, we have started a study group on business modeling at JATES (Japan Techno-Economics Society). The research of this study group is presently continuing a study on the innovation support technology (IST), which consists of a business modeling method, a strategic road mapping method and an innovation architecture (IA) method. These research activities have been reported in past PICMET conferences. Based on the previously proposed IST, the present paper discusses a framework that focuses on the development of service innovations: it describes a modeling method to systematically develop service business models and aims at providing engineers and researchers with a solid tool for new service developments.

## **TE-04.2 [R] Service Value Shift Based on Cultural Background of Hospitality Applied to the Japanese Motenashi Service**

*Kotaro Nakamura; Japan Advanced Institute of Science and Technology, Japan*

*Masakaze Gotoh; Recruit Works Institute, Japan*

In order to produce sustainable and competitive service, it is important to identify proper competence rooted in the cultural background based on traditional features. Moreover, the service must provide service value shifting in time along with the changes in the needs of customers. This paper shows the motenashi hospitality cultures as a root of Japanese style service to focus on the host-guest relations and generalize their relations by the anthropological theory of rituals and reciprocity principle as historical point of view at the service for describing the relationship between contemporary services and their cultural backgrounds. Furthermore, based on their considerations of the cultural background, the framework of the degree of customer participation and the level of service needs is applied to real service cases. Results on application to the case of Japanese traditional motenashi minded service with heartfelt treating as a major service concept clarify the potential of the framework for considering service business strategy by comparison with their cultural backgrounds.

## **TE-04.3 [R] Leveraging Technology to Diminish Hostility in Service Recovery**

*Pi-feng Hsieh; Takming University of Science and Technology, Taiwan*

*Chien-chiang Lin; Shih Hsih University, Taiwan*

Since the most common causes for dissatisfaction in service recovery come from service providers' hostility, we propose technology to be an efficient way to diminish hostility in service recovery. Unlike most research to find the solution from the perspective of emotional labor, we discuss technology's benefits to emotional uncertainty. On the theoretical background of affective expectation model, C-O-P triangles, and emotional perspectives, we define the problem in service recovery and propose technology to be the solution. Our contribution is to integrate the existing literature of service recovery in the aspect of customer compliant, service hostility, and technology adoption, and find the interdependence between technology-based and human encounter strategies in service recovery. Besides, our findings have interesting implications for design of service recovery systems.

## **TE-04.4 [R] Sustaining Profitability on International Sectors through Demand Forecasts**

# SESSIONS

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*S Srinidhi; Indian Institute of Science, India*

The economic liberalization in 1991 followed by the deregulation of Indian skies is witnessing exponential growth of the airline industry in India. Near-perfect competition scenario has gifted concerns for the airlines in terms of demand reductions, thereby stressing the requirement to provide superior customer service in order to entice maximum customers. In the above context, this paper discusses the development of a passenger-trac-demand (PTD) forecasting model for international routes operating from India. The model is a fusion of the gravity model in physics and micro-economic theoretic model that links demand to price. This research highlights that there are factors outside service that could play an important role in demand growth. The model will be tested on data provided by Air India, the national carrier chosen for the purpose of the study. The model, though applied to Air India, would have general applicability.

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## **TE-05 Technology Transfer - 3**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Broadway-3**

**Chair(s) Jisun Kim; Portland State University**

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### **TE-05.1 [R] Review of Government Technology Transfer in Vietnam**

*Thien A Tran; Portland State University, United States*

*Dundar F Kocaoglu; Portland State University, United States*

Vietnam is a developing country which is in a transition from a centrally planned economy to a free market economy. The country embarked on a reform process two decades ago to make a transformation from a rigid administrative bureaucracy to an adaptive management system that can cope up with the movements in today's society. Technology and science is acknowledged by the government as a critical driver of the economic development of the country in the 21st century. However, the country's administration of science and technology activities is still struggling in a mix of legacy inertia and reform efforts. Much effort and time are needed before an effective national innovation system can be put into practice. This paper aims to address the problem of effective transfer of research results from the government R&D agencies to industry in Vietnam. It will first review the process of legal development and the restructuring of the national science and technology system in the country since the late 1980s. Then the technology transfer process from the state R&D agencies to industry will be examined and followed by the issues and challenges of the current system. The paper concludes with some comments and recommendations to improve the effectiveness of the government technology transfer to industry in the country.

### **TE-05.2 [R] Technology Transfer to China: With Case Studies in the High-Speed Rail Industry**

*Leong Chan; Portland State University, United States*

*Fahad Aldhaban; Portland State University, United States*

Through a case study of the high-speed rail industry, this paper introduces and compares major determinants of international technology transfer strategies from the perspectives of both technology importers and exporters. The determinants include the economic system, government policy and initiative, social constraints, and technological impetus.

### **TE-05.3 [R] Technological Transferring and the Institutional Framework of Research Organizations: Some International Evidences**

*Joao Pizieszniq Filho; Brazil. Petroleum, Natural Gas and Biofuels Agency, Brazil*

*Milton A Campanario; University of Sao Paulo, Brazil*

From the early 1980's onwards a series of institutional changes were implemented in order to foster a higher rate of innovation in the productive sector based on knowledge acquired in research institutes. In the U.S., the Bayh-Dole Law guaranteed intellectual property of inventions to the executing institution (university or research institutes), even when financed with public resources. Bayh-Dole results led to the adoption of a similar model in European Community countries and Asia. The aim of this work is to analyze, comparatively, the dispositions of the Brazilian law of innovation vis-a-vis the regulations and practices of North American and European research institutions. Visits were made to business technology of-

fices of foreign institutions, and documents and publications of various organizations were examined in an attempt to identify a benchmark of best practices in technology transfer. In addition to military technology, a series of innovations from research conducted for and during the war contributed to the economic development of the country.

### **TE-05.4 [R] Research to Innovation Models in Central Europe**

*Slavko Dolinsek; Institute for I&D of University of Ljubljana, Slovenia*

*Manca Poglajen; Institute for I&D of University of Ljubljana, Slovenia*

The paper aims to present the regional technology transfer in Central Europe from the point of view of innovation system. Our focus is defined by analysis of the innovation system in parts (administrative units) of seven European Union members in the region. The paper will present the situation of technology transfer by January 2009 in the analyzed countries. This should provide a tool to improve the strategy of these countries and make use of the regional synergies. The goal is to find out the commonalities and to see whether it is possible to create a common research-to-innovation model for the region. The paper is based on the findings of the Central Europe Research to Innovation Models (CERIM) project funded by the Central Europe Program of the European Union. The project analyzes the situation in administrative units in Austria, Germany, Hungary, Italy, Poland, Slovakia and Slovenia.

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## **TE-06 Software Process Management - 2**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Broadway-4**

**Chair(s) Najmul Huda; Tallinn Technical University**

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### **TE-06.1 [R] Turkish Software Producing ICT Companies' Approaches in Establishment of Their Subcontractor Selection and Management Processes**

*Nermin Sokmen; TUBITAK Marmara Research Center, Turkey*

Software developing companies may subcontract some of their workload, and in this case as a part of their subcontracting activities, selecting subcontractors and working with them may cause some problems. These problems are generally less frequent if institutionalization of subcontractor selection and management processes is considered more important. In order to eliminate problems arising due to subcontracting, companies have better track and control their subcontractors in a corporate manner. The aim of this paper is to expose the subcontractor use pattern of Turkish ICT companies engaged in software development activities, and to analyze the behavior of Turkish ICT contractors involved in software development activities in the subcontractor selection stage and in the subcontractor management stage. The study also examines if a relationship exists between their subcontracting activities and their company size, the industry they produce service for, their turnover, their utilization of quality standards, their organizational structures and their product development processes.

### **TE-06.2 [R] Vietnam as an Emerging Destination for Offshore Outsourcing of Software Development for Finnish Companies: A Conceptual Perspective**

*Linh Kuivanen; University of Jyväskylä, Finland*

*Nazmun Nahar; University of Jyväskylä, Finland*

Companies are constantly under pressure to produce software products more efficiently, more rapidly and within tight budgets. Offshore outsourcing has been seen as one solution to the dilemma, and lucrative outsourcing businesses have evolved in many countries such as India, China and Russia. Vietnam is now emerging within this global outsourcing sector. This study investigates Vietnam as an outsourcing destination for Finnish software companies for developing their software products and related services. The research was undertaken by reviewing the literature concerning a) offshore outsourcing, b) offshore software production, c) information technology industry in developing countries, especially in Vietnam, and d) approaches for outsourcing to developing countries and to Vietnam. A conceptual model of software production through offshore outsourcing was developed. The study found impending challenges as well as potential in the Vietnamese software outsourcing industry. In addition, it provides valuable information for practitioners interested in outsourcing to Vietnam and for further research within the area.

**Note: [R] = Research Paper; [A] = Industry Application**

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## **TE-06.3 [A] Mapping Team Collaboration in Software Development Projects**

*John McCreery; North Carolina State University, United States*  
*Vicente Moranta; North Carolina State University, United States*

Low success rates continue to plague software development projects (Standish Group, 2006). One often cited reason for project failure is poor communication and coordination across project teams and subgroups, a growing problem as development efforts become more complex and geographically dispersed. Our study examines the use of a soft tool methodology, organizational network analysis (ONA), to help identify patterns in communication that affect performance. In this study we use ONA to examine a mission-critical software development project at a Fortune 200 company in the IT solutions industry. The project began to show time and scope slippage, due in part to challenges in integrating four project teams residing in different locations in the U.S. and Russia. A detailed analysis was performed on who each person on the project was connected to, using what methods of communication, for what reasons. Based on a series of mappings of the project's human network and calculation of key connectivity measures, management was able to diagnose root causes of problems and institute appropriate solutions. After presenting the results of the case study, we offer prescriptive recommendations on how and when ONA can be effectively used as a diagnostic tool in software development and other project environments.

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## **TE-07 R&D Management - 2**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Forum Suite**

**Chair(s) Alisa Kongthon; National Electronics & Computer Technology Center**

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## **TE-07.1 [R] An Empirical Study of the R&D Globalization of Japanese Firms towards China**

*Kumiko Miyazaki; Tokyo Institute of Technology, Japan*  
*Hu Ying; Tokyo Institute of Technology, Japan*

Japanese companies have been actively globalizing their R&D activities in Western countries since the 1990s. However, compared to other Western countries, Japan has been a late comer in terms of setting up corporate R&D labs in China. Japanese companies foreign direct investments towards China have concentrated on manufacturing, based on low labor costs. The main contribution of this paper is to analyze the motives and strategies of Japanese firms which have established their own R&D labs in China. In addition, the organization and function of the R&D labs, merits, demerits, and problems of R&D management are identified. A preliminary analysis was carried out by reviewing literature as well as previous studies on Japanese companies activities in China. Interviews were carried out with four companies which have set up manufacturing or R&D bases in China. In the second phase, a detailed questionnaire survey was carried out on a sample of 12 leading companies in the field of electronics, office automation equipment, electronic components, wire and cable, machinery, and automobile industries. Statistical analysis carried out on the data confirmed that six companies were identified as having a market pull type R&D strategy, and five companies had a technology push type R&D strategy. This research has shown that Japanese companies R&D strategies in China are driven by both technology push and demand pull strategies, revealing that Japanese companies R&D activities have entered a new phase.

## **TE-07.2 [A] Developing a Body of Knowledge for the Management of Large-Scale International Science Projects**

*Soeul Cha; Korea University, Korea, South*  
*Daniel Ciarlette; Oak Ridge National Laboratory, United States*  
*Ben Cross; Savannah River National Laboratory, United States*  
*Sharm Manwani; Henley Business School, United Kingdom*  
*Luca Landoli; University of Naples Federico Secondo, Italy*  
*Barry Shore; University of New Hampshire, United States*  
*Carl Strawbridge; Oak Ridge National Laboratory, United States*  
*Giuseppe Zollo; University of Naples Federico Secondo, Italy*

Large-scale international science projects (LISPs) are different from conventional projects

for which the body of knowledge in project management has been developed. LISPs can be defined as those projects where two or more countries formally agree to cooperate toward the achievement of a scientific, R&D, or engineering goal. In general, only projects exceeding \$1 billion US are considered LISPs. Agreements among participants typically cover several years and work is accomplished in stages, characterized by formal agreements. In addition, the partners contribute hardware components, funds and/or personnel to the project. This paper introduces a preliminary study that identifies how these projects differ from conventional projects, why conventional approaches may be inadequate, and how these differences might affect project management practices.

## **TE-07.3 [R] The Effect of R&D and Technology Commercialization Capabilities on the Innovation Performance of Korean IT SMEs : The Case of Direct and Indirect Recipients of Public R&D Funding**

*Seo-Kyun Kim; ETRI, Korea, South*  
*Bong-Gyou Lee; Yonsei University, Korea, South*  
*Kyoung Seok Oh; ETRI, Korea, South*

This paper investigates the relationship between R&D capabilities (learning, R&D and external networking), technology commercialization (manufacturing and marketing), and innovation performance (product competitiveness) among SMEs in IT-related businesses. The study focuses on 254 Korean IT SMEs that were either recipients of government R&D grants or their indirect beneficiaries during the two-year period between 2005 and 2007. The major findings of this study are as follows: First, unlike what has been suggested by previous studies, R&D intensity was not the only factor influencing the innovation performance of firms; learning and external networking also had a significant influence on innovation. The research implication of this finding is that the measurement of a firm's performance should not be solely based on the intensity of R&D expenditures, but a broader set of factors including learning and external networking capabilities. Second, the technology commercialization capabilities of firms played the role of a mediator in the relationship between R&D and innovation performance. Within the innovation cycle of input (R&D capabilities), process (technology commercialization capabilities) and output (innovation performance), we found that R&D seldom influenced performance in a direct fashion, but its influence was most often mediated by technology commercialization capabilities. The practical implication of this finding for companies is that in order to improve performance, they must avoid narrowly focusing on R&D, but must invest also in capabilities to commercialize technologies resulting from R&D. Third, when direct and indirect beneficiaries of public R&D funding are compared together, the explanatory power of the relationship between R&D capabilities, technology commercialization capabilities and innovation performance was stronger among the latter than the former. This result suggests that indirect technology support toward Korean IT SMEs through government-sponsored research institutions is a more effective way of allocating public R&D funds than direct funding in the form of grants to individual companies. In other words, sponsoring R&D projects at research organizations with high-quality manpower and equipment and facilities like government research institutions, which are more likely to result in technologies that are readier for commercialization and have greater value-added, and transferring resulting technologies to small- and medium-size ventures is a better strategy for enhancing national technological competitiveness in IT.

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## **TE-08 TUTORIAL: The Knowledge Myopia: Evolution and Future of Knowledge Management**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Council Suite**

**Speaker(s) Eliezer Geisler; Illinois Institute of Technology**

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In this era of the knowledge economy and the knowledge society, we are still taking baby steps in our understanding and utilization of knowledge management. What is this notion of knowledge management? How did it evolve to the current state? Are we on the right track in the application of knowledge management systems (KMS) in work organizations? These are the questions addressed in this tutorial. The discussion focuses on the trend of the growth and utilization of knowledge management and the barriers involved in its implementation in work organizations. The issue of the myopic application of KMS will also be explored. Why

# SESSIONS

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are we encountering so many difficulties in exploiting the knowledge bases in our organizations? Is KMS just a fad, or a potentially powerful tool for growth and effectiveness? Based on the literature and the experience gained from case studies, some recommendations and practical solutions are offered.

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## TE-09 Collaborations in Technology Management - 2

Tuesday, 8/4/09, 16:00 - 17:30

Room: Directors Suite

Chair(s) Ramin Neshati; Intel Corp.

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### TE-09.1 [R] Exploring Potential R&D Collaborators Based on Patent Portfolio Analysis: The Case of Biosensors

Ming-Yeu Wang; National Chiayi University, Taiwan

Tzu-Fu Chiu; Aletheia University, Taiwan

Wei-Ying Chen; National Chiayi University, Taiwan

The purpose of this study is to develop a framework which modifies the patent portfolios analysis to identify potential R&D collaborators for enterprises. The proposed framework uses association analysis of patent documents to identify important technologies related to the technologies or products in question. This study also designs three indicators, namely technology field scale, relative technology advantage, and relative technological integration capability, to draw patent portfolio diagrams. The diagram can show the important complementary technologies for enterprises, providing valuable suggestions for potential R&D collaborators. To illustrate this framework, this study uses the framework to identify potential R&D collaborators for biosensor-related enterprises based on patents. Experimental results show that the patent portfolio diagrams can properly position biosensor-related enterprises and clearly show important complementary technologies for enterprises. Enterprises with important complementary technologies are good candidates for R&D collaboration.

### TE-09.2 [R] Toward Collaborative Situational Awareness in a Time-Critical Operational Environment

Jari Soini; Tampere University of Technology, Finland

Petri Linna; Tampere University of Technology, Finland

Jari Leppaniemi; Tampere University of Technology, Finland

Hannu Jaakkola; Tampere University of Technology, Finland

In many fields of business, management has to act in situations and environments that require fast decision making based on inadequate information of the situation. In rapidly changing circumstances, an organization's opportunities for maintaining the situational awareness necessary for decision-making become substantially more difficult. In this type of situation, decisions often end up being made based on insufficient or even incorrect information, with potentially catastrophic results. This research is based on the ongoing SSMC/DDKM (Seamless Services and Mobile Connectivity in Distributed Disaster Knowledge Management) project, which has the context of the advanced usage of situational knowledge in connection with disasters and catastrophes. In practice, this type of situation requires close collaboration between different authorities and also the optimized, integrated use of management systems and resources. In this context there are various authorities involved and this time-critical operational environment requires effective and seamless collaboration related to information transmission for all participants. Typically, the authorities have had conventions and systems to compile information for their own needs, but difficulties have been observed in composing a shared situational awareness that includes the information captured from all authorities. In this paper methods and techniques are discussed which could promote the creation of collaborative situational awareness to support the collaboration of authorities in the management of disaster situations.

### TE-09.3 [R] A Generic Model to Handle Complexity in Collaborative Networks

Maïke Scherrer-Rathje; University of St. Gallen, Switzerland

Jens Arnoscht; RWTH Aachen University, Germany

Peter Egri; Hungarian Academy of Science, Hungary

Eric Braun; University of St. Gallen, Switzerland

Balazs C Csaji; Hungarian Academy of Science, Hungary

Günther Schuh; RWTH Aachen University, Germany

The importance of joining collaborations and maintaining relationships has significantly increased for industrial companies due to the globalization of markets and the ongoing specialization of companies. Consequently, adjustments in organizational structures are required by companies to fit the characteristics of industrial collaborations. With this, the complexity of collaborations in highly dynamic environments is increasing but often underestimated. This research is based on an EU founded project with the main goal to enlarge the knowledge of complexity in collaborative networks. In this paper we show the results of a questionnaire-based survey identifying problems arising in such collaborative networks. Furthermore, we link these problems to different system characteristics (e.g. network structure, trust, degree of commitment, coordination, change, etc.) and show how the problems and system characteristics influence each other based on case studies in two different collaborative networks. The research results in a generic model for complexity (GeMoC) in collaboration networks, which is based on Beer's viable system model and identifies white spots in the existing complexity research literature.

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## TE-10 Decision Making in Technology Management - 2

Tuesday, 8/4/09, 16:00 - 17:30

Room: Studio Suite

Chair(s) Tugrul U Daim; Portland State University

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### TE-10.1 [R] AHP Application on Evaluation of Health Information Service Attributes

Umit Topacan; Bogazici University, Turkey

A. Nuri Basoglu; Bogazici University, Turkey

Tugrul U Daim; Portland State University, United States

Patients prefer using the service that meets their needs and requirements. So, to develop the best health service requires knowing patients' needs, requirements and preferences. The aim of the research is to explore the factors that affect users' preferences in the health service selection process. In the study, four hypothetical health services were designed by randomly selecting levels of 16 attributes, and these services were evaluated by the potential users. Analytical hierarchy process (AHP), one of the potential decision making methods, was used to assess and select the best alternative. The best alternative, weights of the service attributes and AHP Model for health service selection was proposed at the end of the study.

### TE-10.2 [R] Decision Model for a Place to Live at PSU: The Case of International Graduate Students

Songphon Munkongsujarit; Portland State University, United States

Willi Schweinfurt; Portland State University, United States

Ibrahim Iskin; Portland State University, United States

Rafael Colon; Portland State University, United States

Napong Tanatammatorn; Portland State University, United States

Nuancharas Phopoonsak; Portland State University, United States

Abdulrhman Almobarak; Portland State University, United States

This paper demonstrates the use of decision models for the selection of a place to live for a new student who just came to Portland State University (PSU). A hierarchical decision model (HDM) was selected as the tool and a model was constructed to meet the objective of selecting the best place to live. Cost, convenience, and safety were identified as the three goals in support of the objective. The criteria and sub-criteria were listed with respect to each goal. The alternatives were chosen for both on-campus and off-campus housing. The experts were selected from a group of international graduate students to quantify judgments based on the HDM model. Finally, utility values were used to compare the characteristics of the alternatives. The alternative with the highest score was identified as the best alternative.

### TE-10.3 [R] A Decision Model for Purchasing the Highest Value Printer for Home use for the Least Cost

Jeff Belding; Portland State University, United States

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*Emy Loazon; Oregon Health & Science University, United States*

*Helen Millward; Portland State University, United States*

*Lone Seboni; Portland State University, United States*

*David Sibanda; Portland State University, United States*

*Tiffani Torgeson; Portland State University, United States*

Students have a wide selection of printers to choose from, with a variety of technologies and features, making a purchasing decision difficult. Using our group members as experts, and scope focused on multifunction, or all-in-one, printers to provide a single solution for all of our printing, copying, and scanning needs. Multi-function printers have become more popular and affordable. This paper presents six criteria expert users of all-in-one printers have identified as critical in purchasing an all-in-one printer for student home use. These six criteria were applied to an HDM (hierarchical decision model), a decision making tool for addressing this problem. A review of related literature and studies provided background information on hierarchical decision-making. Pairwise comparisons and the pairwise comparison method (PCM) were used to analyze the numerical rankings for each criterion given by each expert. By referencing the hierarchical decision-making model and the results gathered from pairwise comparisons, a prospective printer buyer could optimise their selection of a printer for student home use. The paper concludes with sensitivity analysis and recommendations for purchasing a multifunctional printer for student home use, based on the HDM presented in the study. The results and analysis demonstrated that HP PhotoSmart C4580 is the most important alternative that meets the problem objective, Highest Value All in One Printer between \$100 and \$200.

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## **TE-11 Emerging Technologies - 1**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Galleria-1**

**Chair(s) Paul R Newman; Portland State University**

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### **TE-11.1 [R] Forward Patent Citations as Predictive Measures for Diffusion of Emerging Technologies**

*M. Hosein Fallah; Stevens Institute of Technology, United States*

*Elliot Fishman; Stevens Institute of Technology, United States*

*Richard R Reilly; Stevens Institute of Technology, United States*

An extensive literature traces diffusion of knowledge and inventions using backward patent citations - i.e. patents cited by a new patent. Backward citations show how knowledge imbedded in past inventions influences new inventions. What can we learn from forward citations? Can forward citations be used to forecast the evolution of emerging technologies? In this study we analyze forward citations for three classes of technology biotechnology, telecommunications and alternative energy. We use patent metrics to measure the rate of technological innovation. Following the existing literature, we examine the incremental advances in the three selected technological fields as indicated by forward patent citations. Our initial proposition is that forward citations should follow a classic S-curve distribution. The paper examines this proposition. Our study entails: selecting groups of patents issued at least 20 years, and some as far as 30 years ago; extracting the number of forward citations issued each year for each patent through 2008; and fitting the cumulative forward citations to a variety of models such S-, linear, quadratic and logistic curves. The analysis and findings are discussed in the paper.

### **TE-11.2 [R] Towards a Metric Management Approach for Multi-Emerging Technology Based Fabrication Facilities**

*Robert Tierney; University of New Mexico, United States*

*Steven Walsh; University of New Mexico, United States*

Multi Technology, High Product Mix, Low Volume fabrication facilities (MT-HMLV) are the harbingers of next generation economies. Yet MT-HMLVs are fraught with ineffective operation and strategic management practice, practices they often borrow from the metric management approach endemic of single technology high volume production facilities. If this is true in a time of recession and increased globalization, then these facilities are at risk. We focus on one very important group of these facilities: those which are working at the interface of micro technology, nanotechnology and semiconductor micro fabrication.

This group is not atypical. Due to the high degree of success that the metrics management approach has enjoyed in High Volume Semiconductor Fabrication facilities (HVSF), they are the de facto standard for any fabrication facility remotely akin to semiconductor fabrication and this group is. However, simply applying HVSF based metrics to our group of MT-HMLV facilities are proving ineffectual. We employ an extensive literature review and the case study methods to ascertain why these commonly used metrics have been so ineffectual. Further, we utilize these same techniques to develop a more useful metrics management approach for our specific group of MT-HMLVs facilities. We base our metrics on the unique nature of MT-HMLV facilities as well as traditionally used HVSF metrics and R&D metrics.

### **TE-11.3 [R] A Systematic Approach to Developing National Technology Policy and Strategy for Emerging Technologies: A Case Study of Nanotechnology for Thailand's Agriculture Industry**

*Pisek Gerdsri; Portland State University, United States*

*Dundar F Kocaoglu; Portland State University, United States*

This research develops a systematic approach for policy makers to strategically define the national technology policy for emerging technologies. In this approach, a hierarchical decision model is built and qualified expert opinions are used as measurements. There are four levels in the hierarchy: mission, objectives, technological goals, and research strategies. Three panels are formed based on their background and expertise in order to minimize and balance any possible biases among the members. The objectives, technological goals, and research strategies are evaluated and prioritized, according to their contribution to the country's mission, by quantifying the experts judgments. This research also demonstrates several approaches for the validation of results. Inconsistency measure, intraclass correlation coefficient, and statistical test for the reliability of the experts and group agreement are used for that purpose. Finally, HDM sensitivity analysis is brought in to study the robustness of the rankings, especially at the technology level, that may be caused by potential changes in the national strategic direction.

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## **TE-12 Technology Management in Telecommunication Industry - 1**

**Tuesday, 8/4/09, 16:00 - 17:30**

**Room: Galleria-2**

**Chair(s) Boemo-Mokhawa Nametsegang; Portland State University**

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### **TE-12.1 [R] A Study of the Relationships between Service Failures and Customer Churn in a Telecommunications Environment**

*Michael J Perez; University of Texas at San Antonio, United States*

*William T Flannery; University of Texas at San Antonio, United States*

Telecommunications companies are facing increasing customer service pressure as they launch the triple-play bundle of voice, video, and internet access services. Firms recognize that providing quality customer service in the highly competitive telecommunications industry is critical to their success, and delivering poor customer experiences puts customer relationships and revenues at risk. One of the metrics used by telecommunications companies to determine their relationship with customers is customer churn, the degree to which a telecommunication company's customers cancel or disconnect their service. An assumption in the industry is that customer churn is directly related to customer satisfaction. The purpose of this research is to identify customers with service failures and determine the propensity for a customer to disconnect based upon the frequency of a recent service failure reported and the success of repair. The research shows that customers who subscribe for the triple-play of voice, video and internet access are more likely to cancel all services from their provider after a service failure than are other customers. The results of the research suggest a strategy for identifying customers in advance who are most likely to disconnect and developing a service request response plan to encourage them to remain loyal customers.

### **TE-12.2 [R] Interaction of Deregulation and Network Externalities in an Accelerated Diffusion of Mobile Telephony**

*Kai-Sheng Kao; National Communications Commission, Taiwan*

*Feng-Shang Wu; Chengchi University, Taiwan*

**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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*Wen-Lin Chu; Chengchi University, Taiwan*  
*Mao-Shong Lin; Chengchi University, Taiwan*

The penetration of mobile telephony exceeded 100 percent in only two countries in 2002, and with a penetration of 108 percent, Taiwan was the higher of the two. This study identifies the impetuses behind the accelerated growth of mobile telephony in Taiwan, in terms of the diffusion model and forces driving the diffusion. The model comparison methodology is introduced to identify the most appropriate diffusion model. The driving forces for the diffusion rate of the model are then estimated. Empirical results, based on data for 1988-2007, indicate that the logistic model performs best. Network externalities explain the dynamics and superiority of the logistic model. Deregulation results in market competition, making it the primary driver for the diffusion. This empirical study also demonstrates that deregulation promotes the diffusion to the takeoff point, which is critical to a self-sustaining diffusion. Overall, network externalities are in conjunction with the deregulation to push the rapid diffusion in Taiwan.

## **TE-12.3 [R] Number Portability to Internet Phone: Consumer Demand and Welfare**

*Jung-Eun Ku; ETRI, Korea, South*  
*Sang-Woo Lee; ETRI, Korea, South*

Even though Internet phone service continues to evolve in terms of quality and competitive pricing compared with the public switched telephone network (PSTN), the number of Internet phone subscribers is still lower than what experts had forecasted for South Korea. Thus, in 2008, the Korean government decided to apply number portability to Internet phone service (IPS) to revitalize the market. In this study, we construct utilities of Internet phone number portability (INP) to analyze the need for INP in the Internet phone market and express its value in monetary terms to measure consumer welfare with a constructive contingent valuation approach based on the value-structuring capabilities of multi-attribute utility theory (MAUT). With this methodology, we investigate the willingness of 316 current PSTN subscribers in South Korea to pay for INP. We apply a specific survey method called double-bounded dichotomous choices (DBDC) to obtain accurate data. The results show that INP is the key attribute for expanding the IPS market, and the calculated value of INP positively impacts consumer welfare.

## **WA-00 PLENARY - 3**

**DATE: WEDNESDAY 8/5/2009**

**TIME: 08:30 - 10:00**

**ROOM: PAVILION**

**CHAIR: DR. RENJENG SU, DEAN**

**MASEEH COLLEGE OF ENGINEERING &  
COMPUTER SCIENCE, PORTLAND STATE  
UNIVERSITY**

## **WA-00.1 [K] Models and Metrics for the Technology Transfer Process from Federal Labs to Application and the Market**

*Albert H. Rubenstein; IASTA, Inc., United States*

The author and his colleagues have worked with over a dozen federal agencies, as well as many industrial firms, on the process of getting new technology out of their labs and into their own innovation programs and/or into the broader markets of industry and other agencies. The focus of this paper is on metrics and flow models for the outputs, at each stage of the process, and the barriers and facilitators that impede or enhance the flow. It deals with the notorious Valley of Death that slows or sinks items of technology at various stages of the R&D/innovation process. It suggests standard methodology for identifying and measuring the impacts, outputs, barriers and facilitators encountered in the flow. Criteria trees are suggested for connecting stage outputs to the Critical Success Factors (CSFs) of the operating units, parent organizations and other sponsors and clients served by the labs.

Some examples of common barriers and facilitators are given, including the over-focus of many Technology Transfer Offices on paper intellectual property (IP), such as patents and licenses, versus real outputs and impacts, such as new products and applications of technology that are transferred to and adopted by the various types of potential users of the technology. Specific examples are also drawn from studies by the author and his colleagues in the fields of aerospace and automotive research; homeland security, agriculture, transportation, health care, and military R&D; and environment, energy and materials R&D.

## **WA-00.2 [K] Growing the Next Generation of Inventors and Innovators to Solve the Worlds Problems**

*Julia Novy-Hildesley; Lemelson Foundation, United States*

As we face the current global economic and environmental crisis, invention is arguably more important today than ever before. We need to inspire and nurture the next generation of inventors and ensure that life-improving and livelihood-generating technologies get into the hands of the nearly three billion people living on less than two dollars per day. This presentation will discuss: \* The Lemelson Foundation is working with partners to design educational approaches that engage high school and university students in invention, creating a pipeline of future inventors whose technologies will spark new enterprises, leading to job creation and social and economic development. For example, over the past 15 years, the National Collegiate Inventors and Innovators Alliance (NCIIA) has launched hundreds of courses and student teams, leading to over 100 patents and enterprises based on new technologies. \* Innovative ways the Foundation is funding social enterprises in developing countries through grants, loans and equity investments that are designing and disseminating sustainable technologies in the areas of water, energy, health, agriculture, and biodiversity. For example, the Solar Electric Light Company (SELCO) in India has designed affordable solar technologies, ranging from lanterns and head lamps to home lighting systems, to serve families living at the base of the economic pyramid. SELCO has employed creative marketing, financing and distribution strategies to ensure the company's profitability.

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## **WB-03 Project / Program Management - 4**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Broadway-1**

**Chair(s) TBD**

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## **WB-03.1 [R] Project Strategy: Selecting the Best Project Structure**

*Michael Poli; Stevens Institute of Technology, United States*  
*Hasan S Mithiborwala; Stevens Institute of Technology, United States*  
*Rado Maksimovic; University of Novi Sad, Serbia-Montenegro*  
*Bojan Lalic; University of Novi Sad, Serbia-Montenegro*

This paper describes a proposed methodology for research into determining if there is an appropriate organizational structure to use for a specific project type. Too often organizations use only one particular organizational structure for their projects. Unfortunately, one size does not fit all. Form must fit function. Project managers must be able to choose the organizational structure which is appropriate for their project and thus position their project for success. This research will look at the organizational structure employed for various real life projects and will try to determine if distinct patterns of organizational structure are observed for specific project types and whether the organizational structures employed had an effect on project success (i.e., which organizational structures when employed with which project types led to project success and which did not). The researchers believe that choosing an appropriate organizational structure for a specific project type will position a project to be more successful thus enabling that project to create better business results and achieve the competitive advantage and value that the organization envisioned.

## **WB-03.2 [A] Beyond Risk Management: Assessing and Managing Program Challenges**

*Aaron J Shenhar; Rutgers Business School, United States*  
*Dov Dvir; Ben-Gurion University, Israel*  
*Joca Stefanovic; Stevens Institute of Technology, United States*

Traditional, well-established risk management techniques are not always working. The

**Note: [R] = Research Paper; [A] = Industry Application**

# SESSIONS

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evidence is well-known: Two of the most important and much anticipated commercial airplane development programs have recently suffered embarrassing delays in execution and delivery schedules. Airbus and its parent company, EADS, had to push A380s entry into service by 19 to 24 months. And Boeing has announced that its 787 Dreamliners delivery to customers will be delayed by at least a year. Clearly, these delays have significant consequences for the two companies and for the transportation industry. There is no doubt that both Airbus and Boeing are quite familiar with risk management techniques. So what happened? How could such experienced and well-managed companies fail so painfully in their main lines of business aircraft building? In this presentation we show that although the traditional techniques of project planning and risk management form the basic and necessary foundation for training project managers, they are insufficient to deal effectively with today's dynamic, risky, and changing projects. Project managers of complex programs must go beyond the classical techniques. We present four myths in the traditional approach to project risk management and contrast them with the realities of modern project management. We suggest that the risk management framework should be expanded to assess, not just what can go wrong, but also how can we get it right and how long will it take. We will offer practical guidelines on how to make this work by assessing both the risk and the challenge in each project.

## **WB-03.3 [R] Improving Project Portfolio Management with Strategic Alignment**

*Supachart lamratanakul; Asian Institute of Technology, Thailand*  
*Ravi Shankar; Asian Institute of Technology, Thailand*  
*Nicholas J Dimmitt; Asian Institute of Technology, Thailand*

This study describes how to apply a project portfolio management approach to a specific selection of projects by using information obtained from the real world. More precisely, there are three major goals specified for project portfolio management: maximizing the value of the portfolio (MVP), balancing a portfolio, and aligning a project portfolio with a business strategy. For the first goal, selecting the MVP projects, the optimization technique is used to determine the optimum portfolio since it portrays a systematic way to find a solution. To balance a portfolio, visual techniques are used to make the right balanced portfolio. Finally, we conclude with the result which came from applying mediation regression analysis to achieve the mediating influence of the alignment. The results establish the context in which to measure the alignment between business strategy and project portfolio on business performance. It also provides a platform to study the alignment between project portfolio and business strategy that could leverage the growing appreciation of this subject.

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## **WB-05 Technology Management in IT Industry - 1**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Broadway-3**

**Chair(s) David Bartlett; IBM**

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### **WB-05.1 [R] A Framework for Assessing the Cost of IT Investments**

*Per Narman; KTH Royal Institute of Technology, Sweden*  
*Teodor Sommestad; KTH Royal Institute of Technology, Sweden*  
*Sofia Sandgren; IBM, Sweden*  
*Mathias Ekstedt; KTH Royal Institute of Technology, Sweden*

Assessing life cycle costs of IT is a difficult endeavor. There are several factors that contribute to the life cycle costs of IT. Many of these factors are of a technical nature, such as development costs or integration costs. A substantial part of the costs are, however, caused by organizational factors such as the changes in the introduction of an IT-system imposed on business processes and the temporary loss of productivity this causes, or the cost of training system users before taking the system into operation. This paper proposes a framework for IT investment cost assessment. The framework integrates factors as proposed by already existing IT cost estimation frameworks and literature on the subject to be able to take into account both technical and organizational factors and cost drivers related to IT life cycle costs. The framework assists in quantifying these factors together with the costs they influence thereby providing more complete and accurate decision support to executives faced with having to make investment decisions. The paper also describes how the frame-

work's usefulness has been validated in two case studies at a large Nordic power company.

### **WB-05.2 [R] Users and Information Technology Interoperability: Analysis of Task Information Fit Model**

*Nuri A Basoglu; Bogazici University, Turkey*  
*Sinan Cayir; Istanbul Technical University, Turkey*

The main reason for the existence of information technologies is to collect, record, store, transfer, aggregate and present the vital information for the organization when requested. Current information technologies used in the organizations vary from tightly integrated ERP systems to broadly distributed information systems. What makes the system used most appropriate or valuable is definitely neither the complexity, nor the integration level. A distributed information system can be designed to better suit the information requirements of the business than a tightly integrated one. This research is focused on the measures of successful information systems considering if they present the right information with proper format when it is required. A task information fit (TIF) model is proposed. The model is verified based on student course registration system scenario. The factors affecting the attitude of users towards using the systems are explored.

### **WB-05.3 [R] Improving the Value Assessment of IT Investments: A Case Study**

*Pia Gustafsson; KTH, Royal Institute of Technology, Sweden*  
*Jakob Hult; Industrial Information and Control Systems, KTH, Sweden*  
*Henrik Lofgren; Industrial Information and Control Systems, KTH, Sweden*

A recent survey showed that 90 percent of the studied companies claimed that they have full control of their IT-costs but less than 10 percent have the same control of the value the IT adds. Even though the figures can be questioned, they show of a large uncertainty within the companies regarding IT value. The lack of processes and methods to support follow up of the investments lead to that companies fail to perceive if the benefits are realized or not. In order to make smarter investment decisions, companies must have better control of their investments through a proper evaluation of benefits. This work presents a framework that describes a method and suggested tools of how the business values of an IT investment can be assessed within a company. The framework combines existing methods for practitioners within the area of investment evaluation together with research findings. In a case study a gap analysis was performed among five different IT projects of different sizes and the framework. The case study shows in which areas the projects fail in their value assessment work.

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## **WB-06 Public Sector - 1**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Broadway-4**

**Chair(s) Paul R Newman; Portland State University**

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### **WB-06.1 [R] Technology Management in Turkish Defense Industry**

*Bulent Gumus; TOBB University of Economics and Technology, Turkey*  
*Verda Demir; TOBB University of Economics and Technology, Turkey*  
*Unver Kaynak; TOBB University of Economics and Technology, Turkey*

The Turkish defense industry has been growing significantly since the 1970s. The majority of the \$416 million USD reserved for the R&D budget in 2005 was spent for the defense and aerospace industry. The total revenue of the defense companies in Turkey was around \$2.2 billion USD in 2008. The Undersecretariat for Defense Industries (SSM) of Turkey aims to increase the average portion to meet the system requirements through local infrastructure to 50 percent and also to increase the export of defense services and goods to \$1 billion USD by 2011. SSM also plans to quadruple the portion of Turkish defense industry in the NATO projects. Companies operating in the defense sector utilize the latest technologies and they have to cope with the fast pace of changes in the technology. On the other hand, the Turkish defense industry is growing significantly and aiming to keep and even accelerate this growth. Therefore, technology management plays a vital role in the Turkish defense industry and this research investigates its current status of technology management.

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## **WB-06.2 [A] Process Management in the Public Sector: A Brazilian Case Study**

*Monica R Biazzi; Escola Politécnica USP, Brazil*

*Antonio Rafael N Muscat; Escola Politécnica USP, Brazil*

*Jorge L Biazzi; FEA/USP, Brazil*

In the last decades, the public sector has been under pressure for improving its performance and showing more transparency and assessment of results. Historically, the Brazilian public sector has developed a departmental and bureaucratic structure, which makes difficult the activity coordination and service efficiency and efficacy. In this scenario, process management provides an alternative to the static and fragmented structure of organization, with a systemic vision, focused on the customer or citizen. Additionally, process management emphasizes process improvement, reached by information technology implementation and technology changes. Thus, process management and technology management are interdependent. In this context, the objective of this work is to present the adoption of process management and expose the usefulness of information technology to support operations and measure performance indicators, in a centenary Public Institution of Undergraduate Education (PIUE), during a project of administrative process improvement. The methodology used was the case study, with qualitative and quantitative approach. The results obtained, measured by performance indicators, were very satisfactory, since the studied process has reached significant improvement with respect to throughput time and quality of output. Moreover, given the major need for improvement of the processes of the public sector, the case description and the analysis of the results present evident practical application, providing a base for future work.

## **WB-06.3 [R] Information Industries Cluster Influences Social Development to the District: Take Hsinchu Science as an Example**

*Yu-Ning Hu; National United University, Taiwan*

*Chun-Te Lin; Yu Da College of Business, Taiwan*

Hsinchu Science Park (HSP) is a good industry-cluster model for hi-tech business. Its success made lots of politicians promise to also build one in their regions. But is the region suitable to establish a science park? What kind of industry fits into the regions? Are science parks positive or negative for regional development? This research is an important reference to the correct business policy. The research on HSP and its influence on the Hsinchu area can help us to know the correct regional development policy.

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## **WB-07 Science and Technology Policy - 2**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Forum Suite**

**Chair(s) Deok Soon Yim; Gyeonggi Research Institute**

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## **WB-07.1 [R] Two-stage R&D Efficiency Evaluation from the Perspective of National Innovation System**

*Dian Yan Liou; Yu Da College of Business, Taiwan*

Following the approaching of the knowledge economy, countries worldwide pay increasing attention to technology innovation; especially at the time of a changing global economical and trade environment, technology has great influence on national competitiveness. Hence, regardless of the establishment of technological policy, the investment of R&D funds and manpower, they are all closely connected to national overall objectives, which have a crucial impact on the promotion of national competitiveness. This research is an exploratory study, mainly combining the competitiveness index and NIS to establish a two-stage R&D efficiency evaluation model. We gathered the information from the World Competitiveness Yearbook made public by IMD, Main Science and Technology Indicators (MSTI) from OECD, statistical data from US Patents and Trademark Office (USPTO), CD-ROM data of National Science Indicators (NSI) published by the International Statistical Institute (ISI) and used two-stage data envelopment analysis (DEA) to analyze 15 countries R&D efficiency and its ranking in evaluation. The research found the R&D activities in six countries on technological objectives are effective after applicable NIS was determined.

## **WB-07.2 [A] Analyzing Intellectual Capital Cluster Index in Thailand's Hard**

## **Disk Drive Cluster**

*Chayakrit Charoensiriwath; National Electronics & Computer Tech. Center, Thailand*

Thailand is now the world's largest exporter of hard disk drive (HDD) with four HDD giants (Seagate Technology, Hitachi Global Storage Technology (HGST), Fujitsu and Western Digital) that all have their production bases in the country. Together with companies supplying materials to these four manufacturers, Thailand hosts almost the entire supply chain of the industry. However, there was no formal technology transfer process within the industry between multinational companies (MNCs) and local SMEs. It was not until recently that the Thai government established the Hard Disk Drive Institute (HDDI) to formally develop national capability on the HDD technology. With financial support from the government through the National Science and Technology Development Agency (NSTDA), HDDI supports collaborative research between local universities and the HDD industry. This study aims to identify key indicators to monitor the technology transfer process within the HDD cluster in Thailand. The Intellectual Capital Cluster Index (ICCI) is applied to combine these indicators. The results of this research will provide the government with a guideline to monitor and create supportive policies to facilitate the technology transfer process within the cluster.

## **WB-07.3 [R] Public Innomediary as Driver for Open Innovation in National Innovation System**

*Chia-Han Yang; National Chiao Tung University, Taiwan*

*Chen-Hsing Li; National Chiao Tung University, Taiwan*

*Joseph Z. Shyu; National Chiao Tung University, Taiwan*

This research aims to analyze the role of public innomediaries as drivers for fostering technology diffusion through open innovation in a national innovation system. Particularly, an empirical case study of technology transfer center in ITRI from Taiwan will be discussed to explain the business model of public innomediary devised in this study. This research reveals that the public innomediaries, such as the technology transfer center in ITRI, have advantages of multiple technology channels, industrial and technological reputation, industrial visibility, public platform and network of technological demand, thereby operating their process of technology search, sorting, reconfiguration, and delivery for technology diffusion and further building a friendly environment of open innovation in a national or regional innovation system.

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## **WB-08 Knowledge Management - 1**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Council Suite**

**Chair(s) Atsushi Aoyama; Ritsumeikan University**

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## **WB-08.1 [R] Harmonizing Emergency Management Knowledge Representation**

*Petri Linna; Tampere University of Technology, Finland*

*Jari Leppäniemi; Tampere University of Technology, Finland*

*Jari Soini; Tampere University of Technology, Finland*

*Hannu Jaakkola; Tampere University of Technology, Finland*

Despite technological advances, the interoperability of the information and decision support systems of the various parties in the emergency and crisis management community remains a difficult task. The Finnish Emergency Response Center (ERC) is responsible for taking all emergency calls in any emergency. This operating model differs from the operating models in most countries, in that the ERC operators can alert all the necessary authorities directly. The response plans (RP), which are the procedures and instructions on how to react and whom to alert in case of a particular emergency situation, are scripted by the corresponding authorities (rescue, health, police, etc.) and ERC officers are obligated to follow the plans. Currently, the Finnish ERC is specifying a new software system and this study was set up in part to support some of the needs of this large national project. This paper discusses how a business process modeling notation (BPMN) could be adapted in a multi-authority field and whether BPMN is suitable for the demands of emergency authorities. Another aim was to describe and specify the relevant organizational structure and the interfaces required in the response plans. The modeled process descriptions were clarified by investigating literature

# SESSIONS

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sources and through discussions with emergency experts. The results show how process descriptions could be used to harmonize the emergency response plans and organization in the Finnish Emergency Center. Process descriptions can also help the ERC to carry out requirement engineering for their new emergency management system.

## **WB-08.2 [R] A Competence of Firm-level Knowledge Accumulation in Enterprises**

*Wen-Hsiang Lai; Feng Chia University, Taiwan*

The global economy has been gradually developing and aiming to promote the economic growth and to propel the industrial production. This article analyzes the competence of knowledge accumulation in Taiwans enterprises by expert interviews, analytic hierarchy process (AHP), and fuzzy set theory. This article shows that the competence of knowledge accumulation can be divided into three major influential variables: knowledge integration ability (KIA), knowledge absorption ability (KAA), and knowledge sharing ability (KSA). The findings indicate that KIA in firm-level knowledge accumulation performs the highest degree of influence among the three influential variables. Based on the literature and expert interviews, three sub-variables of systematic ability, mutual coordination ability, and conventionalization ability are extracted from the KIA variable. The results of fuzzy analysis indicate that "systematic ability" has a significant impact on knowledge accumulation. Furthermore, knowledge creation, access, and accumulative capacity assist in an enterprises innovation, development strategy, and competitive advantage to integrate, absorb and share knowledge.

## **WB-08.3 [R] Employee Commitment, Knowledge Sharing and Knowledge Integration: An Empirical Study of Professional Staffs in Chinese Firms**

*Mei-lian Zheng; Zhejiang University of technology, China  
Gongmin Bao; Zhejiang University, China  
Yuanyuan Qian; school of management, Zhejiang university, China*

Knowledge sharing and knowledge integration (KSI) is an important process in modern organizations, as successful KSI can result in shared and innovated intellectual capital, an increasingly important resource. This paper presents an empirical study, which examines the influences of employee commitment on KSI in the context of China. Considering the object of employee commitment can be any entity, and the characteristics of work-related environment of professional staffs, our research framework included employee commitment to occupation, organization, supervisor and co-worker besides KSI. Data collected from 949 auditors working in Chinese public accounting firms demonstrated that: employee commitment to occupation had a significant positive effect on their organizational commitment, supervisory commitment and co-worker commitment; and employees organizational, supervisory and co-worker commitment had a strong, positive influence on KSI; but although employees occupational commitment had only significantly influenced knowledge sharing, its effect on knowledge integration was not significant; namely, occupational commitment influenced knowledge integration by the full-mediation of organizational commitment, supervisory commitment and co-worker commitment; moreover, knowledge sharing had a significantly positive impact on knowledge integration also. Based on these results, this paper concludes with a discussion of the implications and limitations of the research.

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## **WB-10 Decision Making in Technology Management - 3**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Studio Suite**

**Chair(s) Donald E White; Cal Poly University, San Luis Obispo**

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### **WB-10.1 [R] Heuristics in Decision Making**

*Fatima M Albar; Portland State University, United States  
Antonie J Jetter; Portland State University, United States*

Heuristics are simple rules of thumb for problem solving that follow a logic that is quite different from consequential logic. They have long been regarded as an inferior technique for decision making that is the source of irrational decision behavior. Recently, decision making researchers have demonstrated that some heuristics are highly efficient and can compete with complex decision models in some application domains. This paper explores the differ-

ent streams of research, summarizes the state of the art decision making model, and discusses its implications for complex decisions in engineering and technology management.

### **WB-10.2 [R] A Fuzzy Inference Automatic Negotiation System with Bayesian Learning**

*Yuying Wu; Beijing University of Technology, China  
Jiyun Li; Beijing University of Technology, China  
Feng Yan; Beijing University of Technology, China*

Real-world negotiations are characterized by complex negotiation spaces, tough deadlines, bounded agent rationality, very limited information about the opponents, and volatile negotiator preferences. Classical negotiation models fail to address most of these issues. Practical negotiation agents with an effective and efficient fuzzy inference to deal with complex and incomplete negotiation spaces arising in real-world applications are proposed. The agent with the fuzzy inference determines the values of the new offer through the set of fuzzy rules. An evolutionary algorithm with Bayesian learning of its opponent's preferences according to the history of the counter offers and genetic algorithms (GA) are used to optimize the parameters of the fuzzy rules. Simulation shows that responsive and adaptive negotiation agents work for real-world negotiations.

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## **WB-11 Emerging Technologies - 2**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Galleria-1**

**Chair(s) Pisek Gerd Sri; Portland State University**

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### **WB-11.1 [R] The Potential of Emerging Technologies: Strategy-Planning for Technology-Providers throughout an Application-Radar**

*Dieter Spath; Fraunhofer Institute for Industrial Engineering, Germany  
Antonino Ardilio; Fraunhofer Institute for Industrial Engineering, Germany  
Stefanie Laib; Fraunhofer Institute for Industrial Engineering, Germany*

The increasing divergence and the decreasing half-life period of technologies combined with the growing global competition in the development of technologies force technology providers to comply with the rules of the free market economy and to consider the market needs more intensively in their future technology developments. The establishment of a technology development strategy is quite a demanding task, especially for emerging technologies where future application fields are not understood in detail or are unclear. Subsequently, a general development strategy remains only partially solved. A method for the analysis of technology potential will be introduced in this paper. It addresses these issues and supports its user in the identification of actual and future applications of emergent technologies and the formulation of a technology development strategy. The methodology addresses the following main questions: Do any attractive applications exist which can be addressed by the technology in their actual requirement profile? How must the technology be developed further in order to meet the requirements of the most attractive future markets? The methodology will be introduced and demonstrated through a case study conducted within a research project in the measurement technology area.

### **WB-11.2 [R] Application of Timing Option for Preventing the Opportunity Loss in Japan's Biotech Start-ups**

*Takao Fujiwara; Toyohashi University of Technology, Japan*

Biotech start-ups are expected as a rapid commercialization method from life science rather than big pharmaceutical companies. There are about 300 public companies in 1500 biotech start-ups in the U.S.A., but only 22 public companies in about 500 biotech start-ups in Japan. Why is there such a big numerical difference between both countries? As a main key word, timing option is defined as the deferring valuable rights also as a call option to timely start a project in real options. It is considered as a useful tool to decide the optimal timing in trade-off between the irreversible investments as sunk costs and the risky but promising biopharmaceutical projects. If all business chances are assumed as perpetual American call options, we can characterize, calculate and forecast the optimal timing of project starting by parameter setting. Objectives of this paper are to seek the characteristics of the optimal start timing, to understand model structures, and to forecast the optimal timing. Implica-

# SESSIONS

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tions are to understand the trade-off between the deferring for uncertain reduction and the opportunity cost of not yet deciding, to control the optimal timing, and to improve the development of innovative new drug from life science.

## **WB-11.3 [R] Developing a Framework for Mapping Industrial Emergence**

*Robert Phaal; University of Cambridge, United Kingdom*  
*Eoin O'Sullivan; University of Cambridge, United Kingdom*  
*Clare Farrukh; University of Cambridge, United Kingdom*  
*David R Probert; University of Cambridge, United Kingdom*

The industrial landscape is becoming increasingly complex and dynamic, with innovative technologies stimulating the emergence of new industries and business models. This paper presents a preliminary framework for mapping industrial emergence, based on roadmapping principles, in order to understand the nature and characteristics of such phenomena. The focus at this stage is on historical examples of industrial emergence, with the preliminary framework based on observations from 20 quick scan maps, one of which is used to illustrate the framework. The learning from these historical cases, combined with further industrial consultation and literature review, will be used to develop practical methods for strategy and policy application. The paper concludes by summarizing key learning points and further work needed to achieve these outcomes.

## **WB-11.4 [R] Study on Emerging Technology Selection and Evaluation by Technology Foresight and Fuzzy Consistent Matrix**

*Lucheng Huang; Beijing University of Technology, China*  
*Wenguang Lu; Beijing University of Technology, China*  
*Xin Li; Beijing University of Technology, China*

It is the precondition and foundation of emerging technology selection and evaluation for commercialization and industrialization of emerging technology. This paper has studied the definition and characteristics of emerging technology and fully reviewed the methodologies for emerging technology selection and evaluation, conducted the emerging technology selection and evaluation by introduction of the technology foresight into the setting-up of evaluation indexing system, used fuzzy consistent matrix for emerging technology selection and evaluation.

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## **WB-12 Sustainability - 1**

**Wednesday, 8/5/09, 10:30 - 12:00**

**Room: Galleria-2**

**Chair(s) Kelly R Cowan; Portland State University**

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## **WB-12.1 [R] Characteristics of Value in Green Technology Investments**

*Aija Tapaninen; Tampere University of Technology, Finland*  
*Marko Seppanen; Tampere University of Technology, Finland*

The large potential of bio-energy technologies remains untapped, and awaits exploitation. To compete successfully against rivals, suppliers have to design innovation characteristics of offerings that potential customers can value. The purpose of the study is to address the issue of the characteristics of innovation and thereby contribute to the existing literature in two ways: investigating the existing body of knowledge and examining the perceived characteristics of an innovation to analyze the value for the customer within the context of green investments. The study considers how to classify the perceived adoption criteria according to the innovation characteristics in order to analyze the value for the customer within the context of green technology investment. The results, based on content analysis, indicate that different characteristics seem to have several patterns in assessing the adoption of wood pellet heating systems. Especially, some characteristics of innovation have only limited value in assessing the adoption of a long-term green investment. Further, the findings provide several practical implications of how the value for the customer of green technology investments can be promoted as well as gateways for future studies.

## **WB-12.2 [R] Why Go Green?: The Effects of Internationalization, Path-dependency, and Environmental Uncertainty**

*Yu-shu Peng; National Dong-Hwa University, Taiwan*

*Chin-jung Luan; National Dong-Hwa University, Taiwan*  
*Chia-Ching Chou; National Dong-Hwa University, Taiwan*

The purpose of this study aims to depict the relationships between the degree of internationalization, industry pressure, firm resource and the adoption of a voluntary environmental program (ISO 14001). We employed a data set composed of 357 firm-year observing points from the sampling listed firms in Taiwan during the period from 2001 to 2008. Empirical results suggest that a firm's degree of internationalization has a significant impact on the certification of ISO 14001. Notably, both significantly positive and negative impacts on the certification of ISO 14001 are due to different measurements of internationalization. A positive relationship between the experience of ISO 9000 and ISO 14001, and a negative relationship between environmental uncertainty and ISO 14001, are also confirmed in this study.

## **WB-12.3 [R] Environmental Value Stream Mapping (EVSM) as Sustainability Management Tool**

*Alvair Silveira Torres Jr.; University of Sao Paulo, Brazil*  
*Ana Maria Gati; University of Sao Paulo, Brazil*

From an action research type of investigation, the current paper reports the development of a managerial tool with the purpose to align the economical and environmental aspects in production process by mapping strategy. This study was applied in an alcohol and sugar manufacturing industry. The tool is called Environmental VSM (EVSM). After the tool development, future development alternatives are discussed.

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## **WD-01 TUTORIAL: Managing Corporate Technology Through the Balanced Business Scorecard and Other Methods**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Pavilion East**

**Speaker(s) Birgit J Oberer; University of Applied Sciences Wiener Neustadt**

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In this tutorial participants will learn how to manage corporate technology using the balanced business scorecard. Additionally, other methods for doing corporate technology management will be shown. It is increasingly becoming crucial to achieve organizational and strategic goals. A framework will be presented for evaluating information and technology management strategies based on balanced business scorecard approach and the way to develop a corporate technology management balanced scorecard is shown. After attending this tutorial, participants will know how to design an evaluation framework for information and technology management strategies. The presented framework is a strategic management tool that enables management decision makers to follow up the measures and to drive performance based on the goals that were set and agreed upon in advance.

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## **WD-02 Innovation Management - 5**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Pavilion West**

**Chair(s) Charles M Weber; Portland State University**

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## **WD-02.1 [A] Management Issue of Government Initiated Innovation Cluster: Case of Gwanggyo Techno-Valley**

*Deok Soon Yim; Gyeonggi Research Institute, Korea, South*

Many governments are trying to enhance national technological competitiveness by developing a kind of innovation cluster. Science park, technology park, or Innopolis - regardless of the name - are the kinds of innovation clusters. It is known that there are many success factors of innovation clusters such as location, availability of high quality manpower, good living environment, good universities and so on. Since many of the innovation clusters were supported by central/local governments, the governance itself influences the performance of an innovation cluster. However, little thought was given to the governance and management of the innovation cluster. In the presentation, the theories of the innovation cluster are briefly reviewed, especially in the perspective of governance and management. The experience of Gwanggyo Techno-Valley (GTV) suggests that the governance issue was not properly considered, even though it is very important for the future performance of the GTV. Finally, it can be learned that a more detailed action plan with the right management body

# SESSIONS

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is necessary in the case of regional government-driven innovation cluster development.

## **WD-02.2 [R] IT Industry Development by Dynamic Transformed Human Networks in Sapporo Valley**

*Seiko Hayashi; Tokyo Institute of Technology, Japan*

*Koji Tanabe; Tokyo Institute of Technology, Japan*

Sapporo Valley in Hokkaido of Japan has IT industrial accumulation that has been spontaneously generated since the middle of the 1970s. Sapporo Valley has 247 IT companies with sales of 366 billion yen and employment of 16,085 people in the fiscal year 2007. The human networks among members (university professors, CEOs of IT companies, journalists and local government officers) have been formed in Sapporo Valley through the participation in the study groups and the projects. The collaboration between those networks has deepened by joint activities and the networks dynamically transformed according to the changes of the circumstances. Many spin-off companies have emerged by the support of those human networks in Sapporo Valley. This paper attempts to demonstrate that the dynamic transformed human networks and has cultivated their members entrepreneurship and has contributed to the development of the IT industry in Sapporo Valley. They can be thought of as a regional innovation system.

## **WD-02.3 [R] Complementary Strategic Capabilities and Innovation Capabilities: Cases on Emerging Economies**

*Carlos E Atoche-Kong; Tecnológico de Monterrey, Mexico*

This study analyzes the process of technological capabilities creation in organizations in emerging economies using the resource-based view of the firm. The literature has studied this phenomenon without taking into account the external context, in developed countries, or using macro perspectives, in emerging economies. It uses a longitudinal multiple-case design in order to identify the nature of this process, analyzing the emergence and enhancement of organizational capabilities. I identify Capabilities Development Trajectories, where organizational capabilities have evolved into technological capabilities, shortening the traditional path-dependent cycle in the creation of innovation capabilities. A capabilities trajectory framework is proposed. This study analyzes the process of technological capabilities creation in organizations in emerging economies using the resource-based view of the firm. The literature has studied this phenomenon without taking into account the external context, in developed countries, or using macro perspectives, in emerging economies. It uses a longitudinal multiple-case design in order to identify the nature of this process, analyzing the emergence and enhancement of organizational capabilities. The author identifies Capabilities Development Trajectories, where organizational capabilities have evolved into technological capabilities, shortening the traditional path-dependent cycle in the creation of innovation capabilities. A capabilities trajectory framework is proposed.

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## **WD-03 Project / Program Management - 5**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Broadway-1**

**Chair(s) Dov Dvir; Ben-Gurion University**

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### **WD-03.1 [R] Project Strategy: Success Themes for Strategic Projects**

*Zhiye Huang; Central University of Finance and Economics, China*

*Michael Poli; Stevens Institute of Technology, United States*

*Hasan S Mithiborwala; Stevens Institute of Technology, United States*

The success rate of projects is low. Adopting a measurement regime and consistently applying it has a strong positive impact on project success. However, there is no accepted methodology for measuring project success. Key issues that impact project success are: untested claims exist about success dimensions, measures and critical variables; existing models ignore interdependency among success dimensions and management variables; existing techniques fail to measure the effects of management variables and success measures on overall project success. Project success assessment is integral to top management's decision-making process. Measures should be set prior to project initiation. A new approach is taken in developing a decision-making model to assess and forecast project success qualitatively and quantitatively. This paper deals with the multidimensional nature

of project success measurement. Success dimensions and success factors are explored to determine their impact on measuring project success. Using these results, a project success scheme is created using ANP. This success scheme is used to design a decision-making model. The proposed framework provides project stakeholders with a forecasting and diagnostic tool to evaluate progressively and objectively the projects chances of success to assist in improving overall project performance.

### **WD-03.2 [A] Dodging the Valley of Death in Project Team Management**

*David Wilemon; Syracuse University, United States*

Significant gains have been made in our knowledge of project management. Much of this knowledge has focused on creating better tools to plan, execute, and control projects. There are, however, other equally important determinants of project success. Three success drivers which have received far less attention are how project leaders gain support for their projects via their interpersonal power and influence; how they can productively deal with those who can either block or help facilitate project accomplishment; and how to manage upwards, e.g., managing key relationships with project sponsors and senior management. Without an understanding of these concepts, many project leaders will encounter performance levels not sufficient for project success. This presentation posits that the more complex the project and the more sophisticated and diverse the technology projects require, the more the concepts discussed in this paper are needed for project success. This presentation presents an integrated view of the challenges project managers as boundary spanners face in building high-performing teams and dealing with the inevitable political issues which surround every project.

### **WD-03.3 [R] Project Management in a Global Environment**

*Hardik Khetani; Stevens Institute of Technology, United States*

*Zvi H Aronson; Stevens Institute of Technology, United States*

*Audrey Curtis; Stevens Institute of Technology, United States*

Global teams are staffed with members from different nationalities and cultures working together in a globally dispersed environment to tap into expertise unavailable locally. When leading a global team, project managers ought to consider ways to manage the challenges associated with this diversity and distance without wiping out the advantages associated with them. As a project manager, understanding these differences can prove to be an asset in driving efforts towards successful project outcomes. We review cases from the literature in which differences in team members' national culture exist, and these differences influence various team performance criteria. Additionally, we review cases from the literature that point to similarities between team members who originate from different nationalities due to their occupational culture. We combine both perspectives on culture and apply to global project teams, the focus of the paper, and derive a set of hypotheses on culture mechanisms project leaders can use as levers to manage the differences created by nationality.

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## **WD-05 Technology Management in IT Industry - 2**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Broadway-3**

**Chair(s) Nuri Basoglu; Bogazici University**

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### **WD-05.1 [R] An Enterprise Architecture-based Method Enabling Quantified Analysis of IT support Systems impact on Maintenance Management**

*David M Höök; KTH, Royal Institute of Technology, Sweden*

*Pia Gustafsson; KTH, Royal Institute of Technology, Sweden*

*Lars Nordström; KTH, Royal Institute of Technology, Sweden*

*Pontus Johnson; KTH, Royal Institute of Technology, Sweden*

Enterprise Architecture (EA) is a model-based tool enabling holistic management of an enterprise's IT-system portfolio and its relation and support to the business. A domain where the relation between IT-systems and business processes is crucial for cost efficient operation is maintenance of asset dense geographically distributed processes, such as distribution of electric power. Electric power utilities invest a lot of monetary resources in maintenance without having a clear perception of how its management and processes

# SESSIONS

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should be optimized. A large proportion of these investments are related to development and integration of IT-systems. The degree of efficiency of these investments runs a risk of being low unless there is a clear understanding of how specific IT system solutions impact the maintenance process. The suggested method provides managerial support for rationalizing decisions concerning IT-systems' support of maintenance management by combining EA with the concept of the Balanced Scorecard. Extended Influence Diagrams (EIDs) are introduced to enable quantitative analysis of how cause and effect between IT-systems and the performance of maintenance processes are related to each other.

## **WD-05.2 [R] Analyzing IT Impact on Organizational Structure: A Case Study**

*Pia Gustafsson; KTH, Royal Institute of Technology, Sweden*

*David M Höök; KTH, Royal Institute of Technology, Sweden*

*Evelina Ericsson; KTH, Royal Institute of Technology, Sweden*

*Joakim Lilliesköld; KTH, Royal Institute of Technology, Sweden*

Each year companies spend millions of dollars on IT investments hoping they will lead to higher profits. There are many methods for analyzing what these investments actually bring back to the companies, but unfortunately, they are not stringent enough to make the analysis repeatable. This means that different investments cannot be compared to each other. The management paradigm of Enterprise Architecture (EA) is commonly used to structure a company from a holistic perspective. In this paper, an EA framework for assessing an IT-system's impact on an organization's business value through changes in its structure is validated. The foundation of the framework is a Bayesian inference engine allowing quantified analysis. For practical usage, this analysis framework is also expressed through modeling the organization with a metamodel. Together they form a structured method for quantitative analysis of the IT impact on organizations. An IT system for maintenance management within a European electric power utility has been used as a case study to validate the method. The organization and IT support have been modeled using the proposed metamodel and thereafter analyzed with the Bayesian network. The study has been conducted using guided interviews and a survey. The results from this study of how the business value has been influenced are compared to the user's perceptions on how the business values have changed are also presented in this paper.

## **WD-05.3 [R] Introduction of Information System and Database Integration Capability in Supply Chain Management: Case Studies of Mobile Display Manufacturers**

*Youngwon Park; University of Tokyo, Japan*

*Paul Hong; University of Toledo, United States*

Most of the firms in today's business environment utilize diverse information systems to sustain their competitive advantages. However, it is not uncommon that the return of investment on information technologies is not as high as expected. This is especially true with many small and medium enterprises. This paper presents a research model and examines how mobile display manufacturers implement their information systems for supply chain performance enhancement. For the purpose of this research we involve two firms and consider critical success factors of their information integration practices. A successful firm links its existing database to new information systems and aligns its information system for the larger requirements of supply chains. The other firm shows quite opposite outcomes. Based on extensive interviews with the IT executives and supply chain professionals and IT vendors within the supply chain network of these two firms, we present our findings. Lessons and implications are discussed.

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## **WD-06 Entrepreneurship / Intrapreneurship - 2**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Broadway-4**

**Chair(s) Dilek Cetindamar; Sabanci University**

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## **WD-06.1 [R] A Novel Scheme to Evaluate a Venture Business Quantitatively and Support Decision Making for Incubator by Combining Discounted Cash Flow and Bass Model**

*Kotaro Kawajiri; AIST, Japan*

*Kazuo Ohno; The International Media Research Foundation, Japan*

Although the evaluation of a value of venture business is very difficult because of its high uncertainty, incubator should evaluate the valid value of the ventures business and make a decision on allocating its resources adequately to support them effectively. A new scheme is proposed to evaluate a value and risk of venture business based on the very limited information from their business plan to support decision making quantitatively. Timing and a share of capital return at the initial public offering of the venture, licensing fee and so on can be determined by using this scheme. Future sales with business life cycle are forecasted from their business plan by applying Bass model. The validity of the scheme is verified by using the dataset of past sales of products. The present value of the venture is evaluated by discounted cash flow. The value should be reviewed by using actual sales data after the business starts. The scheme is tried to apply to a simple case study and the potential is shown to support decision making under limited information.

## **WD-06.2 [R] External Corporate Venture Capital Investment: Towards a Framework for Capturing and Measuring Strategic Value**

*Johann Jakob Napp; University of Cambridge, United Kingdom*

*Tim Minshall; University of Cambridge, United Kingdom*

*David R Probert; University of Cambridge, United Kingdom*

This paper presents the initial results of on-going research in the field of external Corporate Venture Capital (CVC) investments, i.e. equity investments of large corporations in entrepreneurial ventures which originated outside the corporation. The research is motivated by the fact that external CVC plays an increasingly important role within the strategy of corporations. Driven by a general trend towards a more open approach to innovation, companies see particular value in external corporate venturing as a tool to gain, for example, access to complementary technologies and a general window on technology developments. The review of literature in the field of external corporate venturing clearly reveals that theoretical gaps exist in understanding mechanisms for capturing value and measurements of this value. To help close these gaps, the research addresses the underlying question: How do corporations and start-ups capture and measure strategic value through external CVC investments by using embedded, multiple case studies? Following an initial set of case studies, steps towards the development of a framework for capturing and measuring strategic value from CVC investments are outlined within this paper and the resulting preliminary framework is presented. The paper closes with an outlook on ongoing and future research steps.

## **WD-06.3 [A] A Success Factor of New Digital Material Based Start-Up Company for High Technology Industry**

*Hideki Hayashida; Osaka University, Japan*

*Hiroshi Yoshida; Osaka University, Japan*

Many Japanese chemical material-based companies supply various kinds of digital materials for high technology-based industries, like semiconductor. Their market shares are over 50 percent in global. That is one of the hidden strongest industries in Japan. There are big expectations for high-tech start-up companies for playing innovative roles at the cutting edge of high technology based industries; semiconductor, display, solar cell, etc. On the contrary, there are not enough studies on digital material based start-up companies from new material development point of view. In this paper, the author reports on a case study of a chemical material based start-up company and proposes a revised business model based on the cube model, which was presented in 2007 PICMET.

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## **WD-07 R&D Management - 3**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Forum Suite**

**Chair(s) Paul R Newman; Portland State University**

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## **WD-07.1 [R] Co-evolution Process between Basic Research and Applied Research: A Case Study of $\mu$ -TAS Projects**

*Hideki Yoshida; Japan Science and Technology Agency (JST), Japan*

*Tadashi Sasa; Japan Science and Technology Agency (JST), Japan*

# SESSIONS

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*Eiichi Maruyama: RIKEN, Japan/GRIPS, Japan*

Although some preceding studies have investigated the co-evolution process of basic research and applied research, the actual interaction between them has not yet been closely observed. This study attempts to show the actual ways in which basic research and applied research interact with and influence each other, by a detailed case study of the  $\mu$ -TAS (micro total analysis system) projects undertaken by Professor Kitamori of the University of Tokyo. This study focuses specifically on his projects because he promoted both basic and applied research concurrently and managed the interaction between them. The static state of the co-evolution process in this case was examined using common indicators such as the science linkage and the co-publication of scientific articles and/or patents with the industry. In addition, the dynamics of the co-evolution process were investigated by in-depth interviews with the project members. Thus, this case study highlights three patterns of the co-evolution process. This process can be traced by the cumulative number of patent applications and scientific article publications.

## **WD-07.2 [R] Expert Identification for Multidisciplinary R&D Project Collaboration**

*Alisa Kongthon: National Electronics & Computer Technology Center, Thailand*  
*Choochart Haruechaiyasak: National Electronics & Computer Technology Center, Thailand*  
*Santipong Thairayoon: National Electronics & Computer Technology Center, Thailand*

A large-scale R&D project collaboration requires various areas of expertise, i.e., multidisciplinary, with multiple partners. Such R&D problems include global warming, emerging infectious diseases, and energy issues. One typical approach for identifying a group of expert candidates is to first come up with an initial expert and then use his/her referral to find additional experts. Hence, the traditional process relies significantly on humans and their personal interrelationships. However, with the increasing availability and accessibility of R&D information in electronic forms, one can apply techniques in the fields of information retrieval, natural language processing, and machine learning to automatically retrieve experts and their areas of expertise from such information sources. In this paper, we present an approach based on the Latent Dirichlet Allocation (LDA) method to discover experts and their associated areas of expertise from R&D bibliographic data. The LDA method could generate multiple hidden topics underlying the given data set. These topics are representatives for those multiple areas of expertise into which individual experts could be assigned. As an illustration, we apply our approach to analyze abstracts from the Compendex database in the domain of emerging infectious diseases (EIDs). Our approach can help enhance the traditional expert identification process in terms of topical coverage and unbiased selection of expert candidates.

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## **WD-08 Knowledge Management - 2**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Council Suite**

**Chair(s) Nasir Sheikh; Sharp Corp.**

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## **WD-08.1 [R] Knowledge Exchange Behaviors of Science Park Firms: The Innovation Hub Case**

*Kai-Ying Chan: University of Pretoria, South Africa*  
*Leon A.G. Oerlemans: Tilburg University and University of Pretoria, Netherlands*  
*Tinus M.W. Pretorius: University of Pretoria, South Africa*

Since the 1990s there has been a rapid growth of science parks, often established to function as engines of (regional) economic growth. Knowledge exchange between on-park firms in general, and between these firms and universities in particular, is one of the key characteristics of a science park. This paper regards knowledge exchange as a type of network behavior. The paper answers three research questions: What are the knowledge exchange behaviors of on-park firms? Can we distinguish different types of behavior among these firms? If so, what are the differences between these groups? To answer these questions, we take a relational approach in which actor and relationship features are studied in a sample of firms located at the Innovation Hub (South Africa). Preliminary results show that there are two groups of firms: on-park firms that network with other on-park firms and those that do not. Moreover, there are interesting differences between these groups: On-

park networkers have in comparison more informal ties with off-park firms than the other group (non-on-park networkers); they are able to gain more useful knowledge from private knowledge sources; and they have more access to unintended knowledge that flows in the park. Despite different knowledge exchange behaviors, the innovative performance of the groups does not differ.

## **WD-08.2 [R] Knowledge Management in a Public Research Organization: Reform of a Planning Section Service by Action Research**

*Emiko Adachi: Japan Advanced Institute of Science and Technology, Japan*

This paper addresses knowledge management of an administration section in a Japanese public research organization. The author was an administrative staff in a planning section of Institute A. Three tasks in a planning section are selected as action research to consider knowledge management and their outcome is fully described, and used in the action research. By accumulating various kinds of knowledge about tasks, the synergy between them creates new knowledge and accelerates knowledge management. Then a planning section becomes a center of knowledge assets. It is important to expand knowledge asset networks and increase the density of networks. As a conclusion, this paper presented the Research Concierge Model, which states that a planning section is at the center of a network in knowledge flow and management of communications in a research institution. A system for collecting and improving knowledge about research activities is elaborated and a planning section service is reformed successfully.

## **WD-08.3 [R] Knowledge Management and Value Creation in Public Research Centers: The Development of a Diagnosis Tool**

*Jose Luis Solleiro: National University of Mexico, Mexico*  
*Rosario Castañón: National University of Mexico, Mexico*  
*Alejandra Herrera Mendoza: National University of Mexico, Mexico*  
*Alma González: National University of Mexico, Mexico*  
*Flor I Escalante-Leyva: National University of Mexico, Mexico*

R&D centers (RDC) are organizations where knowledge and innovation management have a high priority for increasing efficiency of knowledge and creativity processes and their transformation into intellectual assets. At present, these capacities are essential for a competitiveness environment where customers demand new and better products and services. In LATAM countries, the public policies stimulate researchers according to a traditional schema mainly based on number of publications and graduated students. So, knowledge management and value creation are not common RDC evaluation. According to this premise, our R&D team has developed an evaluation tool that has been applied to 14 Mexican RDC, 10 Brazilians and 10 Chileans. The RDCs selected have an acceptable relationship with the productive sector and important contributions to science and technology in the region. The objective of the research was the evaluation of knowledge and value creation management (KVCM) in public RDCs and the identification of social and economic impact of these elements. Our findings present best practices of KVCM around the results of nine strategic areas. This project is sponsored by IDRC and FLACSO Mexico.

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## **WD-09 Science and Technology Policy - 3**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Directors Suite**

**Chair(s) Fred Y Phillips; Maastricht School of Management**

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## **WD-09.1 [R] Academic Landscape of Innovation Research and National Innovation System Policy Reformation in Japan and the U.S.**

*Yuya Kajikawa: University of Tokyo, Japan*  
*Masahiro Hashimoto: New Energy & Industrial Tech. Development Org., Japan*  
*Ichiro Sakata: University of Tokyo, Japan*  
*Yoshiyuki Takeda: University of Tokyo, Japan*  
*Katsumori Matsushima: University of Tokyo, Japan*

In this work, we analyzed the academic landscape of innovation research and compared its trend with policy reform of the national innovation systems in Japan and the U.S. We collected papers that included the word innovation in their title, abstract, and keywords,

# SESSIONS

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and then analyzed the structure of their citation network. We divided the citation network into clusters by clustering the network, and found that the citation network of innovation research can be divided into three main clusters: with technological innovation as the central core together with innovation fundamentals and innovation management, they formed three layers. Historically, research on innovation started from innovation management, such as innovational organization research, but research in the other two cluster areas is more active currently. With this background, we prepared a historical overview of national innovation system policy in Japan and the U.S. Finally, we compared the trend of global innovation research with that of the national innovation systems in Japan and the U.S.

## **WD-09.2 [R] Towards Effective Technology Policies in Latin America**

*Tatiana Láscaris Comneno; Universidad Nacional de Costa Rica, Costa Rica*

Application of technology is today, of all possible factors, the most determinant of the productivity that a workforce can achieve. In addition to its impressive contribution to economic growth, technological progress presents potential contributions, equally significant, to social cohesion and access to opportunities. In the 1950s and 1960s the forecast for the development of a Latin America endowed with good natural and human resources, in comparison with other zones of the planet, was very favorable. However, time went on, and Latin America deepened its contradictions between the potentialities of development and its socioeconomic asymmetries: social inequality hits 40 percent of the population with poverty. This paper seeks to contribute to the discussion of some factors that have deteriorated our social capital, pointed out by international experiences as the key for success in reaching a competitive development based on its own resources, and have undermined the legitimacy and implementation of certain public policies; among them, those somehow link scientific and technological development with economic development. To reach solidarity and a sustainable and inclusive human development requires being clear about your goals, about the resources that are available, about what has been reached at present, and also about the weaknesses and circumstances that, in a society, are detrimental to the human development that is aspired.

## **WD-09.3 [R] Investigative Report of State-Owned Coal Miners Science Literacy Related Factors in Mainland China**

*Li He; China research institute for science popularization, China*

It is of utmost importance to improve the level of science literacy among coal mine workers in order to help prevent tragic accidents that have frequently occurred in coal mines. This paper utilizes data compiled from a survey concerning science literacy related factors among coal miners in China's main coal mining producing areas of Shanxi, Shan Dong, Hebei, Sichuan, and Heilongjiang provinces, and was based on the analysis and research of the science literacy related factors. A questionnaire and multi-stage sampling method was employed in order to investigate the following three aspects: 1) The basic situation of the coal miners, i.e. educational background, age, salary, etc. 2) science literacy and 3) the level of science literacy in safe production and management in the coal mine. This paper further analyzes the present situation, characteristics and current problems of science literacy related factors in safe coal production and mine management within the previously mentioned five coal mine provinces in China. The sampling was 5003. Lastly this investigative report proposes suggestions as to how to improve the coal miners science literacy situation and management in the five provinces and ways to reduce the rate of coal mine disasters.

## **WD-09.4 [R] Harnessing Science and Technology for Cassava Productivity and Food Security in Nigeria**

*Abolaji D Dada; National Centre for Technology Mgmt (NACETEM), Nigeria  
Oladele O Afolabi; National Centre for Technology Mgmt (NACETEM), Nigeria  
Owolabi W Siyanbola; National Centre for Technology Mgmt (NACETEM), Nigeria*

In Nigeria, cassava has grown to become one of the most popular staple food crops. For more than a decade, Nigeria has maintained global leadership in cassava production. This paper reviews and discusses the Nigeria capacity in cassava production and processing.

The aim is to make policy suggestions that can assist government initiatives on promotion of cassava production and processing to enhance food security through the employment of science and technology, although presently the government is encouraging private sector participation in developing technologies for expanded use of cassava as raw materials in the food and non-food industries. The development of the sector, however, will require initial activities in capacity building, further product development, fabrication and transfer of processing technologies to target beneficiaries, and development of clusters to supply identified markets. To sustain Nigeria's global leadership in cassava production, the paper suggests the need to map out the cassava value chain in the cassava sector's innovation system. This no doubt will help to strengthen the links between the supply and demand in the most effective way.

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## **WD-10 Decision Making in Technology Management - 4**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Studio Suite**

**Chair(s) Bing Wang; Portland State University**

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## **WD-10.1 [R] Use of Hierarchical Decision Modeling (HDM) for selection of Graduate School for Master of Science Degree Program in Engineering**

*Turgut Turan; Portland State University, United States  
Muhammad Amer; Portland State University, United States  
Paul Tibbot; Portland State University, United States  
Maher Almasri; Portland State University, United States  
Faisal Al Fayez; Portland State University, United States  
Stuart Graham; Portland State University, United States*

The decision to select an appropriate graduate school is a critical decision for a student seeking this opportunity. This paper uses a hierarchical decision model (HDM) for the selection of an engineering graduate program from five graduate schools in Oregon. The paper includes a brief overview of each criterion used in the model. In addition, there is a brief description of the five universities which are considered as alternatives. The project report shows how the HDM was used to prioritize the alternatives. A judgment quantification instrument (JQI) was developed to obtain pair-wise comparisons from various experts. Twelve experts responded to the instrument and their judgments were analyzed. Then, the paper explains how the calculations were made and final weights were computed. Finally, this project report also suggests future work that can be done to expand the model and to include other universities from the Northwest and other states. Further, modification of this model could allow it to be used for all different types of schools and programs, not just engineering or graduate programs.

## **WD-10.2 [R] Few or More Attributes: Deleting Criteria Using Sensitivity Analysis**

*Fatima M Albar; Portland State University, United States  
Dundar F Kocaoglu; Portland State University, United States*

Research has shown that as the attractiveness of alternatives rises with more choices, individuals experience conflict between the alternatives, which causes them to defer their decision, search for new alternatives, or choose the default option. Having lesser attributes simplifies complex problems and the decision making process. This paper uses the sensitivity analysis in a hierarchical decision model, developed by Hongyi Chen, to prove that we can reduce the size of a problem and make the decision easier with the future change of values of attributes without affecting the final decision.

## **WD-10.3 [R] GA-based One-to-Many Multi-attribute Automatic Negotiation Model**

*Yuying Wu; Beijing University of Technology, China  
Lixing Zhang; Beijing University of Technology, China  
Feng Yan; Beijing University of Technology, China*

With the development of business intelligence, automatic negotiation has become an important channel for resolving the conflict of business. When buyers negotiate with sellers, they often are concerned about a number of attributes and look forward to communicating

# SESSIONS

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with several sellers, and then they choose the best deal. A GA-based one-to-many multi-attribute automatic negotiation model is proposed and simulated to validate the effectiveness and feasibility; when the weight of the buyer changes, the final solution of the model changes accordingly, so the negotiation is sensitive to the parameters in the model.

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## **WD-11 New Product Development - 1**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Galleria-1**

**Chair(s) Terry R Schumacher; Rose-Hulman Institute of Technology**

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### **WD-11.1 [R] Theoretical Framework for Managing the Front End of Innovation under Uncertainty**

*Richard Sperry; Portland State University, United States*

*Antonie J Jetter; Portland State University, United States*

A growing body of research suggests that the fuzzy front-end of product development should not be managed with a one-size-fits-all standard process. Instead, projects with different market and technical uncertainties should be managed with one of five different processes (linear, recursive, evolving, selectionism, trial-and-error). Based on a review of the literature, the paper develops a theoretical framework for front-end management which provides the foundation for ongoing empirical research.

### **WD-11.2 [R] Method to Embed Information Collection/Utilization Mechanism for Recurrence Prevention into Product Design Process**

*Miwaka Inoue; Ritsumeikan University, Japan*

*Atsushi Aoyama; Ritsumeikan University, Japan*

As the competition among companies is intensified, the product design section is required to improve product features with shorter lead time and less cost. One of the most effective ways to reduce lead time and cost is to achieve perfect transition from design to manufacturing. An effective way to reduce trouble in transition from design to manufacturing is to prevent the recurrence of once experienced troubles. It is said that 95 percent of troubles are experienced more than once. Traditionally, the functions of recurrence prevention have been organized and carried out by knowledge leaders. However, it is instable and inefficient because the quality of recurrent prevention is highly dependent on the quality of knowledge leaders. This research proposes to embed information collection/utilization mechanism for recurrence prevention into product design process.

### **WD-11.3 [R] Human Integration Matrix: An Adaptive Framework to Enhance Human Systems Integration in New Product Development**

*Ali Haider Rizvi; National Institute of Technology, India*

*Lakhwinder Pal Singh; National Institute of Technology, India*

*Arvind Bhardwaj; National Institute of Technology, India*

New product development (NPD) is the lifeline of a company for global growth and survival. To a certain extent the human element is also considered in NPD; however, a complete human-centric design approach is next to impossible. In this paper we look at how human systems integration, which is a holistic approach to integrating the human element in system design, can be achieved using a practicable framework for designers called the human integration matrix (HIM). The HIM will provide a broad-based, human-oriented decision making framework for the creation of new products. In order to successfully deploy the HIM, proper parameters are needed as a basis. To find the unique parameters for each product, a questionnaire is formulated. Both the questionnaire and the HIM can be customised to suit the needs of the NPD and the product. A method for deploying this framework is also given.

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## **WD-12 Sustainability - 2**

**Wednesday, 8/5/09, 14:00 - 15:30**

**Room: Galleria-2**

**Chair(s) Robert Harmon; Portland State University**

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### **WD-12.1 [R] Sustainable IT Services: Assessing the Impact of Green Computing Practices**

*Robert R Harmon; Portland State University, United States*

*Nora Auseklis; Intel Corporation, United States*

Green computing refers to the practice of using computing resources more efficiently while maintaining or increasing overall performance. Sustainable IT services require the integration of green computing practices such as power management, virtualization, improving cooling technology, recycling, electronic waste disposal, and optimization of the IT infrastructure to meet sustainability requirements. Recent studies have shown that costs of power utilized by IT departments can approach 50 percent of the overall energy costs for an organization. While there is an expectation that green IT should lower costs and the firm's impact on the environment, there has been far less attention directed at understanding the strategic benefits of sustainable IT services in terms of the creation of customer value, business value and societal value. This paper provides a review of the literature on sustainable IT, key areas of focus, and identifies a core set of principles to guide sustainable IT service design.

### **WD-12.2 [R] Product Development Concept with Product Sustainability**

*Masaru Ishioka; Fukushima University, Japan*

*Kazuhiko Yasuda; Tohoku University, Japan*

Traditional customers' requirements for the new product development are product quality, cost, and delivery. Also, as the product quality, product performance and functions are most important factors for a long time, the new product must satisfy the customer requirements always. Moreover, several emerging new social and market trends such as ecological problems are also satisfied at the same time in the recent product development environment. This paper defines the concept for solving the societal issue such as environmental problems by a marketing focused approach. The introduced approach shows the new type of business model to satisfy the customer and community. It is an emerging subject of the marketing and business field. The three factors are applied to define the strategies for sustainable product development. The factors are: 1. product performance and function as product innovation, 2. product attractiveness such as product concept, style, communication system, and/or after-sales service as service innovation, 3. product competitiveness as a value innovation. In this research, the sustainable product development concept is defined. It is the business sustainable model to satisfy the customer and community issue. The paper defines the several practical methods of sustainable product development by using the three factors.

### **WD-12.3 [A] Application of Engineering and Technology Management Practices to University R&D Research in Sustainable Healthcare Information Technology for Primary Care Clinics**

*David A Dorr; Oregon Health & Science University, United States*

*Nima A Behkami; Portland State University, United States*

Adoptions of information technology (IT) in healthcare settings such as primary care clinics can support the improved quality of patient care and increase clinical efficiency. Such types of applications, generally referred to as health IT (HIT), are frequently results of university R&D projects and teams, often housed in medical schools. Due to the technological nature of these R&D projects, they require a considerable level of systems engineering, product development and business planning competences in conjunction with healthcare domain expertise. Successful research teams incorporate the range of these practices either by partnering with other universities with complementary expertise or adding individuals with such skills to their research teams. The Care Management Plus program at Oregon Health & Science University, founded by the John A. Hartford Foundation and the National Library of Medicine, is an example of a successful HIT development program. The CMP team has implemented an interdisciplinary approach incorporating healthcare, medical informatics and engineering and technology management disciplines. Through this publication the research background, the team and the gap analysis that lead to adoption of an interdisciplinary approach are presented. Specifically, application of technology management concepts, including T technology roadmapping, user-centered innovation, system dynamics and technology transfer, are discussed.

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## **WE-01 TUTORIAL: Management of Strategic Technology Networks**

Note: [R] = Research Paper; [A] = Industry Application

# SESSIONS

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**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Pavilion East**

**Speaker(s) Alptekin Erkollar; University of Applied Sciences ETCOP**

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Today in enterprises and businesses the eWorld has become more and more important. Classic planning and control systems cannot deliver the "right" decision every time. This causes a very important problem for international enterprises and project control. In this tutorial the participants will learn how to manage strategic technology networks in the age of increasing importance of cooperation and globalization in the changing of rules. The purpose of the presented strategic technology program framework is to support achieving the best practice management of strategic technology networks and optimization of network performance and collaboration for national and international enterprises with different goals and possibilities.

**WE-02 Innovation Management - 6**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Pavilion West**

**Chair(s) Gulgun Kayakutlu; Istanbul Commerce University**

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**WE-02.1 [A] Examining Product Champions as Innovators**

*David Wilemon; Syracuse University, United States*

Champions of innovation often play a major role in facilitating entrepreneurial behavior within organizations. Without the influence and efforts of these entrepreneurial champions, many organizational initiatives would not be successful. Examples of organizational initiatives which are often influenced by champions include: new product development, new internal ventures, intrapreneurship, implementing a new information technology (IT) system, strategy creation and implementation, etc. Prior research, however, indicates that up to 70 percent of change initiatives fail (Higgs & Rowland, 2005). Howell and Higgins (1990) describe the role and importance of product champions this way: There is no shortage of creative ideas in corporate America. However, for innovation to occur, someone must take the creative idea, guide it through the trying period when resistance hits a peak, and persevere until it becomes an innovation. In short, every idea needs a champion. The rationale of this paper is to understand more thoroughly the role of product champions in organizations and to identify what we know about several major areas considered important to product champion behavior. The areas we specifically focus on are the product champions' political, power, & process capabilities, which can facilitate the evolution of an innovations performance. The study relies on an extensive literature review on product champions and what we have learned about their behavior. We then narrow our lens to what is known about the power, political, process, and performance issues. A model is then developed that describes the potential relationships among these variables and performance. This study underscores the previous research findings that product champions use a mix of behaviors involving political, personal power capabilities, process issues, all of which influence innovation performance. The findings also suggest that in performing their role that too much influence, like too little influence, can adversely affect a project's potential for success. In addition, prior studies have noted that product champions use their web of influence both within and external to their organizations. Several managerial recommendations are advanced to improve product champion behaviors. Equally important, several research questions are advanced for future study.

**WE-02.2 [A] Best Practices in Quality Management for Achieving Quality and Innovation Performance.**

*Scott A Leavengood; Oregon State University, United States*

*Timothy R Anderson; Portland State University, United States*

In many business sectors today, focus on quality as a competitive tool has been replaced by a focus on innovation. Does this suggest that quality is dead? Or can quality management systems be adapted to lead to innovation performance in addition to quality performance? Research exploring the quality-innovation connection suggests that quality is necessary but insufficient in today's business environment. Thus, while quality is certainly not dead, long-term success, however, depends on firms' abilities to innovate as well. Thus it is not a case of managing for quality or innovation but quality and innovation. But are these

two goals complementary? Several possible tradeoffs between quality and innovation have been proposed. For example, quality management focuses on incremental improvement and satisfying existing customers, in other words doing things better. Innovation is doing things differently - emphasizing breakthrough improvement and focusing on acquiring new customers. However, researchers have found strong linkages between product quality and process innovation, but only weak connections between product quality and product innovation. This paper reports on results of recent case studies of the quality management practices of firms in the forest industry. Best practices will be reported for firms that are successfully achieving innovation goals via traditional quality tools and techniques.

**WE-02.3 [A] Innovation-SP: Web-Wide Innovation**

*Gideon Samid; Case Western Reserve University, United States*

The Internet is efficiently spreading the word on global challenges facing humanity, and it is time to use it to develop a solution for the same. Co-innovation contributed to by a growing number of researchers has been a recent welcome trend. In this article we pitch the extension of open innovation to the full spectrum of Internet-reach worldwide. We describe how to use the InnovationSP as a framework to define and detail the parts of any global issue, how to manage the barrage of expected input, and how to use binary clarity to summarize the community wisdom expressed via the opinions of surfers worldwide. We then point to a successful implementation of this method for the energy crisis.

**WE-03 Project / Program Management - 6**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Broadway-1**

**Chair(s) Jabulani Mangena; Pebble Bed Modular Reactor (Pty) Ltd**

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**WE-03.1 [R] How to Procure Nuclear Power Plants for South Africa with the Intent of Managing Vendor Costs**

*Jabulani Mangena; Pebble Bed Modular Reactor (Pty) Ltd, South Africa*

South Africa is presently looking at ways in which it can cost competitively install additional 20,000MWe nuclear capacity. The nuclear technologies which are being considered are the pressurized water reactors and high temperature gas reactors. This nuclear installation challenge is exacerbated by the world financial turmoil throughout the world. In this research paper, the nuclear power plant acquisition approach and model is recommended as informed by other nuclear programs employing nuclear plant project best practices. The reviewing of nuclear programs in other countries assisted the development of a possible cost sensitive framework to be utilized in SA. In addition, the developed model took into consideration the nuclear power plant project life-cycle. The NPP life-cycle or nuclear project value chain used consist of the following phases: research and development, engineering and design, manufacturing, construction, operation and maintenance, and dismantling and decommissioning. It was therefore recommended that the value chain phases must be examined in identifying cost reduction measures.

**WE-03.2 [R] Grey Critical Chain Project Management Technique and Its Application**

*Junwen Feng; Nanjing University of Science and Technology, China*

*Decheng Li; Nanjing University of Science and Technology, China*

Based on the idea of Grey System and interval number notation, a Grey Critical Chain scheduling approach is studied. According to Grey system theory, the time of project or task completion can be considered as the object that extension is definite but intension is uncertain, which is coincident with the character of the project management. The Grey Critical Chain Scheduling Technique mainly aims at the single project time management, but the management idea can also be applied to the other knowledge areas of the project management. In this technique, we improve the selection method of the buffer time in the critical chain in order to obtain a reasonable feeding buffer time and project buffer time. In this paper, we will use an example to discuss the Grey Critical Chain Scheduling Technique, compare Grey Critical Chain with program evaluation and review technique, critical chain and fuzzy critical chain, and then analyze the advantages, disadvantages and applicable scope of their own.

# SESSIONS

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## **WE-04 Technology Management in Healthcare Sector - 2**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Broadway-2**

**Chair(s) Norman G Einspruch; University of Miami**

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### **WE-04.1 [A] Networked Development to Drive New Dialysis Solutions**

*Julie S Wrazel; Home Dialysis Plus, United States*

Recent data indicates that there are about 400,000 sufferers of End Stage Renal Disease (ESRD) in America and over 1.5 million sufferers worldwide. Many more suffer from Chronic Kidney Disease (CKD), and yet the technology to address their loss of kidney function and preserve quality of life has progressed little in the 20 years since the first artificial kidney devices were made available for treatment. Home Dialysis Plus is seeking to change this by developing small, portable, low cost dialysis devices that leverage micro technologies never before deployed to address healthcare solutions. Doing so successfully in a start-up environment has required that HD+ assemble a network of development resources with the IP and know-how necessary for the effort. In this presentation, the audience will learn: how HD+ launched the early development effort, networking with partners both inside and outside the healthcare field to define device requirements; the extent of the network necessary to address the breadth of technology and regulatory requirements; and the methods used to execute development efforts to forward the design with a summary of issues and successes in this work.

### **WE-04.2 [R] Service Oriented Technology in Healthcare Services: A Research Framework for Studying the Computerized Physician Order Entry System**

*Haluk Demirkan; Arizona State University, United States*

*Robert R Harmon; Portland State University, United States*

Computerized Physician Order Entry (CPOE) is a technology that has been praised for its ability to reduce medical errors and medical costs. Recent studies suggest that healthcare providers believe that this praise is justified and that CPOE actually does help to increase patient safety. However, the penetration of CPOE within the healthcare industry remains low. This study offers insight into the diffusion of information technology in healthcare by investigating specific factors influencing healthcare providers' decisions on whether or not to adopt CPOE. A research framework is constructed with the perception of benefits, organizational readiness, and normative beliefs regarding CPOE in addition to incorporating two factors, liability and consumer surplus, that have not been investigated in prior organizational adoption models.

### **WE-04.3 [A] Adoption & Evaluation of Personal Health Record (PHR) System**

*Leong Chan; Portland State University, United States*

*Muhammad Amer; Portland State University, United States*

*Fahad Aldhaban; Portland State University, United States*

Personal health record (PHR) is an emerging web-based healthcare IT system, which is a hot topic of discussion among healthcare professionals and many common people. It is a very new concept and many companies are offering PHR services to their customers. PHR is created and kept up-to-date by the user, healthcare providers or insurance companies. The users can enter their information and manage their PHR. PHR can include everything from medical histories to test results, physician's notes, prescriptions and information from their pharmacies and insurance companies. Hence, PHR empowers the patients and gives them full access to their healthcare data. Many employers, insurance companies, hospitals, and physicians are offering PHR services to their consumers. There are also many web sites from where consumers can sign up for free PHR services. Due to the many benefits associated with PHR services, consumers find it very attractive to use PHR. But there are also many concerns hindering adoption of PHR. In this paper we shall review the factors affecting adoption of PHR systems using the technology acceptance model (TAM) and formulate hypothesis for PHR adoption.

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## **WE-05 Technology Management in IT Industry - 3**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Broadway-3**

**Chair(s) Ahto Kalja; Tallinn Technical University**

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### **WE-05.1 [A] Self-Managing Autonomic Technology as a Strategic Business Enabler for a Smarter Planet**

*David Bartlett; IBM, United States*

You don't have time to waste. You must respond faster than ever to customer expectations, industry change and regulatory requirements. Yet, as IT complexity increases, your company can often spend more time managing your infrastructure than unleashing its power for business growth. The repercussions can be enormous, decreasing the return on IT investments, diminishing time-to-value, hampering responsiveness, increasing the time and expense of regulatory compliance, and stifling innovation. This presentation will discuss self-managing autonomic technology as a strategic business enabler to becoming an On Demand Business. The speaker will detail how autonomic computing is guiding companies of all sizes in finding innovative IT solutions to business challenges, establishing best practices and methodologies that help companies create a strategic roadmap for building a self-managing environment and furthering their on-demand journey, and driving the adoption of standards and technologies to make information technology systems more responsive to business needs. Attendees will learn how to use self-managing technology to: deliver higher quality of server at a lower cost; achieve the right balance of people, processes and technology; and sustain growth for the business and expand into new markets.

### **WE-05.2 [A] Towards the Information Society: Estonian Case Study**

*Ahto Kalja; Tallinn University of Technology, Estonia*

*Tarmo Robal; Tallinn University of Technology, Estonia*

*Uno Vallner; Ministry of Economic Affairs and Communications, Estonia*

The Internet has always played a significant role in Estonia's development. Over the years, the state has contributed to ensuring its availability in central and local governments, schools, public libraries and other public sector institutions. Two years ago the Government of the Republic approved the Estonian Information Society Strategy for 2007-2013. In this context, an overview of Estonian steps to the information society is given.

### **WE-05.3 [R] Dissemination of the Information and Communication Technologies (ICT) in Exporting Small and Medium Sized Business in Mexico**

*Maria del Carmen Dominguez Rios; Benemerita Universidad Autonoma de Puebla, Mexico*

The expansion of the Internet allows incorporating new trading ways and products, thus it changes the way economic agents relate and work. This paper explores the use of ICT in export small businesses. The results of a survey applied to a representative sample of small exporter businesses are presented. These firms belong to the manufacturing industry and the main purpose is to analyze the use of Internet in the trading processes. The hypothesis to be tested is that the use of ICT is a very powerful tool in small exporters businesses because it represents the access to new markets, clients and products. It is also a way to increase sales. The flexibility of the Internet is compatible with the high capacity of adaptation small businesses require. The creation of a web site offers a lot of possibilities because it is a way to explore new markets and increase exports, even though macroeconomic conditions are determinant in the export processes. The use of Internet and e-commerce in the small exporter businesses has modified many areas of the firm. These firms have bought new computers and other technological gadgets. The incorporation of new technology has reduced costs in areas such as marketing and production. The firm can pay more attention to the development of new products. In many cases the incorporation of more technology increases the productivity of the workers and improves the quality of the product. Besides, it is fundamental to get certifications such as ISO 9000.

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## **WE-06 Entrepreneurship / Intrapreneurship - 3**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Broadway-4**

**Chair(s) Kotaro Kawajiri; AIIST**

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### **WE-06.1 [R] Key Entrepreneurial Traits and Their Relationship to Venture Uncertainty and Venture Success**

# SESSIONS

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*Dov Dvir; Ben Gurion University of the Negev, Israel*

*Arik Sadeh; Holon Institute of Technology, Israel*

*Ayala Malach-Pines; Ben Gurion University of the Negev, Israel*

*Aaron J Shenhar; Rutgers Business School, United States*

While entrepreneurship is one of the most studied topics in business research, findings have been mixed regarding the traits of entrepreneurs. Some of the confusion in the literature may be explained by findings such as John Miner's, who identified four personality types capable of achieving entrepreneurial success. Indeed, several authors differentiated between different entrepreneurial subgroups. However, almost all writers assumed that entrepreneurs have distinct personality traits. Among the traits mentioned most often were: high need for achievement, need for control, autonomy, independence, self-confidence, initiative, optimism, imagination, persistence, leadership, competitiveness and risk taking. Against all this body of research comes the claim that the entrepreneurial personality is nothing but a myth. The current study is the fourth in a series of studies on Israeli entrepreneurs that explored their personal traits, from a macro cross-cultural and cultural perspective, through a mezzo occupational perspective to a micro individual behavioral perspective. This study, coming from a micro individual perspective, examined the correlates of the set of personal traits portraying Israeli entrepreneurs found in our previous research. It showed a) that entrepreneurial traits such as love of challenge, initiative, optimism, creativity and energy are highly correlated with a risk-taking propensity; b) that this set of traits is also correlated with a higher level of venture uncertainty in terms of market and technological uncertainty, and c) ventures with higher levels of uncertainty and risk create higher opportunities for future activities such as entering new markets and introducing new product lines, but are less efficient in terms of meeting schedule and budget goals.

## **WE-06.2 [R] The Influence of Ten Different Motivational Factors on Academic Entrepreneurial Intentions**

*Igor Prodan; University of Ljubljana, Slovenia*

*Alenka Slavec; University of Ljubljana, Slovenia*

Understanding what motivates academics to be involved in entrepreneurial activities could be crucial in technology transfer from academic organizations to industry. Using a data set of 547 academics employed at two different universities (University of Cambridge and University of Ljubljana), this study investigates (using multi-sample analysis and structural equation modeling) the impact of ten different motivational factors as predictors of academic entrepreneurial intentions. The following ten motivational factors were studied: (1) dissatisfaction with the academic environment, (2) desire for independence, (3) desire for safe and permanent employment, (4) desire for taking on and meeting broader responsibilities, (5) desire for wealth, (6) desire to bring technology into practice, (7) desire to disseminate findings through the scientific literature, (8) desire to do something others could not, (9) desire to pursue technological perfection, and (10) desire to secure additional research funding. The study's results show that desire for safe and permanent employment and desire to disseminate findings through the scientific literature have a negative significant influence on academic entrepreneurial intentions, while desire for independence, desire for taking on and meeting broader responsibilities, desire for wealth, and desire to bring technology to practice have a positive significant influence on academic entrepreneurial intentions.

## **WE-06.3 [R] Developing Techno-preneurship Program at the Center for Innovation, Entrepreneurship, and Leadership (CIEL), School of Business and Management (SBM), Bandung Institute of Technology (ITB), Indonesia**

*Dwi Larso; Bandung Institute of Technology, Indonesia*

*Yulianto Yulianto; CIEL, SBM-ITB, Indonesia*

*Sonny Rustiadi; CIEL, SBM-ITB, Indonesia*

*Leo Aldianto; CIEL, SBM-ITB, Indonesia*

The School of Business and Management (SBM) at Bandung Institute of Technology (ITB) was established in 2003 partly to take advantage of the strong programs at ITB in science and engineering and bring its technology assets to commercialization. In 2004, SBM developed a curriculum offering a course in entrepreneurship and a three-course series for

SBM-only students to plan, run a business, and to do a community service using the profits made. It has been acknowledged as an innovative approach in educating entrepreneurs. Learning from the curriculum implementation for the last four years has led us to develop a more innovative program, called Entrepreneurship Track (e-Track). This program offers students from all schools and faculties in the university to establish real businesses in the last year of their study. This program is intended to mix students from various disciplines to work together and establish technology-based businesses. The paper records lessons learned and offers an alternative in educating techno-preneurs. It discusses not only the curriculum, but also infrastructures needed to facilitate its implementation.

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## **WE-07 Technology Forecasting - 2**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Forum Suite**

**Chair(s) Scott W Cunningham; Delft University of Technology**

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### **WE-07.1 [R] In Technology Forecasting Using Bibliometrics what Information Source is Relevant when?: Exploring Different Source Types**

*Heini Jarvenpaa; Tampere University of Technology, Finland*

This paper explores the different sources to be used for the purposes of technology forecasting using bibliometrics. The Technology Life Cycle Indicators are taken as a starting point, for they take the whole life cycle into account and point to indicators for the different phases of this cycle. Two indicators were tested: the applied research phase, indicated by the number of hits in databases such as the Engineering Index; and the application phase, indicated by the number of hits on News Abstracts Daily. The latter indicator demonstrated unexpectedly early activity compared to the engineering source. The news source was then looked at in more detail and divided into news categories. Of the different news categories, magazines and journals showed an early appearance, and newswires and blogs a late booming activity. Overall, the results showed that the sources in the business environment should be looked at more broadly, as there is information available from various sources already early in the technology's life cycle.

### **WE-07.2 [A] WiMAX: Forecasting by Integrating Scenario Planning and Bass Model Methodologies**

*Youngkoo Yoon; Portland State University, United States*

*Sabrina Patino; Portland State University, United States*

*Nathaniel Jarpa; Portland State University, United States*

*Hamad Alanazi; Portland State University, United States*

The primary objective of this paper is to develop a forecast for mobile WiMAX as an emerging technology using scenario planning and Bass model methodologies. To understand why these methods were applied in assessing a forecast for the adoption of WiMAX, the paper will discuss the technology's evolution, functionality, and market competition. A literature review on the methodology and applications of forecasting in the mobile communications industry will be considered to help provide examples of technology forecasting estimations. The results obtained for each scenario will then be compared and analyzed to the behavior of WiMAX subscribers in both the US and Korea. The paper intends to discuss the differences in the US and Korea models. Significant consumer interest variations, price, and population patterns are presented. The key to forecasting WiMAX's adoption technology rates is to understand the difference in consumer reactions that exists within countries. The analysis will conclude that WiMAX will diffuse in Korea at a faster rate due to high response from imitators. With big market potential and a clear vision of subscriber needs, the next major evolution is expected to occur in the area of personal broadband services. The WiMAX standard promises to deliver high-speed, cost-effective and high-quality services with long distance broad coverage.

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## **WE-08 Knowledge Management - 3**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Council Suite**

**Chair(s) TBD**

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### **WE-08.1 [R] A Structural Model of Knowledge Management across Borders**

# SESSIONS

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Caroline Benton; *University of Tsukuba, Japan*

Remy Magnier-Watanabe; *University of Tsukuba, Japan*

Knowledge has been cited as the most important strategic asset for managing innovation in the hyper-competitive environment of the 21st century. However, the sharing and creation of knowledge at the organizational level is a difficult process that will not proceed without incentives and conscious efforts by management. The complexity of knowledge management is further compounded by the influence of a wide variety of factors such as leadership, organizational culture, organizational characteristics and individual work styles. Based on a large dataset gathered from a questionnaire survey of a multi-national Japanese pharmaceutical company and its subsidiary in the United States, we compare how the aforementioned organizational factors influence the processes of knowledge management, expressed through the SECI model of socialization, externalization, combination and internalization. Results of a structural equation modeling path analysis show that although part of the same corporate group with similar goals, the two companies' knowledge management programs were affected by very different organizational factors. This implies that knowledge management activities need to be tailored to the organizational idiosyncrasies of each local office, without betraying the global vision of a corporation.

## **WE-08.2 [R] Local Ecological Knowledge and the Impacts of Global Climatic Change on the Community of Seaweed Extractors in Pisco-Per**

Jose C Alvarez; *PUC-Peru, Peru*

Kelly Vodden; *Memorial University, Canada*

Global climate change implies difficulties for coastal communities where activities are highly influenced by climate. This paper examines the case of seaweed harvesting in the community of Pisco-Per. Aspects of environmental change that impact seaweed harvesting include global warming, El Nino events, pollution of marine space, declines of marine species, and the rupture of ecological cycles. We look for relationships between local ecological knowledge (LEK) related to climate and other environmental change and strategies for coping with and adapting to current and anticipated change. This project is developed through a participative methodology, with the participation of university researchers and the community of seaweed extractors, and builds on an ongoing study of collaborative approaches to research and development of the algae industry in this region. Research questions include: the nature of the LEK held and shared; the extent to which LEK includes: the effects of climate changes on resources, harvesting and communities; and the contribution of LEK to industry resilience, harvester livelihoods and community well-being. The results of the research provide insight into LEK accumulation about algae species, management, and impacts of global environmental change. Documenting methods of collecting, analyzing and sharing harvester knowledge is an additional contribution.

## **WE-08.3 [R] Towards Building a Knowledge-Based Society in Egypt**

Sherif H Kamel; *The American University in Cairo, Egypt*

Emerging information and communication technology (ICT) is setting the pace for a changing, competitive and dynamic global marketplace, representing an invaluable vehicle for socioeconomic development and introducing new forms and structures of organizations that are no longer affected by geographical or time barriers. Egypt, as a developing nation with an emerging economy, has realized the potentials of ICT since the 1960s and has increasingly invested in building its infostructure and infrastructure during 1980s, but it was in the 1990s that ICT was put on the national agenda as an enabler for development and a gateway to the knowledge society. The government in collaboration with different stakeholders has implemented a number of projects to diffuse ICT for development with implications that varied across different sectors and communities. This paper intends to describe the evolution of the ICT sector to draw on the experiences of the role of ICT in development in the context of an emerging economy. Finally, the chapter addresses the challenges and opportunities made available by using ICT for development and the related socioeconomic implications on the society.

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**WE-10 Decision Making in Technology Management - 5**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Studio Suite**

Note: [R] = Research Paper; [A] = Industry Application

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**Chair(s) Ibrahim Iskin; Portland State University**

## **WE-10.1 [R] Technology Make-or-Buy Decisions in the German Industry: Criteria, Methods and Organization**

Daniel A Gerhard; *University of Erlangen-Nuremberg, Germany*

Kai-Ingo Voigt; *University of Erlangen-Nuremberg, Germany*

Because of limited resources and inherent risks, companies tend to develop not all technologies by themselves. There are alternatives to internal development, i.e. company acquisition or contract development. To have a decision basis for one of these alternatives it is necessary to evaluate those in the context of the company. The decision about internal or external acquisition of technologies is part of the technology strategy which is closely connected to the firm's competitive and market entry strategy. Our study addresses the connection between the technology acquisition decision and the company's technological market entry and competitive strategy. The quantitative explanatory study in the German industry shows that there are some notable differences between companies with cost leadership and differentiation strategy. Differentiators more often used joint research and patent or technology purchasing and involve more often the legal department in the decision process. Pioneers, compared to followers, involve more internal stakeholders in the decision process, e.g. corporate management, R&D and the legal department. Furthermore, they tend to source technology externally more often using joint research approaches.

## **WE-10.2 [R] A Decision Model for Energy Resource Selection in China**

Bing Wang; *Portland State University, United States*

Dundar F Kocaoglu; *Portland State University, United States*

Jiting Yang; *Portland State University, United States*

Energy is important to human existence, economic development and society progress, which is also related to safety of a country and sustainable growth of economy. China is a rapidly developing country, where the decisions about energy alternatives are critical. This paper discusses coal, petroleum, natural gas, nuclear energy and renewable energy resources as energy alternatives for China. The paper presents a hierarchical decision model for the selection of energy resources for China in the future. The results indicate that renewable energy, coal, nuclear energy, natural gas and petroleum are ranked in that order. The sensitivity analysis reflects that the most critical criterion in the energy selection is the current energy infrastructure.

## **WE-10.3 [A] A Proposed Method for Modeling Research and Development (R&D) Project Prioritization Criteria**

Alexsandro S Lima; *Instituto Tecnológico de Aeronautica, Brazil*

José Henrique S Damiani; *Instituto Tecnológico de Aeronáutica, Brazil*

Organizations of different types, sizes and purposes often face situations which compete amongst themselves for the allocation of resources. In view of such circumstances, this work aimed at verifying the contribution of multicriteria decision aid (MDA) as a tool to enable the establishment of an analytical structure capable of supporting the decision-making process of research and development (R&D) project prioritization in an organization of the Brazilian aerospace sector. Thus, this work has proposed a method for modeling project prioritization criteria with the referred nature, in which concepts and methods that are part of the constructivist approach for MDA are put into practice, with the aim of contributing to the solution of the problem initially described. The proposed method makes use of existing methods and techniques found in the literature, such as cognitive mapping and measuring attractiveness by a categorical based evaluation technique (MACBETH) method, which were here particularized for use in the highlighted problem. The development of a decision makers cognitive map, combined with the use of the MACBETH method for modeling the preferences of that decision maker, allowed verification of the adequacy of the joint employment of those tools for structuring R&D project prioritization problems, where complexity, given the multitude of criteria, has acted as main characteristic.

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**WE-11 New Product Development - 2**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Galleria-1**

# SESSIONS

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**Chair(s) Donald E White; Cal Poly University, San Luis Obispo**

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## **WE-11.1 [A] Using Mass Customization Techniques to Realize True Platform Development**

*Tony Williams; Rodgers Instruments LLC, United States*

Markets are increasingly expecting high numbers of options and customization. At the same time, increases in the cost of product development are necessitating platform approaches to product development planning and execution. These two trends are complementary in companies moving from typical model-oriented product development toward mass customization. This paper will show how a local company (in Hillsboro, Oregon) has used mass customization techniques and IT to focus the development effort on platforms instead of models. It will propose a purely engineering and manufacturing adoption of mass customization, even if the marketing, sales, and accounting arms of an organization want to remain model-oriented. It will touch on complications involving the support of field reconfigurations of products, and implications that has for continued evolution of the underlying platform. It will touch on both hardware (BOM) and embedded software (extra-BOM) configuration.

## **WE-11.2 [A] New Product Development Simulation**

*Terry R Schumacher; Rose-Hulman Institute of Technology, United States*

This paper describes the New Product Development (NPD) Simulation we developed and use in our Marketing and Entrepreneurship courses. The simulation teaches NPD best practice, focusing on determining potential customers needs, then matching those needs with product attribute selection. Participants simulate the building and launching of a product, then receive feedback on their NPD process.

## **WE-11.3 [R] Addressing the Strategy Synthesis Approach for Accomplishing the Strategic Fit in New Product Development Projects and Programs: A Literature Review**

*Cesar A Castilla; Portland State University, United States*

*Dragan Z Milosevic; Portland State University, United States*

How the strategic alignment for new product development projects and programs may be carried out is critical in actual business environments. Then formulating and implementing the right strategic chosen priorities are key tasks to be developed for achieving successful NPD projects and programs. Thus, the main purpose of this paper is to address the strategic synthesis approach that may leverage into a more efficient and effective way of accomplishing strategic fit for them. Thus, the first goal is to give a better understanding of these topics for further research. To do so, first a literature review of contemporary strategies' school of thought was developed. Second, the actual fragmentation-integration in the strategic management field is stated. Next, the synthesis schools are mentioned as boundary of firms, dynamic capabilities, and strategy configurations. Further, the dynamic capabilities approach is developed from theoretical and empirical research views. Finally, research gaps are stated and further research is proposed.

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## **WE-12 Sustainability - 3**

**Wednesday, 8/5/09, 16:00 - 17:30**

**Room: Galleria-2**

**Chair(s) Yu-shu Peng; National Dong-Hwa University**

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## **WE-12.1 [A] Green Technologies for Building Material Business**

*Lawrence Carter; Portland State University, United States*

*Worathai Choothian; Portland State University, United States*

*Nuttawat Intrarode; Portland State University, United States*

*Pattavadee Ploykitikoon; Portland State University, United States*

Technology assessment is one aspect of the technology acquisition process. This process provides a framework that helps companies thoroughly understand their necessities and capabilities in order to select appropriate emerging technologies from the right sources for the companies at the right time. With rapid changes in technology and boundless customer needs in our globalization era, these implications significantly impact the companies' ability

to move forward and to maintain their competitive advantages in order to remain superior to their rivals. Thus, it is necessary to acquire the right technology to enhance their ability to create tremendously successful business results in the long run. The aim of this research is to develop a technology assessment model for evaluating green technologies to build business materials, drawing on a Thai company case study. A variety of tools needs to be applied to this framework. In addition to the assessment of technology, various perspectives included technological, organizational, and market perspectives. The results of this research will reveal the most appropriate technology for building business materials, regarding technology advances and new product development. Overall, the research will develop a highly successful framework to be applied to technology assessment, with a unique focus on other building materials businesses.

## **WE-12.2 [A] A Sustainable Management of Treatment Plant for Dairy Wastes with the Use of Its By-products**

*Svetlana Nikolaeva; Universidad Nacional de Costa Rica, Costa Rica*

*Enrique Sánchez; Universidad Nacional de Costa Rica, Costa Rica*

*Manuel Moya; Universidad Nacional de Costa Rica, Costa Rica*

*Marlen Duran; Fundacion UNA, Costa Rica*

*Bernal Mederos; Geominera S.A., Costa Rica*

One of the main problems related to environmental protection in Costa Rica is the adequate management and treatment of piggery and dairy waste. Pig and dairy farms with hundreds to several thousand animals are in operation without adequate systems for treatment and disposal. Manure, urine and remaining food are washed out from the cages with volumes of water not adequately controlled, causing a great variation in the volume and concentration of the effluents. This situation has caused the failure of conventional wastewater treatment plants. The successful application of anaerobic technology AFBRs to treat the wastewater of dairy milk with the utilization of biogas in order to produce electricity for the dairy equipment in the milk farm located in the province of Cartago, Costa Rica, is presented. As a result, it offers the industrialists an ecologically viable system and with the use of all its by-products, which allows it to be described as a clean production.

## **WE-12.3 [R] Application of Green Input Output Matrix to Sustainable Development in China**

*Yuying Wu; Beijing University of Technology, China*

*Yue Xia; Beijing University of Technology, China*

*Feng Yan; Beijing University of Technology, China*

The green input output matrix will not only include the economic factors as the traditional input output matrix, but also include the environmental factors such natural resources, environmental pollution and environmental protection. Therefore, the input output matrix with environmental pollution and waste recycling is set up based on data from China Statistical Yearbook 2007 and is applied to analyze the sustainable development of China. The green input output matrix has two variables that are different from traditional input output matrix, i.e. resources restoration and pollution control, indicating the environment pollution and waste recycling. The green input output matrix can evaluate the sustainable development of China more efficiently.

## **HA-00 PLENARY - 4**

**DATE: THURSDAY 8/6/2009**

**TIME: 08:30 - 10:00**

**ROOM: PAVILION**

**CHAIR: TERRY OLIVER; BONNEVILLE POWER ADMINISTRATION**

## **HA-00.1 [K] Renewable Energy for a Sustainable Future**

*I.P. Jain; University of Rajasthan, India*

# SESSIONS

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Energy is an important aspect in the development of any nation. In view of the rising energy demand and reducing sources of conventional energy, energy conservation, management and applications of non-conventional energy sources become imperative for a sustainable future. Reduced sources of conventional energy are cause for great worry among scientists, technologists, economists and political thinkers. We are consuming more energy than can be produced by nature. The other aspect is pollution added by these sources to our environment. The more we use these sources, the poorer is our quality of life on this planet. The environmental benefits of renewable energy (RE) are well accepted and have been promoted by governments. It is found that wherever REs are in use, people have improved quality of life, health, sanitation, and reduced biomass. The planet earth is fast making progress in the field of solar energy in the form of exploiting it for commercial applications. Solar energy is available abundantly and can be utilized for both thermal and electrical applications. The solar thermal programs include promotion of hot water systems for industrial, commercial and domestic users, solar cookers, solar dryers and solar stills. Solar photovoltaic is suitable for many applications where other energy sources may not be feasible or cost effective. Solar photovoltaic systems promoted are solar lanterns, solar home lighting systems, solar streetlights, solar water pumps, etc. A significant initiative that has been taken by many countries for increasing the use of solar photovoltaic systems pertains to installation of decentralized power plants for meeting the electrical energy needs of remote and isolated villages. Apart from harnessing solar and wind energy, tidal power and biomass power generation are the other potential energy sources which are attracting energy agencies to tap their power potential. Power generation based on biomass holds great promise as various countries are producing huge amounts of crop residues every year. Biogas production is one of the major programs all over the world to cater to families for helping rural populations in their energy needs. These plants are estimated to be generating fuel gas equivalent to many billions of tons of wood fuel per year and simultaneously producing enriched organic fertilizer as artificial fertilizers are harmful for the earth. Wind power is one of the major contributors to the power network. India has been recognized as a new wind super power for its development in this field. India has developed small hydro power projects (SHP) of up to 3MW capacity. The program on new technologies covers chemical sources of energy including fuel cells, hydrogen energy and geothermal energy, alternate fuels for surface transportation and ocean energy. The R&D activities are supported in relation to these technologies in national laboratories and companies. Hydrogen energy systems are making inroads in several directions. All the major car companies have built prototypes of cars running on hydrogen fuel. Some cities have started demonstration projects using hydrogen fuel transit buses. Of course, hydrogen is already being used as the fuel of choice for space programs around the world. It will be used to power aerospace transports to build the international space station, as well as to provide electricity and portable water for its inhabitants. It is to be noted that the developing international consensus on the reality of global warming will likely be followed over the next 5-10 years. Advocates of REs for sustainable development for the future have hoped for impetus from the international response to global climate change. There are sufficient environmental and public health benefits of direct hydrogen fuel to justify moving ahead based on what we know already about fossil fuels, their consequences and their limitations. The economic case for hydrogen will continue to strengthen as well, even without a global warming treaty. A climate change treaty would only sweeten the pot. Renewable energy (RE) provides the solution and also allows the progressive and non-traumatic transition of today's energy sources toward feasible, safe, reliable and complete sustainable energy chains. Development of RE technologies is the way to supply energy to isolated places, many of them in India, Latin America and the Caribbean, which represent where two thirds of the population lives. With vast natural resources the world is all set to make remarkable progress in power generation from renewable sources that are cost effective and eco-friendly. The renewable energy industry all over the world is a small but rapidly growing industry. The agreement recently made internationally, to limit the world's greenhouse gas emissions, gives an extraordinary chance to emphasize renewable energy as a true tool for recovering air quality. The coming decade will definitely see greater and greater use of green power so as to ensure less dependence on fossil fuels and also in order to prevent environmental degradation.

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## HA-00.2 [K] The Indispensable Role of ICT in a Carbon-constricted Global Economy

*Andrew J McKeon; carbonRational, United States*

The earth's biosphere, despite all its complexity, can be seen simply as a system with an aim. The system is very information intense, energy conserving, and resilient, with the aim of sustaining life for the overall system. Humanity is finding that its aims, as manifested through human industrialization, are increasingly out of alignment with the aim of the earth's biosphere. The greatest manifestation of this misalignment is global climate change, which is threatening the stability of earth's climate system. To solve the problem of climate change, humanity must not only drastically reduce our dependency on carbon-based fuels, but also adjust the aims of our industrial economy to align with the aim of the earth's ecosystem. In a very real sense, business needs to rethink everything it does, and the biosphere will be an important teacher. Information and communication technologies (ICT) will play important roles in this realignment. The biosphere is an information intense and energy efficient system, so the future global economy will also substitute information intensity for energy intensity. In the carbon-constricted economy of the future, ICT will be needed to reduce energy usage, research new technologies and make discoveries through information sharing made possible by continued development of information technology.

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## HB-02 Decision Making in Technology Management - 6

Thursday, 8/6/09, 10:30 - 12:00

Room: Pavilion West

Chair(s) Fatima M Albar; Portland State University

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## HB-02.1 [R] The Use of Decision-Making Tools in End-of-Life Decisions: A Case Study in the South African Petro-Chemical Industry

*Pieter Kitching; University of Pretoria, South Africa*

*Cornelis C van Waveren; University of Pretoria, South Africa*

Infrastructure assets are aging, therefore ongoing maintenance and renewal of that infrastructure has become much more significant. Sound asset management decisions that are based on a thorough understanding of the modern business context are needed. When it comes to the decision to dispose of assets, managers tend to avoid making the final decision, sometimes mothballing the asset and leaving it to self-destruct. This could cause either safety hazards at a plant or environmental neglect. In many organizations there is a clear divide between the project teams and operations teams. The project team's responsibility ends when the asset reaches beneficial operation. The operations team then becomes the owner of the asset. During the operational phase of an asset, decisions typically include cost, risk and performance as tradeoffs in the decision criteria. This happens in an ever changing business and technological environment. Decisions regarding the use of assets can be made at any stage of the asset life-cycle and at various levels of an organization. The renewal or decommissioning phase of the asset life-cycle is perhaps just as important as an initial establishment decision as it is another stage that large capital amounts are committed, given the risk that a poor decision can carry a heavy penalty for many years to come. To assess whether decision-making models and tools are effectively used in industry to make asset disposal decisions, a survey was conducted within a large petro-chemical organization in South Africa. A survey was chosen to conduct this research as the maximum feedback could then be obtained within a limited timeframe. A number of conclusions could be reached from the study with regards to the use of decision making models and tools at different departments and different levels of the organization.

## HB-02.2 [R] Technology and Business Practice Adoption as a Constrained Shortest Path Problem

*Steven D Formanek; The American University in Cairo, Egypt*

*Brian P Cozzarin; University of Waterloo, Canada*

A constrained shortest path algorithm is developed and implemented in Matlab to optimize the management decision-making process, which is a potential tool for managers. The constrained shortest path algorithm we developed is tested against other leading methods in the literature and is found to be competitive. The tests are run on randomly generated

# SESSIONS

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constrained shortest path problems of varying degrees of complexity with the algorithm performing well on all levels.

## **HB-02.3 [R] Optimization of Retail Clusters by Improving Individual Store Performance**

*Ali Haider Rizvi; Dr. B R Ambedkar National Institute of Technology, India*  
*Anish Sachdeva; Dr B.R. Ambedkar National Institute of Technology, India*

Clustering is a common phenomenon seen all around the world in industries and the service sector. Clustering is a complicated case in retail, and mainstream literature is populated with studies that define store performance for single stores; however, not much is available when they are in clustering, as the conventional trading boundaries, which form the area in which the stores influence extends, cannot be defined. The present study was conducted to improve the overall performance of the entire cluster by dealing with individual stores. It was conducted in a large retail cluster dealing exclusively in stationary. The store facilities are analyzed using fuzzy linguistic modelling from both the customer and the retailer's standpoint. A model of such clusters is then prepared for the current demographic. The model generated aims to provide a holistic approach to grade the facilities available in order to determine returns. This also gives a framework for retailers to upgrade their existing facilities according to the cluster characteristics, thus improving not only individual performance, but also the performance of the cluster.

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## **HB-03 Project / Program Management - 7**

**Thursday, 8/6/09, 10:30 - 12:00**

**Room: Broadway-1**

**Chair(s) Jeffrey Busch; Jeffrey S. Busch PMP**

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### **HB-03.1 [R] Project, Systems and Risk Management Processes Interactions**

*Baqer M Alali; Old Dominion University, United States*  
*Ariel Pinto; Old Dominion University, United States*

This paper discusses three major concepts: projects, risk, and systems management. Systems and project management consider risk management as an integral part of their processes. Risk management is used to avoid any failure or crisis during their life cycles. Projects have well defined life cycles during which the risk is defined, controlled, and managed. Systems, on the other hand, have a relatively longer life cycle that is divided into phases. Risk management is processed in each phase of the systems. Projects have a very strong relation to systems since projects mostly become parts of larger systems. These projects are initiated within the systems for two purposes: 1) to close certain operational gaps, or 2) to expand the capabilities of the system. The issue raised in this paper is whether failure events occurring within a system could be traced back to initiating events in the project or in its integration. Is it possible to reduce or eliminate risks within the system by managing the initiating events of risk in the projects? The objective is to identify if projects have any role in risky event in the system.

### **HB-03.2 [A] Risk Analysis and Management of Projects with High Innovation Content**

*Michal Korecky; SKODA Transportation s.r.o., Czech Republic*  
*Vaclav Trkovsky; SKODA Transportation s.r.o., Czech Republic*

The ability to innovate products and introduce them on the market over a short period of time is one of the main competition advantages in the current turbulent climate. In the field of rail vehicles, when deliveries are often made in small series, the development is usually directly incorporated into the projects with deliveries to a specific customer, which brings along a number of risks. The paper discusses risk analysis and management in this type of innovation project with the necessity to comply with the stipulated contractual deadlines. Concurrent preparing and executing of several projects results in the need to be able to deal with risks arising from sharing limited resources in the development, the technical preparation of production, and the production itself. Risks might also arise in relation to the suppliers and partners that participate in the development. Attention has been paid, in particular, to initial risk analyses when it is essential to check risks for various project options available, in view of other projects running or of other potential projects, and to decide

on the conditions of entering into a particular project.

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## **HB-04 Technology Management in Healthcare Sector - 3**

**Thursday, 8/6/09, 10:30 - 12:00**

**Room: Broadway-2**

**Chair(s) Nima A Behkami; Portland State University**

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### **HB-04.1 [A] The Challenge of Creating Value through Integrated Solutions in a Brazilian Health Care Provider: The Blue Life Case Study**

*Marlene Paes de Almeida; Instituto Tecnológico de Aeronáutica, Brazil*  
*Marluci Paes de Almeida; Instituto Tecnológico de Aeronáutica, Brazil*  
*Marcelo P Crespo Jr.; Instituto Tecnológico de Aeronáutica, Brazil*  
*Milton F Chagas Jr.; Instituto Tecnológico de Aeronáutica, Brazil*

This work is the result of a hindsight analysis of a successful project led by a Brazilian health care provider. It shows that the company's market value significantly increased through the use of Integrated Solutions made up of integration strategies conceived specifically to balance its stakeholders needs. This analysis investigates economic value creation through the identification of business opportunities and strategy formulation in product differentiation for capital goods that have a high unit cost and are technology-intensive. A resource-based vision analysis was the theoretical framework used in order to assess the solution adopted by the company, which aimed to meet the needs of the new Brazilian supplementary health regulations. The case shows how system integration competence-building was required to establish a strategic partnership that aimed to increase the company's economic value. The highlight of this Brazilian case is a repositioning of the firm's place in the health care value chain: it experienced upstream movement in building its own hospital and downstream movement in providing new services directly to its final customers. Through this upstream movement, the company established strategic partnerships with other companies in order to share risks and costs as well as profits and lessons learned.

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## **HB-05 Intellectual Property - 1**

**Thursday, 8/6/09, 10:30 - 12:00**

**Room: Broadway-3**

**Chair(s) Chayakrit Charoensiriwath; National Electronics & Computer Tech. Center**

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### **HB-05.1 [A] Patent Claims and Value Capture Points: Introducing Value-Chain Patent Strategy**

*George E Darby; Paradise Patent Services, Inc., United States*

A value-chain patent strategy applies business model design techniques at a product or service level to ensure that patent claims protect value capture points in the business model. By using value-chain patent strategy, business strategy and IP strategy can be integrated, and patent claims can be designed to protect the value capture points in the business model for a new or improved product or service. Value-chain patent strategy requires a major shift in how patent strategy is currently formulated and executed; the most likely corporate change agents are technology managers. Training technology managers in value-chain patent strategy requires the introduction of coursework about business models, value chain analysis, patent applications, and patent claims into management of technology curricula.

### **HB-05.2 [R] Study of the Linkages between Innovation and Intellectual Property**

*Karuna Jain; Indian Institute of Technology Bombay, India*  
*Mukundan Raghavan; Indian Institute of Technology Bombay, India*  
*Shishir K Jha; Indian Institute of Technology Bombay, India*

The incredibly fast-evolving information ecosystem has created porous boundaries across industries and its market, disrupting the traditional models of innovation and questioning the theory of intellectual property (IP) as the method of appropriation. The means of innovation are shifting from independent ownership to collaborative and service based. This paradigm shift in the innovation process has an impact on the three primary firm level processes, namely: strategic management (SMP), innovation management (IMP) and

# SESSIONS

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technology development (TDP). IP has been considered as the major incentive that enables innovation, and existing literature studies the linkage between innovation and IP from an individual perspective: economic, social, development or standards to name a few. Too often the interests of the producer dominate the evolution of an IP policy, and that of the ultimate consumer is neither heard nor heeded. Certain firms have aligned their IP management to the new emerging perspective in one of two ways: individual alignment of their business models [IBM, SUN, P&G, Google] or as a consortium of specific technologies (3GPP, WiMAX patent partnership, Green IP patent partnership). What variables should the firm's IP management system be aware of that can help strategize its market position by banking on innovation outputs? We propose a set of variables (nature of the good, essentiality of IP and open innovation) that are useful to identify the role of IP to determine the innovation outputs.

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## **HB-06 New Product Development - 3**

**Thursday, 8/6/09, 10:30 - 12:00**

**Room: Broadway-4**

**Chair(s) Richard Sperry; Portland State University**

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### **HB-06.1 [R] The Impact of Intangible Value on the Design and Marketing of New Products and Services: An Exploratory Approach**

*Frank Steiner; RWTH Aachen University, Germany*

*Robert R Harmon; Portland State University, United States*

Innovators are always confronted with the issue of how to identify, measure, design, produce, communicate, and deliver the intangible qualities of their new products and services to their target markets. Intangible product attributes can have a dramatic effect on the market success of a new product or service, but the product and service design process seldom accounts for such attributes. Customers desire complete solutions. It is not sufficient to just offer a core product or service. Companies need to deliver products that are unique, create customer value, and build long-term relationships with customers that often depend on intangible factors. In addition to the physical product, services and intangible product attributes such as knowledge, emotion, and the customer experience are important and perhaps primary elements in the total value equation. This paper will present a taxonomic review of the literature on intangible product and service value, identify key research issues, propose intangible-value models for future research, and explore the impacts on the new product development and marketing strategy processes.

### **HB-06.2 [R] Relationship between Delayed Technology Utilization and Product Success: An Empirical Study of Personal Computers and Gaming**

*Ozgur Dedehayir; Tampere University of Technology, Finland*

*Saku J Mäkinen; Tampere University of Technology, Finland*

Organizations seek opportunities to innovate when technological asymmetries between sub-systems emerge in evolving technological systems. Consequently, competition among organizations to close technological disparities should lead to the development of products with higher performance. However, currently little is known about the dynamic relationship between the time lag in technology utilization and product success. In this paper we firstly develop a time gap measure of technological disparity between sub-systems within a technological system and apply the developed measure in an empirical study of the personal computer (PC) systems GPU (graphics processing unit) and PC game sub-systems including 1300 product launches. Our findings show that the PC game sub-system trails the GPU sub-system in the level of technological performance throughout the years 1996 to 2007, inclusively, with varying size of time gap. Secondly, we explore the relationship the technological disparity, as measured by the time gap, with the product performance of PC games, as measured by game ratings. Our results interestingly do not indicate a relationship between the time gap and the success of PC games. We elaborate on managerial implications of these findings and provide theoretical generalizations on technology systems and their evolution inside the technology and innovation management arena.

### **HB-06.3 [R] Integration of Technology Roadmapping and Project Portfolio Management to Improve the Front-End of NPD Process**

*Maicon G Oliveira; University of Sao Paulo, Brazil*

*Henrique Rozenfeld; University of Sao Paulo, Brazil*

Although front-end activities are critical to the success of NPD, they are in fact almost ineffective in practice because the existing methods were developed for stand-alone applications. A bibliographical review showed that technology roadmapping (TRM) and project portfolio management (PPM) are stand out methods for the front-end of NPD. This finding motivated the research question of our work: Can the integration of TRM and PPM contribute to improve the front-end of NPD? Hence, this paper evaluates the potential of this integration based on a case study at a high-tech company. The TRM applied here is based on the T-Plan developed at the University of Cambridge, and a sequence of steps and tools are proposed for PPM based on a synthesis of the findings of numerous authors. In this specific case, the front-end of NPD benefited from the integration. The set of product proposals were aligned with business and technological strategies, providing synchronization between market trends, NPD and new technology. Project portfolio management provides feedback for technology roadmapping. Therefore, the integration of NPD front-end methods appears to constitute a productive field of research and should be considered by high-tech companies.

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## **HB-07 R&D Management - 4**

**Thursday, 8/6/09, 10:30 - 12:00**

**Room: Forum Suite**

**Chair(s) Seung Jun Yoo; KISTEP**

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### **HB-07.1 [A] Analysis of Climate Change Related R&D Investment in Korea**

*Hyun-Jeong Cho; KISTEP, Korea, South*

*Jung Suk Hong; KISTEP, Korea, South*

*Young-Il Park; EWha Womans University, Korea, South*

In these days, counterplan for climate change became an essential part of government policy. To overcome the limit of related technology, the importance of R&D is growing in this area. In 2006, Korea government made 'R&D Master Plan for Climate Change Convention' to support R&D activity efficiently. In this study, we analysed the characteristics of R&D investment in Korea based on 'R&D Master Plan for Climate Change Convention', and tried to find out valuable implications from the investigation.

### **HB-07.2 [A] Evaluation of New and Renewable Energy Technology R&D Investment Strategy in Korea**

*Jung Suk Hong; KISTEP, Korea, South*

*Young Soo Ryu; KISTEP, Korea, South*

*Boojong Kil; KISTEP, Korea, South*

In 2008, the new president of Korea announced a low carbon green growth initiative and strongly drove the policy of climate change and environment. Until now, the Korean government tried to support R&D investment in this area. However, from now on, R&D investment will be much more strengthened by the President's will. The core of low carbon green growth is mitigation of climate change - reduction of greenhouse gas. For successful conduction of this policy, it is necessary to introduce new energy technology. There are various energy technologies such as energy efficiency, renewable energy, hydrogen and fuel cell, nuclear technology, etc. And renewable energy technology is major concerning part and related industries are growing rapidly. In this paper, the environment of renewable energy use and R&D in Korea was analyzed, and the desirable strategy for renewable energy technology and R&D investment is discussed.

### **HB-07.3 [A] Improving the Oil & Gas Industry Innovation with a Strategic Fuel: Distributed Research and Development**

*Clarissa Côrtes Pires; Aeronautics Technological Institute - ITA, Brazil*

*Ligia Maria S. Urbina; Aeronautics Technological Institute - ITA, Brazil*

The Brazilian Oil & Gas (O&G) industry has increased significantly for the last years, especially during the process of breaking the state monopoly in 1997. The industry impacts directly on the national economy; its contribution to GDP grew more than three times since 1998, when it was almost 3 percent, and in 2007 the rate increased to about 11 percent of

# SESSIONS

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GDP. Energy integration with neighboring countries such as Argentina, Bolivia or Venezuela also contributes to value for this sector. The importance and great opportunities of the O&G sector force its companies to pursue new technologies aiming at efficiency and flexibility, and then become more competitive. In Brazil, this type of innovation process occurs mostly through university-industry cooperation; however, the gap between university and industry is still huge. This paper presents a method for coordination distributed R&D projects for a big O&G Company, using the concepts of collaborative partnerships, open innovation and distributed research and development strategy. The method is illustrated by a case study.

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## HB-08 Knowledge Management - 4

Thursday, 8/6/09, 10:30 - 12:00

Room: Council Suite

Chair(s) Caroline Benton; University of Tsukuba

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### HB-08.1 [R] Innovation Forecasting: A Case Study of the Management of Engineering and Technology Literature

Scott Cunningham; Delft University of Technology, Netherlands

Jan Kwakkel; Delft University of Technology, Netherlands

The following paper contributes to the methodology of innovation forecasting. The paper analyzes the literature of engineering and technology management. A brief history and justification for interest in engineering and technology management is presented. The field has a 60 year history of interdisciplinarity, and is therefore a ripe source for closer investigation into time trends of knowledge. The paper reviews the literature of innovation forecasting, examining a range of theoretical and methodological literature interested in the evolution of knowledge. A new model, suitable for sparse and count-like data, is presented. A mathematical presentation of the model is offered. A discussion is offered of how the model may be implemented in an approachable way within spreadsheet software. A time history of engineering management literature is extracted from a database and analyzed using the model. A projection of keyword growth is offered, and key features of the emerging knowledge base within engineering management are discussed. Recommendations for future research, as well as for those monitoring the status of the discipline of engineering management, are made.

### HB-08.2 [R] Toward a Flexible Service-Oriented Reference Architecture for Situational Awareness Systems in Distributed Disaster Knowledge Management

Jari Leppaniemi; Tampere University of Technology, Finland

Petri Linna; Tampere University of Technology, Finland

Jari Soini; Tampere University of Technology, Finland

Hannu Jaakkola; Tampere University of Technology, Finland

The aim of our research is to develop methods for authorities to improve situational awareness in support of management activities in disasters and catastrophes. One of the objectives is to anticipate, collect and analyze requirements for advanced situational awareness information systems and use them to define a free and open source based reference architecture for a flexible service oriented system designed to support the loose connection of the situational awareness systems of different authorities. This task is a very demanding one, because the interfaces of the legacy information systems of the different authorities are typically closed, their age, technology and position in their lifecycle are very different and they are mainly intended to support only certain types of activities (rescue, firefighting, police work, health and emergency, safety, etc.). Additional challenges for requirement elaboration include the special characteristics of the information needed in different phases of the emergency management cycle (mitigation & prevention, preparation, response and recovery), quantitative and qualitative differences in situational awareness needs (i) at local versus global level and (ii) between different types of authorities (rescue, police, health etc.), and (iii) the type of management decision (tactical, operational or strategic). This paper deals with the challenges in collecting and managing the information and knowledge needed for the development of situational awareness in disaster and catastrophe management.

### HB-08.3 [R] Review of Knowledge Transfer Program Based on Mobile Phone

### (KEITAI)'s Technology Prediction and Its Psychological Impact on Users

Yukiko Nishimura; The University of Tokyo, Japan

Takeaki Sugimura; PRIP Tokyo, Japan

Kunihiro Nishimura; The University of Tokyo, Japan

Under the rapid spread of mobile phone (KEITAI) in recent years, it is expected that the introduction of new technology and functions will further increase the gap between users in their consciousness of KEITAI's new technology. In view of such a background, we have conducted the research for the safer usage of KEITAI. We so far proposed and conducted a seminar as a method of knowledge transfer to bridge the gap between KEITAI users as well as between new technology and user consciousness. The seminar is organized based on the KEITAI user survey results and the analysis of the existing KEITAI products. We analyzed the level of user's skill in KEITAI usage and the seminar includes a training program adapting to these four different user groups. We conducted a survey for KEITAI user consciousness asking about the feasible KEITAI technology and services in the near future. In this report, we compare the different user group's survey results to review the points that will expand the gap between users and clarify the points that need knowledge transfer to solve the user's gap in knowledge. Further, we conducted an effect measurement after the KEITAI seminar to confirm its effectiveness. We adopted a scaling technique based on semantic differential method and factor analysis to review the validity of our KEITAI seminar in a broad sense.

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## HB-09 Strategic Management of Technology - 4

Thursday, 8/6/09, 10:30 - 12:00

Room: Directors Suite

Chair(s) Ann-Marie J Lamb; Portland State University

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### HB-09.1 [A] A Case Study for Using Informetric Methods in R&D Strategic Planning and Research Performance Analysis in KIST

Dae-Shin Kang; Korea Institute of Science and Technology(KIST), Korea, South

In-Wook Nah; Korea Institute of Science and Technology, Korea, South

Ho-Young Chun; Korea Institute of Science and Technology, Korea, South

Yong-Su Shin; Korea Institute of Science and Technology, Korea, South

Dae-Hee Lee; Korea Institute of Science and Technology, Korea, South

Yun-Chul Chung; Korea Institute of Science and Technology, Korea, South

The Korean governmental budget for R&D in 2007 exceeded US \$10 billion, as one of seven countries in the world. The point in time when other countries reach an R&D budget of US \$10 billion is essentially when the paradigm for social and economic development changes and, accordingly, the overall demand for new technological development to meet the paradigm. In other words, innovative and value-creating technologies are highly demanded. Since 2004, Korea has strengthened its R&D planning to satisfy the need for technology development; it is extensively applying this policy to government supported research institutes. One of the representative government supported research institutes, KIST, has begun emphasizing preliminary R&D planning. It includes the analysis of world-wide technological trends, the identification of emerging technologies and latent competitors, and the establishment of strategies for global R&D cooperative networks. To obtain analysis results which are more objective, KIST is applying bibliometric methodologies, employing the patents and articles database, rather than the expert peer review method. As a result, researchers can now submit R&D proposals based on the analysis result, and top management can utilize the data to verify the reasonableness of the proposed research projects. This study introduces concrete cases for the analysis of trends, networking, technology maturity, and citation analysis, based on the patents and articles analysis process for strategic R&D planning at KIST. Particular analytical methodologies, including patent and articles knowledge extraction, patent and article map analysis, technology clustering, technology networking, S&T database application, text mining with Vantagepoints, and ThemeScape productions of patents and articles, will be described. It will also analyze how researchers and top management are utilizing the analysis results for practical applications and significance of R&D planning and paradigm shift.

### HB-09.2 [R] Perceptions of Strategic Management of Technology in Small

# SESSIONS

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## High-Tech Enterprises

*Kari T Sahlman; Nokia Siemens Networks, Finland*  
*Harri Haapasalo; University of Oulu, Finland*

Strategic management of technology is a necessity for wealth creation in society, but also in corporations as members of that society. Emergence of new economical order enabled by global competition and proliferation of information involves increasingly rapid changes in technologies which causes major competitive challenges to enterprises to manage their technological capabilities. In the absence of commonly agreed management of technology frameworks this study discovers perceptions and current state of management of technology in high-tech SMEs. Theoretical background of this study is based on a conceptual framework of strategic management of technology originating from large enterprise practices. The elements are classified with respect to structures, objectives and company internal and external impacts. Conceptually entire field is perceived to be complex and there is contingency and immaturity in practices deployment in SMEs. As a conclusion it is suggested that SMEs should consciously develop management of technology practices, and the presented structures elements of strategic management of technology framework would provide a frame of reference when constructing the practices in enterprises. It is also proposed that strategic management of technology should be evolved as a distinguishing functional and managerial domain that enhances the management paradigm of multifunctional strategic orientation in enterprises.

## HB-09.3 [R] New Business Models for Producers of Capital Goods and their Organisational Implications

*Stephan Scheuner; Universitat Siegen, Germany*  
*Joana G Geraldi; Cranfield School of Management, United Kingdom*  
*Gerald Adlbrecht; Universitat Siegen, Germany*

The global market environment in the capital goods (CG) industry is characterized by a discontinuous turnover structure and shrinking margins. To meet these economic challenges, many producers of capital goods opt for a strategic relocation along the value chain aiming at assuming more entrepreneurial responsibility. A possible path to pursue this strategy is the integration of business to business operator models into the product portfolio. From the point of view of CG producers, the propagation of these models poses two main research questions: 1) Which concrete possibilities exist in the broad field of business to business operator models? 2) What are the organizational consequences for companies adapting these models? This paper will address the first question by introducing a comprehensive typology of these business models which has been developed based on the analysis of case and market studies. Furthermore, the organizational implications of these business models for project-based organizations will be discussed.

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## HD-01 TUTORIAL: Project Management Alignment Program – A Collaborative Methodology for Delivering Highly Successful Outcomes

**Thursday, 8/6/09, 14:00 - 15:30** **Room: Pavilion East**  
**Speaker(s) Jeffrey Busch; Jeffrey S. Busch PMP**

PMAP - What is it? Project financial risks have moved to the forefront of companies' concerns given today's challenging economic climate. Such risks are also continuously influenced by many of today's global project factors, including: the dynamics of sophisticated system and business owners, the complexity of global businesses, aggressive cultures, technological advances, and out-sourcing strategies. The Project Management Alignment Program is based on early principles of partnering in order to slow a litigious environment. Additionally, it is more than a temporary effort; it is an on-going emphasis and strategy for highly successful performance driven projects. It can turn around the most troublesome endeavors and can bring a halt to the adversarial environment which materializes in many aggressive projects. Its focus is high standards, continuous collaboration, active and persistent project participants, enhanced management processes, project-focused communication, and maintenance of principles and habits of alignment. PMAP is about people. A world evolving in a paradigm of fundamental changes will challenge how businesses accomplish work. People are most often motivated from within, influenced by their surroundings and

personal experiences, which results in unique responses to even the most common project-related challenges. In some cases, people may act unreasonably, feel unjustly criticized, fight back or run away to avoid situations, which can contribute to additional project risk. How people treat each other and respond to events, issues and situations, ties directly to the success or failure of the project. Trust and respect are elusive and need to be continually built upon. Simply put, it is how we do business together that makes the project succeed. Fundamental changes in how business and technology development will be executed in the future will stretch the business capabilities from both a resource and economic standpoint. Facing the diverse economic challenges, including energy consumption and distribution and environmental demands, will be daunting. As such, why not direct business resources and focus intensely on the technology as the focal point for our change, rather than expend valuable resources addressing distractions and inefficiencies which result in continual project shortcomings.

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## HD-03 Technology Roadmapping - 3

**Thursday, 8/6/09, 14:00 - 15:30** **Room: Broadway-1**  
**Chair(s) Nathasit Gertsri; Mahidol University**

### HD-03.1 [R] Addressing the Cognitive and Social Influence Inhibitors during the Ideation Stages of Technology Roadmapping Workshops

*Clive I Kerr; University of Cambridge, United Kingdom*  
*Robert Phaal; University of Cambridge, United Kingdom*  
*David R Probert; University of Cambridge, United Kingdom*

Technology roadmapping workshops are essentially a social mechanism for exploring, creating, shaping and implementing ideas. The front-end of a roadmapping session is based on brainstorming in order to tap into the group's diverse knowledge. The aim of this idea stimulation activity is to capture and share as many perspectives as possible across the full scope of the area of interest. The premise to such group brainstorming is that the sharing and exchange of ideas lead to cognitive stimulation resulting in a greater overall group idea generation performance in terms of the number, variety and originality of ideas. However, it must be recognized that the ideation stage in a roadmapping workshop is a complex psychosocial phenomenon with underlying cognitive and social processes. Thus, there are downsides to group interactions, and these must be addressed in order to fully benefit from the power of a roadmapping workshop. This paper will highlight and discuss the key cognitive and social inhibitors involved. These include: production blocking, evaluation apprehension, free riding/social loafing, low norm setting/matching. Facilitation actions and process adjustments to counter such negative factors will be identified so as to provide a psychosocial basis for improving the running of roadmapping workshops.

### HD-03.2 [A] Value-Driven Technology Road Map (VTRM)

*Dave Fenwick; Portland State University, United States*  
*Tugrul U Daim; Portland State University, United States*  
*Nathasit Gertsri; Mahidol University, Thailand*

This paper presents a new approach to technology roadmapping by integrating marketing and decision methodologies. While much of the research into technology roadmapping has been applied to products that represent a one-time ROI to the manufacturer, current Internet technologies are resulting in web services that use an entirely different financial and business model of licenses and subscriptions. This paper addresses the software services applicability and documents a start-to-finish application of cross-discipline models and tools to form a real-life roadmap from market drivers to project headcount. Pitfalls in the roadmapping process will be documented and suggestions for improvement will also be discussed.

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## HD-04 Environmental Issues - 2

**Thursday, 8/6/09, 14:00 - 15:30** **Room: Broadway-2**  
**Chair(s) Robert Harmon; Portland State University**

### HD-04.1 [R] The Positive Effect of Green Relationship Learning on Green

# SESSIONS

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## **Innovation Performance: The Mediation Effect of Corporate Environmental Ethics**

*Ming-Ji James Lin; National Central University, Taiwan*  
*Ching-Hsun Chang; National Central University, Taiwan*

This study explores the positive effect of green relationship learning on green innovation performance in the Taiwanese manufacturing industry. The research also discusses the mediation effect of corporate environmental ethics between green relationship learning and green innovation performance. With the increasing trend of environmentalism, green innovation becomes a critical factor for companies to obtain sustainable development. This study proposes the three hypotheses. First, this research asserts that green relationship learning can facilitate corporate environmental ethics. Second, the study posits that corporate environmental ethics has a positive association with green innovation. Third, this study argues that corporate environmental ethics is a mediator between green relationship learning and green innovation. This study is conducted in the Taiwanese manufacturing industry to test the above research hypotheses. The results show that green relationship learning has a positive effect on corporate environmental ethics which affects green innovation performance positively. In addition, the results verify that corporate environmental ethics is a mediator between green relationship learning and green innovation performance.

## **HD-04.2 [R] Incentive Policies to Address Climate Change in China**

*Jun Jin; Zhejiang University, China*  
*Ying Dong; Zhejiang University of Science and Technology, China*

Climate change has become one of the most serious problems faced by all countries. Like other countries, China has launched a set of policies and activities to reduce the impact of climate change in the development of economics and society. This paper reviews the policies in China to encourage the environmental beneficial and energy-saving innovation, such as the environmental policies and the environmental tax in the future. Based on archival analyses, the policies are reviewed from some aspects, for instance, the national plan, and the S&T actions. It is a system of low-carbon innovation policies in China to build a low-carbon country. In addition, the development of the new energy vehicle industry is taken as a case to illustrate the implementation of incentives for climate change. Recommendations to the policies upgrading and implication are proposed at the end of the paper.

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## **HD-05 Technology Transfer - 4**

**Thursday, 8/6/09, 14:00 - 15:30**

**Room: Broadway-3**

**Chair(s) Timothy R Anderson; Portland State University**

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## **HD-05.1 [R] University Technology Transfer: A Conceptual Model of Impacting Factors and Phased Process**

*Jisun Kim; Portland State University, United States*  
*Tugrul U Daim; Portland State University, United States*  
*Timothy R Anderson; Portland State University, United States*

Among technology transfer research conducted in the last two decades, there are some intensive empirical studies, which were exploring organizational characteristics influencing the university technology transfer (UTT) practices, and reasons why some universities have the better productivity in commercialization. Little studies, however, provide a holistic view of how those factors interact and how they influence the performance of UTT. The objective of this paper is to summarize prior research, and provide a comprehensive theoretical model of effective and efficient UTT. The factors identified from the literature are grouped into internal and external factors. The internal factors are categorized in terms of technical, organizational and personal (TOP) perspectives.

## **HD-05.2 [R] A Novel Integrated SEM Based on DEMATEL for Evaluating Technology License Income Performance**

*Yun Ken; National Yunlin Univ. of Science and Technology, Taiwan*  
*Tao Huang; National Yunlin Univ. of Science and Technology, Taiwan*  
*Chih-Hung Wu; National Taichung University, Taiwan*  
*Shian-Hung Shiu; National Yunlin Univ. of Science and Technology, Taiwan*

This study proposes a novel two-stage approach which combines DEcision-MAking Trial and Evaluation Laboratory (DEMATEL) with structural equation modeling (SEM) for addressing and identifying the interrelationships of determinants and decision factors that influence or impact technology transfer. In the first stage, DEMATEL analysis is capable of revealing the central components and illustrating the interrelation structure of key factors that influence technology license income. Second, the result of DEMATEL offers SEM for further analyzing technology transfer performance. Research results provide a visualized framework to assist in assessing and predicting technology transfer performance license income in universities.

## **HD-05.3 [R] Super-efficiency DEA Model for Evaluating Technology Transfer Performance of U.S. University**

*Yun Ken; National Yunlin Univ. of Science and Technology, Taiwan*  
*Tao Huang; National Yunlin Univ. of Science and Technology, Taiwan*  
*Chih-Hung Wu; National Taichung University, Taiwan*  
*Shian-Hung Shiu; National Yunlin Univ. of Science and Technology, Taiwan*

American research universities have been allowed to receive license income from licensing patent rights to private sectors for further development and commercialization after the passage of the University and Small Business Patent Procedures Act (Bayh-Dole Act) in 1980. The Act made a huge fundamental and policy change in encouraging universities to rapidly increase their patenting and licensing activities. In the age of fundamental change, technology management, especially technology transfer performance (TTP), has become an important issue among the entire American research universities. Nowadays, due to the complexity of patenting and licensing activities, a direct and precisely TTP evaluation and comparison is usually important but difficult. Unfortunately, few studies have been devoted to proposing an objective and quantitative mechanism or technique for precisely evaluating TTP so far. Therefore, this study employs and compares two alternative data envelopment analysis (DEA) models, Charnes-Cooper-Rhodes (CCR) and super-efficiency slack-based measure (SBM), to determine relative efficiencies and to measure the slack values among universities on the basis of AUTM licensing survey data whereby TTP is transformed into monetary value. Our research results will be able to sort the performance and provide managerial suggestions for each university to improve its TTP.

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## **HD-07 R&D Management - 5**

**Thursday, 8/6/09, 14:00 - 15:30**

**Room: Forum Suite**

**Chair(s) Paul R Newman; Portland State University**

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## **HD-07.1 [R] Applying Patent Analysis to Explore the Co-opetition Behavior between Two LED Manufacturers: Nichia and Osram**

*Yu-Shan Chen; National Yunlin University of Science & Technology, Taiwan*  
*Bi-Yu Chen; National Yunlin University of Science & Technology, Taiwan*

This study used patent analysis to explore the co-opetition behavior between the two LED manufactures, Nichia and Osram, from the two critical technological fields in the LED industry, LED components and phosphor. The results of patent analysis indicated that Nichia had advantages in the field of LED components, while Osram had advantages in the field of phosphor. Therefore, there existed cooperation opportunities for the two opponents in the LED industry, because their technological capabilities were partially complementary. Therefore, Nichia and Osram were willing to make a compromise to solve the patent litigations between them and further agreed to offer cross-licensing of patents for each other. Their strategic reactions were changed from full competition to co-opetition which is win-win for them. The results of this study can provide a valuable reference for managers not only in considering patent strategies of their companies, but also in formulating strategic plans.

## **HD-07.2 [R] Insights from Some National Centers of Excellence in the Philippines (An input for the proposed Center of Excellence for the Philippine Electronics Industry)**

*Camara L Ho; Graduate School, University of the East, Manila, Philippines*

This paper contains a summary of the research results conducted on four established Na-

# SESSIONS

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tional Centers of Excellence (CoEs) in the Philippines, namely, the Marine Science Institute (MSI), the National Institute for Geological Sciences (NIGS), the National Institute of Physics (NIP) and the Natural Sciences Research Institute (NSRI). This research study was undertaken in order to gain insights and/ or perspectives on the relevant, practical experiences of these established CoEs. Such insights/ perspectives will be used as a guiding input for the concept paper proposing the establishment of a Center of Excellence for the Philippine electronics industry. There is currently a synergistic effort undertaken by committed and relevant organizations and institutions from the academe, industry and government, such as ASTI, that seeks to address significant issues, as well as to help increase the global competitiveness of the whole Philippine Electronics Industry. In acknowledging the increasing global competition experienced by the industry, including the specific competition from ASEAN countries, Vietnam and China, there was strong consensus in coming up with a strategic master plan or road map for the industry that seeks to counter this problem. At the heart of the said industry strategic plan is the proposal for the establishment of a National Center of Excellence that will help achieve the goals set forth.

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## HD-08 Knowledge Management - 5

Thursday, 8/6/09, 14:00 - 15:30

Room: Council Suite

Chair(s) Jari Soini; Tampere University of Technology

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### HD-08.1 [A] Temporary Staff Agency for Knowledge-based Society: A New Trend in Japanese Mobile-Phone Industry

Hitoshi Niwano; Kochi University of Technology, Japan

Makoto Hirano; NTT Photonics Labs., Japan

This paper describes a case of a small start-up agency on intelligent, knowledgeable temporary staffs in Japanese mobile-phone industry as a new trend in the field of IT industry in Japan. In the rapid progress of technology and market, many enterprises in IT industry are facing to a serious shortage of knowledge/knowledgeable-employees on technology and market. For example, in the mobile-phone industry, the number of account customers has been so rapidly increased and varieties of services and technologies have also been so drastically increased that the employees inside mobile-phone enterprises cannot cover the whole service and technology. Therefore, outsourcing labor force like temporary staffs has become so important in the industry. However, the problem is that it is not easy to obtain appropriate labor force with sufficiently intelligent, knowledgeable for IT industry and market. The case analyzed here implies a clue to solve this problem by flexible, autonomous decentralized organization on temporary staff agency and effective self-education system. The characteristics of such a start-up enterprise and their manner of absorbing/sharing knowledge are discussed.

### HD-08.2 [A] Proposal of a Knowledge Management Model for Launch Operations at the Brazilian Aerospace Technology Center: The Case of the Interface Launch Group

William Limonge; Instituto de Fomento e Coordenação Industrial IFI, Brazil

Eraclés Durante; Instituto de Fomento e Coordenação Industrial IFI, Brazil

Ligia Maria S. Urbina; Instituto Tecnológico de Aeronáutica - ITA, Brazil

Manuel A Fagundes Perez; Instituto Tecnológico de Aeronáutica - ITA, Brazil

Knowledge management reduces risk associated with launching operations. Thus, to improve mission success, the Comando-Geral de Tecnologia Aeroespacial (CTA), a Brazilian aerospace technology center, created an Interface Launch Group. This group is responsible for analyzing the launch interfaces in order to get subsidies to develop a knowledge management model that allows the transference of knowledge across different sectors and missions. In this context, the objective of this paper is to propose this knowledge management model. Initially a literature review was performed on knowledge management concepts, such as knowledge management models and knowledge cycles. Afterwards, the Interface Launch Group activities were analyzed in order to propose a model capable of capturing the main knowledge generated, so that knowledge can be transferred across sectors and missions. The model focus is to select, capture and disseminate knowledge that is key for the launch operations success. As a conclusion, it is necessary to point out that the model

proposed should be considered as a first step that must be improved and expanded by CTA in order to conquer and retain technological growth.

### HD-08.3 [R] Future-oriented Innovation Management with Co-active Knowledge Dynamics

Kubota, Yayoi; Fuji Xerox Co., LTD., Japan

Nomura, Takahiko; Tokyo Institute of Technology, Japan

So far, various analytical innovation approaches have been studied in the past, but the individual and organizational behaviors will be more important to continuously drive innovation rather than analytical methods. During the Knowledge Benchmarking Program conducted in 2008, which theme was "Creative Paradigm Management" realizing social values beyond organizations, we compared the best practice companies and participating companies of the research and discovered that their largest gap was focus on fostering creative culture and flexible change of strategy based on external changes such as society and environment. In a period of great uncertainty, creating an organization which has multidimensional future scenarios and positively capture unexpected external changes will lead to a greatest difference in the result of technological management. We have created the co-active innovation model that aims an organization which every member contributes to design future scenario and develop knowledge asset which will be broadly searched for areas of application, through benchmarking activities of innovative companies. This paper will discuss the case of a pilot project based on this model that was conducted through collaboration with Japanese companies and practical co-active innovation model that we obtained from this project.

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## HD-09 Strategic Management of Technology - 5

Thursday, 8/6/09, 14:00 - 15:30

Room: Directors Suite

Chair(s) George E Darby; Paradise Patent Services, Inc.

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### HD-09.1 [R] A Heuristic Procedure to Identify Most Valuable Chain of Patents in a Given Technology

Fang-Pei Su; Yung Ta Institute of Technology & Commerce, Taiwan

Kuei-Kuei Lai; National Yunlin University of Science & Technology, Taiwan

Wen-Goang Yang; Chaoyang University of Technology, Taiwan

RRK Sharma; India Institute of Technology Kanpur, India

We argue that patents under litigation have maximum value. We develop a heuristic procedure to determine how patents (associated with a given technology) under litigation form a network of patent family members and priority patents involved. Later we develop a simple algorithm to identify critical and significant chain in the above network. We argue that these critical and significant chains (in the above network so created) offer companies valuable information in deciding their patent portfolio strategies.

### HD-09.2 [R] Core/Periphery Structure of the Technological Network

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

Kuang OuYang; National Yunlin University of Science & Technology, Taiwan

Hsien-Che Lai; National University of Tainan, Taiwan

By applying a network analytical approach, this paper examines the position of technological network in shaping the contribution of a technology in technological development. Between the core and the periphery of the technological network structure, we argue that technologies which occupy an intermediate position are in propensity to seminal technologies, on the contrary, which occupy a peripheral position are to more tendency to succeed or derivative technologies. We empirically test the patent data of insurance business method and the theoretical implications of the results are discussed.

### HD-09.3 [R] Patent Analysis of Technology-Performance by Integrating Patent Family and Patent Citation

Kuei-Kuei Lai; National Yunlin University of Science & Technology, Taiwan

Kuang OuYang; National Yunlin University of Science & Technology, Taiwan

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

# SESSIONS

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*Wen-Goang Yang; Chaoyang University of Technology, Taiwan*

The value of mechanical engineering patents often lies in innovative graphic designs and detailed complementary context. Therefore, without having the contents of a patent thoroughly examined by experts, we cannot understand its true innovation value by using the current information analysis technology. Since the process of qualitative research, on the other hand, is a complicated and time-consuming task, this paper proposes a Key Patent Analysis Process (KPAP). KPAP uses the focusing first, and then finding the detailed idea to prove the feasibility of this method by giving a specific case. Firstly, we propose using a patent family to effectively retrieve the key patents to meet the requirements of the innovation design; then we propose proceeding to the next step using a patent citation to broaden the search field to thoroughly comprehend the development in a specific technology field. Finally, we use TRIZ to create a technology performance map and technology development niche, and to effectively solve the possible engineering obstacles that may come to mind at the detail designing stage. The model suggested by this research can indeed promote the effectiveness of patent technology to extract useful patent intelligence; moreover, it improves the overall efficiency of new product designs.

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## **HE-01 SPECIAL SESSION: PICMET '10 and '11 Planning Session**

**Thursday, 8/6/09, 16:00 - 17:30**

**Room: Pavilion East**

**Speaker(s) Dundar F Kocaoglu; Portland State University**

**Timothy R Anderson; Portland State University**

**Tugrul U Daim; Portland State University**

**Antonie J Jetter; Portland State University**

**Liono Setiowijoso; Portland State University**

**Charles M Weber; Portland State University**

**Ann White; Portland State University**

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This panel session will provide a chance to give feedback on PICMET '09 as well as to get involved in the planning for PICMET '10 and '11 conferences. The next PICMET will be held July 18-22, 2010 at the Intercontinental Hotel in Bangkok, Thailand. The following year it will be back in Portland from July 31 to August 4th.



Note: [R] = Research Paper; [A] = Industry Application

# AUTHOR INDEX

---

## A

Abe, Atsushi ; ME-04.2  
Abe, Hitoshi ; ME-03.1; TE-04.1  
Adachi, Emiko ; WD-08.2  
Adlbrecht, Gerald ; HB-09.3  
Afolabi, Oladele O. ; WD-09.4  
Aguwa, Celestine C. ; TB-06.2  
Akhavan, Amir Nasser ; TB-05.4  
Akhilesh, K.B. ; MB-11.2  
Akkaya, Yildiz ; MD-06.2  
Al Fayeze, Faisal ; WD-10.1  
Alali, Baqer M. ; HB-03.1  
Alanazi, Hamad ; WE-07.2  
Alarcon Ozuna, Alejandro ; MB-12.3  
Albar, Fatima M. ; WD-10.2; WB-10.1;  
HB-02  
Albright, Richard ; MD-03.2; ME-11  
Aldhaban, Fahad ; TE-05.2; WE-04.3  
Aldianto, Leo ; WE-06.3  
Alkaya, Ali F. ; MB-08.1  
Almasri, Maher ; WD-10.1  
Almobarak, Abdulrhman ; TE-10.2  
Alvarez, Jose C. ; WE-08.2  
Alves, Robson P. ; MB-12.4  
Amer, Muhammad ; WE-04.3; WD-10.1  
Anderson, Timothy R. ; TD-10.2;  
MD-01; HD-05; HE-02; WE-02.2;  
HD-05.1  
Aoyama, Atsushi ; WB-08; WD-11.2  
Ardilio, Antonino ; WB-11.1  
Arechavala Vargas, Ricardo ; MB-12.3  
Arman, Husam ; MB-09.2  
Arnoscht, Jens ; TE-09.3  
Aronson, Zvi H. ; WD-03.3  
Arroyo, Pilar E. ; MB-07.3  
Atoche-Kong, Carlos E. ; WD-02.3  
Auseklis, Nora ; WD-12.1  
Ayala Arriaga, America ; MB-12.3

## B

Bacioiu, George M. ; TD-11.3  
Badur, Bertan ; MD-06.2  
Bao, Gongmin ; WB-08.3  
Barezi Sabrejan, Asghar ; TB-05.4  
Bartlett, David ; WE-05.1; WB-05  
Basak, Melek ; TB-06.1

Basoglu, Nuri A. ; TB-10.2; TE-10.1;  
WB-05.2; WD-05  
Becker, Pamela R. ; ME-07.3; MD-07  
Behkami, Nima A. ; WD-12.3; HB-04  
Belding, Jeff ; TE-10.3  
Benade, Siebert ; MD-05.1  
Benton, Caroline ; WE-08.1; HB-08  
Ben-Zvi, Tal ; MD-12.1  
Berg, Daniel ; TD-04.1  
Berg, Pekka ; MD-10.3  
Bers, John A. ; MB-02.1; MB-02.2;  
ME-01; MB-02  
Beyerlein, Michael M. ; MB-01  
Beyerlein, Susan T. ; MB-01  
Bhardwaj, Arvind ; WD-11.3  
Biazzi, Jorge L. ; WB-06.2  
Biazzi, Monica R. ; WB-06.2  
Biloslavo, Roberto ; MD-10.4  
Blair, Andrew J. ; ME-03.3  
Bouncken, Ricarda B. ; MD-05.2;  
TB-13.2  
Braun, Eric ; TE-09.3  
Brenden, Rubyna K. ; MD-03.3  
Breuer, Henning ; TE-02.2  
Brockhoff, Klaus ; MA-00.2  
Buchanan, Walter W. ; TB-06.1  
Busch, Jeffrey ; HD-01; HB-03  
Bushell, Mike ; TD-09.1  
Butler, Jeff ; TD-07; MD-01  
Byeon, Soon Cheon ; TB-09.3  
Byun, JungWook ; TD-05.3

## C

Campanario, Milton A. ; TE-05.3  
Cao, Yong ; ME-04.2  
Cardenas, Jose Manuel M. ; MD-11.3;  
TD-08.3  
Carter, Lawrence ; WE-12.1  
Castañòn, Rosario ; WD-08.3  
Castellanos, Oscar F. ; TD-10.3  
Castilla, Cesar A. ; WE-11.3  
Cavin, Shirley ; MB-09.2  
Cayir, Sinan ; WB-05.2  
Cetindamar, Dilek ; MB-06.3; TD-01;  
TE-01; WD-06; MB-06  
Chagas Jr., Milton F. ; HB-04.1  
Chaïy, Soeil ; TE-07.2  
Chakravorty, Satya S. ; TB-12.1  
Chan, Kai-Ying ; WD-08.1  
Chan, Leong ; TE-05.2; WE-04.3  
Chang, Ching-Hsun ; HD-04.1  
Charoensiriwath, Chayakrit ; WB-07.2;  
HB-05  
Chen, Bi-Yu ; HD-07.1  
Chen, Gary ; MD-04.2  
Chen, Hongyi ; TD-02.1; MB-10; TD-02  
Chen, Peng-Ting ; MB-10.3  
Chen, Song ; MB-09.4; ME-06.2  
Chen, Wei-Ying ; TE-09.1  
Chen, Yi-Wen ; TD-02.2  
Chen, Yu-Shan ; HD-07.1  
Cheng, Ai-Chia ; MB-13.2  
Cheng, Joe Z. ; MB-10.3  
Chiu, Tzu-Fu ; TE-09.1  
Cho, Hyun-Jeong ; HB-07.1  
Choi, Bodum ; TD-05.3  
Choi, Kwoung Hee ; TB-09.3  
Choothian, Woraruthai ; TD-04.3;  
MB-03.3; WE-12.1  
Chou, Chia-Ching ; WB-12.2  
Choudhury, Piyasi ; MD-02.1  
Choy, King Lun ; TB-06.4  
Chu, Wen-Lin ; TE-12.2  
Chu, Yi-Wei ; TB-07.2  
Chun, Ho-Young ; HB-09.1  
Chung, Yun-Chul ; HB-09.1  
Ciarlette, Daniel ; TE-07.2  
Cinar, Didem ; TE-02.1  
Cisse, Adji ; TD-08.1  
Clark, Tim J. ; ME-09.3  
Clemens, Jon ; TA-00  
Colon, Rafael ; TE-10.2  
Connelly, Michael C. ; MB-02.4  
Cortes Pires, Clarissa ; HB-07.3  
Courseault Trumbach, Cherie ; MB-02.3;  
TD-10  
Cowan, Jan ; ME-07.2  
Cowan, Kelly R. ; WB-12; TB-07.1  
Cozzarin, Brian P. ; HB-02.2  
Crespo Jr, Marcelo P. ; HB-04.1  
Cross, Ben ; TE-07.2  
Csaji, Balazs C. ; TE-09.3  
Cunningham, Scott ; TD-10.2; HB-08.1;  
WE-07; MB-11  
Curran, Clive-Steven ; TB-08.1  
Curtis, Audrey ; WD-03.3

# AUTHOR INDEX

---

## D

Dada, Abolaji D. ; WD-09.4  
Daim, Tugrul U. ; MD-12.3; MD-03.1;  
HD-05.1; HD-03.2; TE-10.1; TE-10;  
HE-02; TB-01; TB-07.1; MD-01  
Damiani, Jose Henrique S. ; WE-10.3;  
ME-06.1  
Darby, George E. ; HD-09; HB-05.1  
Darcan, Osman N. ; MD-06.2  
de Souza Nascimento, Paulo T. ;  
ME-12.2  
Dedehayir, Ozgur ; HB-06.2  
del Rocío Vintimilla Castro, Amparito ;  
MD-11.3  
Demir, Verda ; WB-06.1  
Demirkan , Haluk ; WE-04.2  
Deo, Prosenjit S. ; TD-06.1  
DeVora, Natalia ; MB-06.1  
Diaz-Perez, Claudia ; MB-12.3  
Dimmitt, Nicholas J. ; WB-03.3  
Dincer, Ibrahim ; TA-00.2  
Dismukes, John P. ; MB-02.4; MB-02.2;  
ME-01; MB-02; MB-02.1  
Dolinsek, Slavko ; TE-05.4  
Dong, Ying ; HD-04.2  
Dorr, David A. ; WD-12.3  
Duman, Ekrem ; MB-08.1  
Duran, Marlen ; WE-12.2  
Durante, Eraclés ; HD-08.2  
Dvir, Dov ; WE-06.1; WB-03.2; WD-03

## E

Egri, Peter ; TE-09.3  
Einspruch, Norman G. ; TE-04; WE-04;  
TD-04.1  
Ekstedt, Mathias ; WB-05.1  
Ergeneman, Metin ; MD-12.3  
Ericsson, Evelina ; WD-05.2  
Erkollar, Alptekin ; WE-01  
Ernst, Holger ; ME-05.1  
Erosa, Victoria E. ; TB-11.4; MB-07.3  
Escalante-Leyva, Flor I. ; WD-08.3

## F

Fagundes Perez, Manuel A. ; HD-08.2;  
ME-06.1  
Falcao e Cunha, Joao ; TB-05.2  
Fallah, Hosein M. ; MD-02.1; TB-07.1;  
TB-07; TD-10.1; TE-11.1  
Falsarella, Orandi M. ; MB-12.4  
Fang, Kwoting ; MD-06.1  
Farris, George ; MD-01  
Farrukh, Clare ; WB-11.3  
Fayed, Asser ; MB-08.2  
Feng, Junwen ; WE-03.2  
Fenwick, Dave ; HD-03.2  
Fis, Ahmet M. ; MB-06.3  
Fischer, Marcia ; TB-09.1  
Fishman, Elliot ; TE-11.1  
Flannery, William T. ; MB-07.1; TE-12.1;  
TB-04.2  
Formanek, Steven D. ; HB-02.2  
Fox, Patricia L. ; ME-07.2  
Franza, Richard M. ; TB-12.1; TB-12  
Frederick , Bjorn W.B. ; TD-13.3  
Fujiwara, Takao ; WB-11.2

## G

Gati, Ana Maria ; WB-12.3  
Gatti Junior, Wilian ; TD-13.3  
Geisler, Eliezer ; TD-11.1; TE-08  
Gemunden, Hans Georg ; TB-02.3  
Gentile, Francesco ; MD-04.3  
Georghiou, Luke ; TD-09.1  
Geraldi, Joana G. ; HB-09.3  
Gerdri, Nathasit ; MD-12.3; TB-11.1;  
HD-03.2; HD-03  
Gerdri, Pisek ; TE-11.3; WB-11  
Gerhard, Daniel A. ; WE-10.1  
Gindy, Nabil ; MB-09.2  
Gomes Santos, Domingos B. ; MD-11.3  
Gonzalez , Alma ; WD-08.3  
Goodman, David ; ME-07.2  
Gotoh, Masakaze ; TE-04.2  
Graham, Stuart ; WD-10.1  
Grieve, Bruce D. ; TD-09.1  
Gu, Yu ; MB-09.4; ME-06.2  
Guemes, David ; MB-13.3  
Gul, Naila ; ME-13.4

Gumus, Bulent ; WB-06.1  
Gupta, V K. ; ME-12.3  
Gustafsson, Pia ; WD-05.1; WD-05.2;  
WB-05.3

## H

Ha, Imsook ; ME-11.1  
Haapasalo, Harri ; HB-09.2  
Hallaj, Wajeeh ; MD-03.3  
Hallam, Cory ; TB-04.2; MB-06.1  
Hammond, Robert ; TB-07.1  
Haner, Udo-Ernst ; MD-10.3  
Hanewicz, Cheryl A. ; MD-07.2; ME-07;  
MB-07  
Happonen, Ari ; TB-13.3  
Harmon, Robert R. ; WD-12.1; WE-04.2;  
WD-12; HD-04; HB-06.1  
Haruechayasak, Choochart ; WD-07.2  
Hashimoto, Masahiro ; WD-09.1  
Hayashi, Seiko ; WD-02.2  
Hayashida, Hideki ; WD-06.3  
He, Jiang ; TD-10.1  
He, Li ; WD-09.3  
Herrera Mendoza, Alejandra ; WD-08.3  
Hewing, Martin ; TE-02.2  
Hirano, Makoto ; HD-08.1  
Hiregoudar, Nagraj L. ; TB-04.4  
Ho, Camaro L. ; HD-07.2  
Ho, Jonathan C. ; ME-05.2; MB-09.1;  
ME-05  
Hocova, Petra ; TB-05.2  
Hoegl, Martin ; ME-05.1; MD-05  
Honda, Satoru ; TB-04.1  
Hong, Jung Suk ; HB-07.2; HB-07.1  
Hong, Paul ; WD-05.3  
Hook, David M. ; WD-05.2; WD-05.1  
Hou, Sheng-Tsung ; MD-08.3  
Hsieh, Hsin-Pei ; MB-10.3  
Hsieh, Pi-feng ; TE-04.3; ME-05.2  
Hsu, Chiung-Wen ; MD-07.3  
Hsu, Wen-Ling ; ME-08.1  
Hu, Yu-Ning ; WB-06.3  
Huang, Hung Chun ; ME-13.1  
Huang, Lucheng ; WB-11.4  
Huang, Tao ; HD-05.2; HD-05.3  
Huang, Zhiye ; WD-03.1  
Huda, Najmul ; TD-06.1; TE-06  
Huldt, Jakob ; WB-05.3

# AUTHOR INDEX

---

Hundley, Stephen ; ME-07.2

Hung , Ke-ming ; ME-05.3

Hussain, Faheem ; TD-13.1

Hwang, Kiha ; TB-09.3

## I

Iamratanakul, Supachart ; WB-03.3

Iandoli, Luca ; TE-07.2

Ibaragi, Masahiro ; TE-04.1

Igarashi, Yoichiro ; ME-03.1; TE-04.1

Ihl, Jan Christoph ; TB-02.2

Ikawa, Yasuo ; MB-04.1; TD-04.2

Ingle, Aaron ; TB-07.1

Ingle, Marcus ; TB-09.1

Inman, Lane ; MB-13

Inoue, Miwaka ; WD-11.2

Intrarode, Nuttawut ; WE-12.1

Ishioka, Masaru ; WD-12.2

Iskin, Ibrahim ; TE-10.2; WE-10; TB-01

Itaya, Kazuhiko ; ME-12.1

Iwase, Munehiko ; ME-03.1

## J

Jaakkola, Hannu ; WB-08.1; HB-08.2;  
TE-09.2

Jain, I. P. ; HA-00.1

Jain, Karuna ; HB-05.2

Jarpa, Nathaniel ; WE-07.2

Jarvenpaa, Heini ; WE-07.1

Jetter, Antonie J. ; WD-11.1; WB-10.1;  
TB-08; TD-04; HE-02

Jha, Shishir K. ; HB-05.2

Jimenez, Claudia N. ; TD-10.3

Jin, Jun ; HD-04.2

Jinno, Fumio ; TE-04.1

Johnson, Pontus ; WD-05.1

## K

Kaggwa, Martin ; MD-12.2

Kajikawa, Yuya ; TD-11.2; WD-09.1;  
TD-11

Kalja, Ahto ; WE-05.2; WE-05

Kamel, Sherif H. ; WE-08.3

Kang, Dae-Shin ; HB-09.1

Kao, Kai-Sheng ; TE-12.2

Karkkainen, Hannu ; MD-09.1

Karvonen, Matti ; TB-08.2

Kassi, Tuomo ; TB-08.2

Katoch, Sony ; MD-03.3

Kawajiri, Kotaro ; WD-06.1; WE-06

Kayakutlu, Gulgun ; TE-02.1; MD-04;  
TB-13; WE-02

Kaynak, Unver ; WB-06.1

Keltsch, Jan-Niklas ; MD-09.2

Ken, Yun ; HD-05.2; HD-05.3; ME-08.1

Kerr, Clive I. ; HD-03.1

Keys, L. Ken ; ME-07.1

Khan, Nausheen ; TD-04.3; MB-03.3

Khanna, Vinod K. ; MB-12.2

Khetani, Hardik ; WD-03.3

Khormaei, Ron ; MD-09; TB-02

Kil, Boojong ; TD-07.1; HB-07.2

Kim, Byoung Soo ; TB-09.3

Kim, Jisun ; TD-09; TE-05; HD-05.1

Kim, Seo-Kyun ; TE-07.3

Kim, Seongjin ; TD-07.1

Kim, Young Gi ; TB-09.3

Kim, YunBae ; TD-05.3

Kitching, Pieter ; HB-02.1

Kobayashi, Shinji ; TD-05.1

Kobayashi, Yoshiya ; MB-04.1

Kocaoglu, Dundar F. ; TE-11.3; HE-02;  
TB-01; TD-05.2; TE-05.1; WE-10.2;  
WD-10.2

Kockan, Irmak ; MD-12.3

Kohrs, Fernando A. ; TD-02.4

Kohtsuki, Shotaro ; MD-02.2

Koike, Shunichi ; ME-03.1

Kongthon, Alisa ; WD-07.2; TE-07

Kopac, Janez ; ME-04.3

Korecky, Michal ; HB-03.2

Kortelainen, Samuli ; MD-09.1

Kovavisaruch, La-or ; TB-10.1

Ku, Jung-Eun ; TE-12.3

Kubota, Yayoi ; HD-08.3

Kuivanen, Linh ; TE-06.2

Kutvonen, Antero ; MD-02.3

Kwakkel, Jan ; TD-10.2; HB-08.1; ME-13

## L

Lai, Hsien-Che ; HD-09.2

Lai, Kuei-Kuei ; HD-09.3; HD-09.1

Lai, Wen-Hsiang ; WB-08.2

Laib, Stefanie ; WB-11.1

Lalic, Bojan ; WB-03.1

Lamb, Ann-Marie J. ; MD-03.1; HB-09;  
TB-10

Lane, Julia I. ; MA-00.1

Lant, Mike ; TD-09.1

Laochan, Putchapun ; TB-10.1

Laosiripornwattana, Phuwadet ; TD-04.3

Larso, Dwi ; WE-06.3

Lascaris Comneno, Tatiana ; WD-09.2

Latz, Gil ; TB-09.1

Leavengood, Scott A. ; MD-03.1;  
WE-02.2

Lee, Bong-Gyou ; TE-07.3

Lee, ByungChol ; TD-05.3

Lee, Ching-Fang ; MD-08.3

Lee, Chung-Shing ; ME-05.2

Lee, Dae-Hee ; HB-09.1

Lee, Guan-Hua ; ME-11.3

Lee, Pei-Chun ; MD-09.3; ME-03.2

Lee, Sang-Woo ; TE-12.3

Lee, Yoon Been ; MB-11.1

Leem, Byunghak ; TB-12.2

Lehtovaara, Matti ; TB-08.2

Leker, Jens ; TB-08.1

Lempiala, Tea ; MD-10.3

Leppaniemi, Jari ; TE-09.2; WB-08.1;  
HB-08.2

Lersviriyajitt, Siriphan ; TB-01; TD-04.3

Li, Chen-Hsing ; WB-07.3

Li, Decheng ; WE-03.2

Li, Jiyun ; WB-10.2

Li, Xin ; WB-11.4

Li, Yiming ; ME-11.3

Liao, Wan-Fen ; TD-09.2

Liberatore, Matthew J. ; MB-03.1; TD-03

Lilliesköld, Joakim ; WD-05.2

Lima, Alexsandro S. ; WE-10.3

Lima, Nilton C. ; ME-12.2

Limonge, Willian ; HD-08.2

Lin, Chien-chiang ; TE-04.3

Lin, Chien-Hsin ; MB-04.2

Lin, Chun-Te ; WB-06.3; MD-05.3

Lin, Chwen-Yea ; MD-06.1

Lin, Linda ; TD-08.2

Lin, Mao-Shong ; TE-12.2

Lin, Ming-Ji James ; HD-04.1

# AUTHOR INDEX

---

Lin, Yu Sheng ; MB-10.3  
Lindqvist, Antti ; MB-13.1  
Linna, Petri ; WB-08.1; TE-09.2; HB-08.2  
Linstone, Harold A. ; MD-01  
Linton, Jonathan ; ME-09.2; MD-01  
Liou, Dian Yan ; TB-09.2; WB-07.1  
Liu, Shang-Jyh ; MD-07.3  
Liu, Shih-Chia ; TB-04.2  
Liu, Yao-Jen ; MD-07.3  
Loanzon, Emy ; TE-10.3  
Lofgren, Henrik ; WB-05.3  
Lu, Chun-Ling ; MD-05.3  
Lu, Wenguang ; WB-11.4  
Luan, Chin-jung ; WB-12.2  
Lutzenhisser, Loren ; TB-07.1

## M

Ma, Lin ; TD-13.4  
Ma, Ning ; TD-12.2  
Mabogunje, Ade ; MD-10.3  
Machado, Marcelo A. ; MB-09.3  
Magnier-Watanabe, Remy ; WE-08.1  
Mahesh, Sathiadev ; MB-02.3  
Mahmud, Uzma R. ; ME-13.4  
Makinen, Saku J. ; TB-08.3; HB-06.2  
Makinen, Timo K. ; TD-06.2  
Maksimovic, Rado ; WB-03.1  
Malach-Pines, Ayala ; WE-06.1  
Malik, Khaleel ; TD-09.1  
Mallak, Larry ; MB-10.1  
Mangena, Jabulani ; WE-03.1; WE-03  
Manwani, Sharm ; TE-07.2  
Maruyama, Eiichi ; WD-07.1  
Matsubayashi, Hajime ; ME-03.1  
Matsushima, Katsumori ; WD-09.1;  
TD-11.2  
McCreery, John ; TE-06.3  
McKeon, Andrew J. ; HA-00.2  
Mederos, Bernal ; WE-12.2  
Mello, Karine Gargioni Pereira C. de ;  
TD-13.3  
Mendes, Marcio A. ; MD-11.3  
Miller, Lawrence K. ; MB-02.1; MB-02.5;  
ME-01; MB-02  
Miller, Ruth ; MB-02.5  
Millward, Helen ; TE-10.3  
Milosevic, Dragan Z. ; WE-11.3

Minshall, Tim ; WD-06.2  
Mithiborwala, Hasan S. ; WD-03.1;  
WB-03.1  
Mitsuoka, Masahide ; TE-04.1  
Miyazaki, Kumiko ; MD-08.1; MB-09;  
TE-07.1  
Monplaisir, Leslie ; TB-06.2  
Moranta, Vicente ; TE-06.3  
Morita, Yoshitsugu ; MD-02.2  
Morris, Pamela ; MB-01  
Moya, Manuel ; WE-12.2  
Mudau, Ronald ; TD-03.1  
Munkongsujarit, Songphon ; TE-10.2  
Munson, J. Michael ; MB-07.2  
Mupemba, Kabasele Yves ; MB-03.3  
Muscat, Antonio Rafael N. ; WB-06.2

## N

Nagata, Junji ; TE-04.1  
Nah, In-Wook ; HB-09.1  
Nahar, Nazmun ; TE-06.2; TD-06.1  
Nakamura, Kotaro ; TD-04.2; TE-04.2  
Nakata, Yukihiko ; ME-08.2; MD-08  
Namba, Masanori ; MB-12.1  
Nametsegang, Boemo-Mokhawa ; TE-12  
Napp, Johann Jakob ; WD-06.2  
Narman, Per ; WB-05.1  
Nas, Zekeriya ; ME-13.4  
Nascimento, Paulo T. de Souza ; TD-13.3  
Neshati, Ramin ; MD-11.2; TE-09;  
TB-09; MB-08  
Newman, Paul R. ; MB-12; TE-11;  
WD-07; HD-07; WB-06  
Nguyen, Matthew ; TB-07.1  
Nie, Fengying ; TD-13.4  
Nielsen, Anders P. ; MD-10.1  
Nigro, Francisco E.B. ; TD-13.3;  
ME-12.2  
Nikolaeva, Svetlana ; WE-12.2  
Nishimura, Kunihiro ; HB-08.3  
Nishimura, Yukiko ; HB-08.3  
Niwa, Kiyoshi ; MD-11.1; ME-12;  
ME-12.1  
Niwano, Hitoshi ; HD-08.1  
Nomura, Takahiko ; HD-08.3  
Nordstrom, Lars ; WD-05.1  
Novy-Hildesley, Julia ; WA-00.2

## O

O. Yu, Abraham S. ; ME-12.2  
Oberer, Birgit J. ; WD-01  
Odake, Nobutaka ; TD-12.1  
Oerlemans, Leon A.G. ; WD-08.1  
Oh, Kyoung Seok ; TE-07.3  
Ohba, Shigemi ; TD-05.1  
Ohno, Kazuo ; WD-06.1  
Okada, Makoto ; ME-03.1  
Oklu, Ceylan ; ME-13.4  
Oliveira, Maicon G. ; HB-06.3  
Oliver, Terry ; HA-00  
O'Sullivan, Eoin ; WB-11.3  
OuYang, Kuang ; HD-09.2; HD-09.3

## P

Paes de Almeida, Marlene ; HB-04.1  
Paes de Almeida, Marlucci ; HB-04.1  
Park, Chanmin ; TD-05.3  
Park, Jiyoung ; MB-11.1  
Park, Young-Il ; HB-07.1  
Park, Youngwon ; WD-05.3  
Pasek, Zbigniew J. ; TD-11.3  
Patanakul, Peerasit ; MB-03.2  
Patel, Kirit ; TD-03.3  
Patino, Sabrina ; WE-07.2  
Pawlak, Monika M. ; TD-13.2  
Pellissier, Rene ; TE-02.3  
Peng, Ya-Ni ; TB-07.2  
Peng, Yu-shu ; WB-12.2; WE-12  
Perez, Michael J. ; TE-12.1  
Perman, Gary W. ; MD-11  
Phaal, Robert ; HD-03.1; MD-09.2;  
ME-03; TD-01; TE-01; WB-11.3  
Phillips, Fred Y. ; ME-09.1; MD-07.1;  
WD-09  
Phopoonsak, Nuancharas ; TE-10.2  
Pihlajamaa, Jussi ; MD-10.3  
Piirainen, Kalle ; MD-09.1; MB-13.1  
Piller, Frank T. ; TB-02.2  
Pinto, Ariel ; HB-03.1  
Piscopo, Marcos R. ; TD-03.2  
Pizysiezniq Filho, Joao ; TE-05.3  
Ploykitikoon, Pattravadee ; WE-12.1  
Pogljajen, Manca ; TE-05.4  
Polat, Ebru ; TB-10.2

# AUTHOR INDEX

---

Poli, Michael ; TE-03; WD-03.1;  
TE-03.2; WB-03.1; TB-03

Pollack-Johnson, Bruce ; MB-03.1

Poskela, Jarno ; MD-10.3

Pouris , Anastassios ; MD-12.2

Pretorius, Leon ; TD-03.1; ME-04.1;  
MD-10.2

Pretorius, Tinus M.W. ; WD-08.1

Probert, David R. ; HD-03.1; TB-06.3;  
WD-06.2; MD-09.2; TD-01; TE-01;  
WB-11.3

Prodan, Igor ; WE-06.2; TB-05.3

Pusavec, Franci ; ME-04.3

## Q

Qian, Yuanyuan ; WB-08.3

Quinello, Robson ; ME-12.2

Quinn, Joann F. ; TE-03.1

Quinsey, Ralph ; MA-00

## R

Raghavan, Mukundan ; HB-05.2

Ramdass, Kem ; ME-04.1

Ramirez, Jorge ; TB-11.3

Rashid, Asif M. ; ME-13.4

Reilly, Richard R. ; TE-11.1

Reinoso, Marisa H. ; TD-04.3

Rikkiev, Andrei ; TB-08.3

Rios, Maria del Carmen Dominguez ;  
WE-05.3

Rizvi , Ali Haider ; WD-11.3; HB-02.3

Robal, Tarmo ; WE-05.2

Robinson, Kent ; MB-03.3

Rogers, Jamie ; MD-04.2; MD-04.3;  
ME-04

Rohrbeck, Rene ; TB-02.3

Roth, Caleb ; MB-07.1

Roy, Santanu ; TD-07.3

Rozenfeld, Henrique ; HB-06.3

Rubenstein, Albert H. ; WA-00.1

Rustiadi, Sonny ; WE-06.3

Ryou, Byung-Seock ; ME-05.2

Ryu, Jiyeon; TB-09.3

Ryu, Young Soo ; HB-07.2

## S

S. M. Russo, Rosaria F. ; ME-12.2

Sachdeva, Anish ; HB-02.3

Sadeh, Arik ; WE-06.1

Saha, Samar K. ; MD-08.2; ME-08

Sahlman, Kari T. ; HB-09.2

Sakata, Ichiro ; WD-09.1; TD-11.2

Salman, Rosine H. ; MB-10.2

Salmela, Erno ; TB-13.3

Samid, Gideon ; WE-02.3; TE-02

Sanchez, Pedro Luis P. ; MD-11.3

Sanchez, Enrique ; WE-12.2

Sandgren, Sofia ; WB-05.1

Sasa, Tadashi ; WD-07.1

Scherrer-Rathje, Maike ; TE-09.3

Scheuner, Stephan ; HB-09.3

Schroeder, Annika ; TD-02.3

Schuh, Gunther ; TE-09.3

Schumacher, Terry R. ; WE-11.2; WD-11

Schweinfurt, Willi ; TE-10.2

Seboni, Lone ; TE-10.3

Seino, Takehisa ; TB-04.1

Sekhar, Jai A. ; MB-02.1; MB-02.4

Seppanen, Marko ; WB-12.1

Setamanit, Siri-on ; TB-13.1; TD-06

Setiowijoso, Liono ; HE-02

Shankar, Ravi ; WB-03.3

Sharma, RRK ; HD-09.1

Sheble, Gerald ; TB-07.1

Sheikh, Nasir ; WD-08; MB-04; TD-12

Shelbrooke, Alec E. ; MB-02.1

Shenhar, Aaron J. ; WE-06.1; WB-03.2

Shibagaki, Shigeaki ; ME-03.1

Shibata, Naoki ; TD-11.2

Shih, Hsin Yu ; ME-13.1

Shimada, Gen ; MD-08.1

Shin, Yong-Su ; HB-09.1

Shirahada, Kunio ; MD-11.1; TD-08

Shiraishi Kondo, Marcia N. ; MD-11.3

Shiu, Shian-Hung ; HD-05.2; HD-05.3

Shore, Barry ; TE-07.2

Shyu, Joseph Z. ; TD-09.3; WB-07.3

Sibanda, David ; TE-10.3

Siebdtrat, Frank ; ME-05.1

Silveira Torres Jr., Alvair ; WB-12.3

Singh, Lakhwinder Pal ; WD-11.3

Siyانبola, Owolabi W. ; WD-09.4

Slavec, Alenka ; WE-06.2; TB-05.3

Soini, Jari ; WB-08.1; HB-08.2; TE-09.2;  
HD-08

Sokmen, Nermin ; TE-06.1

Solleiro, Jose Luis ; WD-08.3

Sommestad, Teodor ; WB-05.1

Son, Seokho ; TB-09.3

Soragaon, Bhimasen ; TB-04.4

Spath, Dieter ; WB-11.1

Sperry, Richard ; WD-11.1; HB-06

Spinola, Mauro M. ; TD-08.3

Spivey, W. Austin ; MB-07.2; MD-10

Srinidhi, S ; TE-04.4

Stanicek, Zdenko ; TB-05.2

Stecke, Kathryn ; TB-04; TD-13

Stefanovic, Joca ; WB-03.2

Steiner, Frank ; TB-02.2; HB-06.1;  
MD-02

Steinhoff, Fee ; TE-02.2; TD-02.3

Steyn, Jasper L. ; MD-12.2; ME-06

Strawbridge, Carl ; TE-07.2

Su, Fang-Pei ; HD-09.1

Su, Hsin-Ning ; MD-09.3; ME-03.2

Su, Renjeng ; WA-00

Subramanian, Ganesh ; MD-03.3

Suebsin, Chonyacha ; TB-11.1

Sugihara, Taro ; MB-04.1; MD-06

Sugimura, Takeaki ; HB-08.3

Sumi, Tadao ; TB-04.3

Sun, Hangil ; MD-06.3

Suula, Markus ; TD-06.2

Suzuki, Akihiko ; ME-03.1

Suzuki, Yasuyuki ; TB-02.1

## T

Tabas, Joe ; ME-07.2

Takeda, Yoshiyuki ; WD-09.1; TD-11.2

Tanabe, Koji ; WD-02.2

Tanaka, Toru ; TB-04.1

Tanatammatorn, Napong ; TE-10.2

Tapaninen, Aija ; WB-12.1

Tarman, Refik Tarcan ; TB-02.2

Taylor, Ryan ; TD-02.1

Tepandi, Jaak ; TD-06.1

Thaiprayoon, Santipong ; WD-07.2

Thamhain, Hans J. ; TD-03.2

# AUTHOR INDEX

---

Thompson, Charles W. ; MD-03  
Thorn, Valerie ; TB-06.3  
Tian, Meng ; MD-09.4  
Tibbot, Paul ; WD-10.1  
Tierney, Robert ; TE-11.2  
Topacan, Umit ; TE-10.1  
Torgeson, Tiffani ; TE-10.3  
Torkkeli, Marko ; MD-02.3  
Tran, Thien A. ; TD-05.2; TE-05.1;  
TB-05  
Trauffer, Gaston ; TE-04.1  
Trkovsky, Vaclav ; HB-03.2  
Trnavcevic, Anita ; MD-10.4  
Tsai, Bi-Huei ; ME-11.3; MB-08.3  
Tsai, Chien-Tzu ; TD-09.2  
Tsai, Tung-Yu ; ME-08.1  
Tseng, Fang-Mei ; TB-07.2; MB-13.2  
Tu, Chien-Chung ; MD-06.1  
Tu, Yi-Hsien ; ME-05.3  
Tunnitisupawong, Venice ; MB-03.3  
Tuominen, Markku ; MD-09.1  
Turan, Turgut ; WD-10.1; TB-01  
Turchetti, Giuseppe ; TD-11.1

## U

ud Din Shami, Muiz ; ME-13.4  
Upadhyaya, Sunita S. ; TD-07.3  
Urbina, Ligia Maria S. ; ME-06.1;  
HB-07.3; HD-08.2; TD-07.2

## V

Vallner, Uuno ; WE-05.2  
van Daalen, Els C. ; ME-13.3  
van Waveren, Cornelis C. ; HB-02.1;  
TD-13.1; MD-12  
Varkoi, Timo K. ; TD-06.2  
Veziroglu, T. Nejat ; TA-00.1  
Vieira, Wilson J. ; TD-07.2  
Villanueva, Ana ; TD-08.3  
Vodden, Kelly ; WE-08.2  
Voigt, Kai-Ingo ; WE-10.1

## W

Wakeland, Wayne ; TB-07.1  
Walsh, Kenneth R. ; MB-02.3

Walsh, Steven ; TE-11.2; ME-09.2  
Walters, Andrew T. ; MD-04.1  
Wang, Bing ; WE-10.2; WD-10  
Wang, Celine Mei-Ya ; TD-02.2  
Wang, Ming-Yeu ; TE-09.1  
Wang, Sheng ; ME-06.2  
Wang, Yen-Cheng ; MD-08.3  
Wang, Yi-Chieh ; MB-09.1  
Watve, Neelima S. ; MB-11.2  
Weber, Charles M. ; TB-11; WD-02;  
HE-02; ME-11.2; MB-08.2; TB-11.2  
Weeks, Richard V. ; MD-05.1; ME-09  
Weng, Calvin S. ; HD-09.2; HD-09.3  
White, Ann ; HE-02  
White, Donald E. ; WB-10; WE-11  
Wilemon, David ; WE-02.1; MB-06.2;  
WD-03.2; TE-03.1  
Williams, Tony ; WE-11.1  
Williams, Jr., Gerald H. ; MB-03  
Winkler, Viviane A. ; MD-05.2; TB-13.2  
Winzker, Dietmar H. ; MD-10.2  
Woo, Hong S. ; TB-05.1; TD-05  
Wrazel, Julie S. ; WE-04.1  
Wu, Chih-Hung ; HD-05.2; HD-05.3  
Wu, Feng-Shang ; TE-12.2  
Wu, Wei ; TD-12.2  
Wu, Yuying ; MD-09.4; WB-10.2;  
WD-10.3; WE-12.3  
Wyrick, David ; TD-08.1; TB-06

## X

Xia, Yue ; WE-12.3  
Xing, Yan-ju ; ME-04.2  
Yamaki, Shinichi ; MD-02.2

## Y

Yan, Feng ; MD-09.4; WB-10.2;  
WD-10.3; WE-12.3  
Yang, Chia-Han ; TD-09.3; WB-07.3  
Yang, Jiting ; TB-01; WE-10.2  
Yang, Wen-Goang ; HD-09.3; HD-09.1  
Yasuda, Kazuhiko ; WD-12.2  
Yen, Ju-Miao ; TD-02.2  
Yi, Sangwon ; TB-12.2  
Yildirim, Ahmet M. ; MD-12.3  
Yim, Deok Soon ; WD-02.1; WB-07

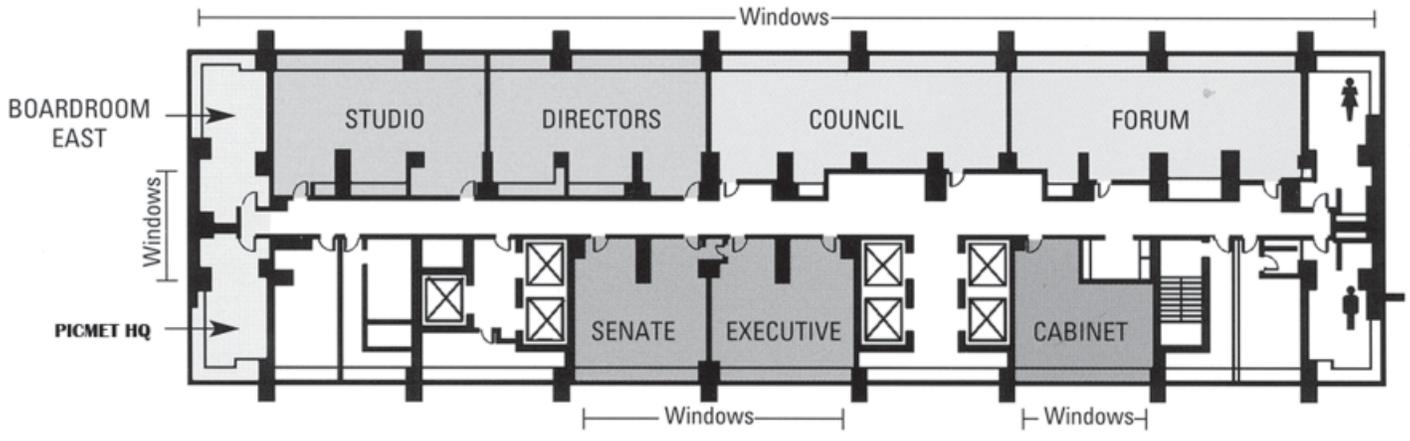
Ying, Hu ; TE-07.1  
Yoo, Seung Jun ; TD-07.1; HB-07  
Yook, Seungyun ; ME-11.1  
Yoon, Youngkoo ; WE-07.2  
Yoshida, Hideki ; WD-07.1  
Yoshida, Hiroshi ; WD-06.3  
Yoshida, Satoshi ; ME-13.2  
Yu, Abraham S.O. ; TD-13.3  
Yucel, Gonenc ; ME-13.3  
Yulianto, Yulianto ; WE-06.3  
Yurtseven, Murat K. ; TB-06.1

## Z

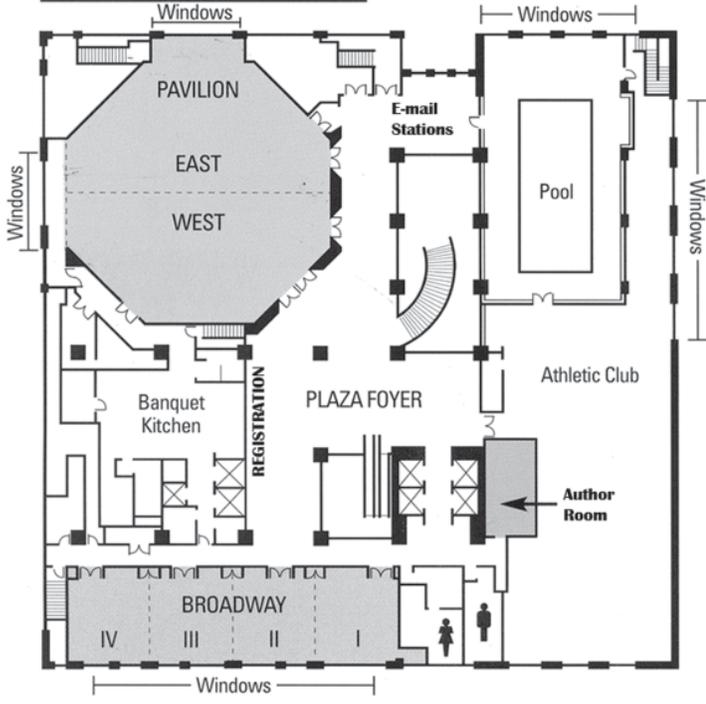
Zenobia, Brent A. ; TB-11.2; ME-11.2  
Zhang, Lixing ; WD-10.3  
Zhao, Li ; ME-04.2  
Zhao, Zhenghua ; MB-09.4  
Zheng, Mei-lian ; WB-08.3  
Zollo, Giuseppe ; TE-07.2  
Zuffo, Marcelo K. ; MD-11.3

# HILTON FLOOR LAYOUT

## 3RD FLOOR CONFERENCE LEVEL



## PLAZA LEVEL



## BALLROOM LEVEL

