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PICMET '05

PICMET

Dear PICMET Guests:

It is a great pleasure for us to welcome you to PICMET '05.

Technology continues to be the central force affecting all aspects of life. It dominates the way we design strategies, develop tactics and implement operational decisions in every subsystem of society, including industrial, economic, educational, financial, political, medical, and other sectors. As this dominance continues, we are observing the growth of technology's impact in more and more areas that are not intuitively obvious. These impacts are resulting in complex relationships and interactions among a multitude of disciplines, specialties and subspecialties.

Disruptive technologies and discontinuous innovations are changing the world and opening doors for exciting new opportunities. The potential of stem cell research to find cures for "non-curable" diseases, the promise of fuel cells to provide nearly unlimited energy, and the vision of a world with nano-level biomechanical devices collecting and disseminating information for continuous improvements in people's health are no longer science fiction. They are within reach of humanity.

Bringing these opportunities to reality is not possible within any single discipline. They require interactions among virtually all disciplines including science, engineering, finance, economy, psychology, sociology, ethics, law, theology, art and many others. Parochial, discipline-oriented views will not be able to address the issues that have been brought to focus by the rise of technology to its current, prominent role in society. A unifying discipline must provide leadership and guidance in bringing the various disciplines together and melting the boundaries among them, so we can harness the energy of technology and make it work for the betterment of humankind. It is not an easy role but a necessary responsibility for which the technology management community should accept the challenges. That is the only way to manage technology and not be managed by it.

Recognizing this enormous challenge, PICMET '05 has taken a bold step and examined the role of technology management in melting the boundaries among disciplines to guide technology toward the betterment of humankind.

PICMET, in its 14th year now, is the largest conference on technology management in the world. There are 135 sessions with about 400 presentations in this year's conference. The papers have been received from authors representing about 200 universities and 100 industrial corporations, research institutes and government agencies in more than 40 countries. They have all been subjected to a double-blind review process. Approximately 80 percent of the presentations are research papers indicated with an [R] preceding their titles in this bulletin, and 20 percent are industry applications indicated with an [A].

Hundreds of people participated in planning and organizing PICMET '05. The International Advisory Council whose members represent the leading educational institutions, industrial corporations and government agencies around the world, helped to define the critical issues to be addressed by the conference. The Board of Directors provided strategic directions. The Program Committee, whose more than 100 members from virtually every country, conducted the double-blind reviews of the submissions. Finally, the members of the "Core Team," who are our students in the department of Engineering and Technology Management at Portland State University, took on major responsibilities in every aspect of the work involved in putting together PICMET '05. We acknowledge the individuals and organizations which supported PICMET, and extend our deep gratitude and thanks to every one of them. We also hope that the ever-increasing enthusiasm of all these people has resulted in a conference that will be a truly rewarding experience for our guests.

PICMET '05 has three publications: This *Bulletin* gives a synopsis of the conference with an up-to 200 word abstract of each presentation; the *Proceedings* includes all of the presentations in full length; and the book, *Technology Management: A Unifying Discipline for Melting the Boundaries*, contains select papers that best represent the technology management field as it exists today.

(continued on next page)

PICMET ’05

(continued from previous page)

The papers scheduled for presentation at PICMET ’05 are clustered into 39 major tracks, alphabetically listed below.

Accelerated Radical Innovation
Collaborations in Technology Management
Competitiveness in Technology Management
Cultural Issues in Technology Management
Decision Making in Technology Management
E-Business
Entrepreneurship/Intrapreneurship
Environmental Issues in Technology Management
Government Sector
Information/Knowledge Management
Innovation Management
International Issues in Technology Management
Management of Intellectual Capital
Management of Technical Workforce
Manufacturing Management
New Product Development
New Venture Management
Productivity Management
Project/Program Management
R&D Management
Resource Management
Science and Technology Policy
Semiconductor Industry
Service Industry
Software Process Management
Strategic Management of Technology
Supply Chain Management
Technological Changes
Technology Acquisition
Technology Adoption and Diffusion
Technology Assessment and Evaluation
Technology Based Organizations
Technology Management Education
Technology Management Framework
Technology Marketing
Technology Planning and Forecasting
Technology Roadmapping
Technology Transfer
Telecommunications Industry

We are pleased and proud to hear from the participants that every PICMET is better than the previous one in terms of its contents, quality and the impact it is making on the technology management field.

We believe PICMET ’05 will have a major impact on the growth of the field and will contribute significantly to research, education and implementation of Technology Management. We hope you will find it beneficial and enjoyable.

All of us at PICMET wish you a productive week, with active participation in the technical activities as well as networking opportunities throughout the Conference.

Sincerely,

Dundar F. Kocaoglu
President and CEO

OFFICE OF THE GOVERNOR
STATE OF OREGON

PROCLAMATION

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 Engineering Management Program at Portland State University in cooperation with the AeA Oregon Council, INFORMS Technology Management Society, and the Japan Society for Science Policy and Research Management have convened the Portland International Conference on Management of Engineering and Technology, July 31 through August 4, 2005 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 July 31 through August 4, 2005 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 12, 2005.

Theodore R. Kulongoski

Theodore R. Kulongoski, Governor

Bill Bradbury

Bill Bradbury, Secretary of State

GORDON H. SMITH
OREGON

United States Senate

WASHINGTON, DC 20510–3704

COMMITTEES:
FINANCE
COMMERCE, SCIENCE, AND TRANSPORTATION
ENERGY AND NATURAL RESOURCES
INDIAN AFFAIRS

CHAIRMAN, SPECIAL COMMITTEE ON AGING

July 31, 2005

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

Dear Friends,

Welcome to the Portland International Center for Management of Engineering and Technology '05 Conference. As you complete your important work discussing technology management, I hope you also have the opportunity to enjoy all that scenic Oregon has to offer.

Technology is the bridge from today's problems to tomorrow's solutions. Harnessing its potential requires effective management of the wealth of information and new tools created by science. I hope this conference helps further your efforts to apply the best in research and applied science to the issues facing us today.

I welcome you to Portland and wish you a successful conference.

Warm regards,

Gordon H. Smith
United States Senator

DAVID WU
1ST DISTRICT, OREGON

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COMMITTEES:

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21ST CENTURY COMPETITIVENESS
EMPLOYER-EMPLOYEE RELATIONS

SCIENCE
RANKING MEMBER
ENVIRONMENT, TECHNOLOGY AND STANDARDS
SPACE AND AERONAUTICS

July 11, 2005

Dear Friends:

It is my pleasure and honor to welcome you to Oregon for the 2005 Portland International Center for Management and Engineering Conference.

This is my fourth term representing the 1st Congressional District, which is home to Oregon's Silicone Forest, and the issues you will address during the PICMET conference are directly related to the work I do in Congress. As a member of the House Science Committee and the Education and Workforce Committee, I am working to provide children with the best education in the world and to support workforce development so that Oregon and the nation are able to compete in the ever-changing world economy. In addition, my work in the Science Committee focuses on ways to support and enhance new scientific discoveries and technological opportunities.

Your participation this week will continue a dialogue among the best and brightest scholars, businesses, and academic research institutions. Portland State University is a fitting host for this conference as it is a vital link between the public and private sectors in Portland's growing science and technology-based industry.

On behalf of the citizens of Oregon and my colleagues in the United States Congress, I would like to thank each one of you for your dedication and hard work on shaping the technology of the future.

With warm regards,

David Wu
Member of Congress

ACKNOWLEDGMENTS

SPONSORED BY:
Portland State University
Department of Engineering and Technology Management

SUPPORTED BY:
Portland State University Office of Information Technologies
Maseeh College of Engineering and Computer Science

COOPERATING SOCIETIES:
IEEE Oregon Section
INFORMS Technology Management Section

PICMET '05

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Portland State University

CO-DIRECTORS OF
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Hongyi Chen, Iwan Sudrajat
Portland State University

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. Bulent Atalay, Prof., Univ. of Mary Washington and the Univ. of Virginia – USA

Dr. Daniel Berg, Professor and Former President, RPI – USA

Dr. Frederick Betz, Professor, University of Maryland – USA

Dr. Joseph Bordogna, Deputy Director, NSF – USA

Mr. Jim Coonan, Chairman and CEO, Kentrox, Inc. – USA

Dr. Youngrak Choi, Chairman, Korea Research Council of Public Science & Technology, Korea

Dr. Joseph W. Cox, OUS Distinguished Service Professor – USA

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Dr. Gunnar Hambraeus, Royal Swedish Academy of Engineering Sciences – Sweden

Dr. Kathryn J. Jackson, Executive Vice President, TVA – USA

Mr. Richard I. Knight, Former President and COO, Sarif Corp.– USA

Dr. Jay Lee, Eminent Scholar & L.W. Scott Alter Chair Prof., Univ. of Cincinnati - USA

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Dr. Frederick A. Rossini, Former Provost, George Mason University – USA

Dr. Nam Suh, Professor, MIT – USA

Mr. Donald VanLuvanee, Former Chairman and CEO, ESI Corp. – USA

Dr. Nejat Veziroglu, Professor, University of Miami – USA

Dr. Eric von Hippel, Professor, MIT – USA

Dr. Seiichi Watanabe, Executive General Manager, Terumo Corporation – Japan

Dr. Rosalie Zobel, The European Commission – Belgium

PICMET '05

PROGRAM COMMITTEE

The Program Committee consisted of 106 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.

Dawood Abugharbieh
Mike Adams
John O. Aje
Audrey Alvear
Bonnie J. Bachman
Tony Bailetti
Elif Baktir
Jean-Claude Balland
Nuri Basoglu
Neil Berglund
John Bers
Ali Bilge
Jason Brigham
Dilek Cetindamar
Hongyi Chen
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Antonie de Klerk
Glenn Dietrich
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William (Ike) Eisenhauer
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Boonkiart Iewwongcharoen
Guven Iyigun
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Patricia Ordonez de Pablos
And Ozbay
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William R. Peterson
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John Ruggiero
Samar K. Saha
Liono Setiowijoso
Aaron J Shenhar
Michelle T. Simpson
Kathryn E. Stecke
Harm-Jan Steenhuis
Iwan Sudrajat
Mathias Sunardi
Hans J. Thamhain
Charles W. Thompson
Trace Thornberry
George Tovstiga
Rias J. van Wyk
Ozalp Vayvay
Chris Viehoff
Steven Walsh
Charles M. Weber
David Wilemon
Gerry Williams
Chuck Yang
Deok Soon Yim
Brent A. Capps Zenobia

PICMET ’05

PICMET ’05 CORE TEAM

The PICMET Core Team implemented a large number of projects involved in the planning and organizing of the conference. Members of the Core Team were M.S. and Ph.D. students in the Department of Engineering and Technology Management (ETM) at Portland State University.

The students were assigned as project managers to oversee a variety of projects in the planning and organizing phases of PICMET ’05 during the year preceding the conference. The Core Team met frequently to discuss the progress of each project, to evaluate the project schedules and outcomes, and to modify the strategies as needed.

The Core Team approach made it possible to not only get the work done for PICMET, but also to give the ETM students the opportunity to manage complex projects with tight schedules in a real-life situation.

CORE TEAM PROJECT MANAGERS

Audrey Alvear
Vinay Chawla
Asser Fayed
Phanichandra Gunturu
Abram Hernandez
Patricio Hernandez
Supachart Iamratanakul
Christine Igarta
Diane Keil
Kiatiphong Lertsathitphong
Nitin Mayande
Doug McCartney
Gorken Mimioglu
Guillermo Rueda
Sabin Srivannaboon
Mathias Sunardi
Michelle Tangen-Simpson

Student Paper Awards

The number of students doing significant research in the area of Engineering and Technology Management was demonstrated by the 25 nominations received. The selection of the award winners was difficult because of the excellent quality of all the submissions, but four papers stood out for their contributions to the field of Engineering and Technology Management.

AUTHOR

Nathasit Gerdsri

ADVISOR & CO-AUTHOR

Professor Dundar F. Kocaoglu

UNIVERSITY

Portland State University, Portland, Oregon, USA

PAPER TITLE

"An Analytical Approach to Building a Technology Development Envelope (TDE) for Roadmapping of Emerging Technologies"

ABSTRACT

This paper presents the research on the development of a new concept and methodology called Technology Development Envelope (TDE). TDE approach is applied for identifying the optimum path in developing a technology roadmap in which technology strategies and business strategies are combined. TDE allows the executive level decision makers in corporations, as well as the policy level decision makers in governments to incorporate disruptive technologies and radical innovations in the development of technology strategies. The combination of Delphi method and hierarchical decision (AHP) is used as a foundation for building the TDE concept. The judgments from technology developers and technology implementers are utilized in the process to assure that the technology strategies are in full support of corporate goals and objectives.

AUTHOR

Jaegul Lee

ADVISOR & CO-AUTHOR

Professor Francisco Veloso

UNIVERSITY

Carnegie Mellon University, Pittsburgh, Pennsylvania, USA

PAPER TITLE

"Knowledge-Partitioning and Inter-firm Innovation: An Empirical Case Analysis"

ABSTRACT

Building on emerging research on knowledge partitioning and an information processing view of product development, this study examines the impact of task uncertainty on the knowledge boundary between manufacturers and suppliers in automobile industry. Using successfully applied patents in automobile emission control technologies from 1970 to 1998, this research shows that manufacturers expand their in-house R&D capabilities beyond architectural knowledge and into component innovation whenever they encountered task uncertainties. Moreover, and unlike what was anticipated, manufacturers' endeavor in building up in-house component innovation was shown to increase over time, indicating a growing importance of component knowledge for manufacturers in times of task uncertainties, even after the establishment of dominant designs. This study also provides a large scale empirical test for the theoretical claims that effective knowledge management for both architectural and component knowledge is a key factor influencing firms' competitiveness in the inter-firm product developments.

Student Paper Awards

AUTHOR

Leonardo P. Santiago

ADVISOR & CO-AUTHOR

Professor Pirooz Vakili

UNIVERSITY

Boston University, Boston, Massachusetts, USA

PAPER TITLE

"Optimal Project Selection and Budget Allocation for R&D Portfolio"

ABSTRACT

We introduce a new formulation of the problem of project selection and budget allocation for R&D portfolios. Due to R&D budget constraints and limited resources, firms are often forced to select a subset of all potential idea/products to carry on the development process. In the formulation presented we make a distinction between budget constraints during the development phase and the commercialization phase by arguing that the latter constraints are not hard constraints. Firms that succeed in developing promising and breakthrough products have little difficulty in securing resources for their commercialization. The portfolio selection at the commercialization phase therefore can appropriately be treated as an instance of selection among a set of financial instruments and the rich theory of financial portfolio formation can be utilized. Optimal selection of projects at the development phase, on the other hand, needs to be performed with the optimal selection at the commercialization phase taken into account. Following this line of argument, we formulate a two stage optimal project selection and budget allocation problem. Properties of the solution and the implications of adopting this formulation are discussed. Project interdependencies at both stages of development and commercialization are considered and illustrated via examples.

AUTHOR

Xuying Zhao

ADVISOR & CO-AUTHOR

Professor Kathryn E. Stecke

UNIVERSITY

University of Texas at Dallas, USA

PAPER TITLE

"Managing the Technology of Integrating the Production and Transportation Functions in Assembly or Flow Operations for Make-to-order Industries"

ABSTRACT

When a make-to-order manufacturing company commits a delivery due date for an order, we call it a commit-to-delivery business mode. In this mode, the manufacturing company is responsible for the shipping cost and selecting a shipping mode which is usually provided by a third party logistics company. Generally, shipping cost is higher when the selected shipping mode requires shorter shipping time. How should a company schedule production in production lines for all accepted orders so that the company can leave enough shipping time for orders to take slow shipping modes to reduce the shipping cost? We study the production and transportation integration technology for a make-to-order manufacturing company with a commit-to-delivery business mode. In the distribution scenario where partial delivery is allowed, we provide an optimal production schedule which minimizes the total shipping costs for all finished orders. When partial delivery is not allowed, we provide a near-optimal heuristic algorithm which is proved to be efficient and effective by numerical tests.

MEDAL OF EXCELLENCE

MEDAL OF EXCELLENCE AWARD

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

PICMET '05 AWARDEE

Bob Colwell

President, R & E Colwell and Associates, former Fellow, Intel Corporation–United States

Bob Colwell was Intel's chief IA32 microprocessor architect from 1992-2000, and managed the IA32 Arch group in Intel's Hillsboro, Oregon facility through the P6 and Pentium 4 projects. He was named the Eckert-Mauchly award winner for 2005, the highest honor in the field of computer architecture, for "outstanding achievements in the design and implementation of industry-changing microarchitectures, and for significant contributions to the RISC/CISC architecture debate." He was named an Intel Fellow in 1996.

Previously, Colwell was a CPU architect at VLIW pioneer Multiflow Computer, a hardware design engineer at workstation vendor Perq Systems, and a member of technical staff at Bell Labs. He has published many technical papers and journal articles, is inventor or co-inventor on 40+ patents, and has participated in numerous panel sessions and invited talks. He is the Perspectives editor for *IEEE Computer Magazine*, and writes the *At Random* column. He is currently an independent consultant. Colwell holds the BSEE degree from the University of Pittsburgh, and the MSEE and PhD from Carnegie Mellon University.

LTM AWARDS

LEADERSHIP IN TECHNOLOGY MANAGEMENT AWARDS

PICMET's Leadership in Technology Management 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; Norman Augustine, Chairman of Lockheed Martin; Jack Welch, CEO Of General Electric; Dr. Modesto A. Maidique, President of Florida International University; Carleton S. Fiorina, Chairman of CEO of Hewlett-Packard Co., Donna Shirley, manager of the Mars Exploration Program; and Kwan Rim, Chairman of Samsung Advanced Institute of Technology (SAIT).

PICMET '05 AWARDEES IN ALPHABETICAL ORDER:

Morris Chang

Founding Chairman, Taiwan Semiconductor Manufacturing Company Ltd. (TSMC)—Taiwan

Morris Chang has been the founding Chairman of Taiwan Semiconductor Manufacturing Company Ltd. (TSMC) since 1987. TSMC pioneered the "dedicated silicon foundry" industry and is the largest silicon foundry in the world.

Prior to his career in Taiwan, Dr. Chang's career was in the United States. He was the President and Chief Operating Officer of General Instrument Corporation from 1984-1985, and prior to that, he was at Texas Instruments for 25 years (1958-1983), where he was responsible for TI's worldwide semiconductor business for six years.

Dr. Chang received his B. S. and M. S. degrees in Mechanical Engineering from the Massachusetts Institute of Technology. in 1952 and 1953, and his Ph.D. in Electrical Engineering from Stanford in 1964. He received honorary doctorates from Chiao-Tung University, Ching-Hua University, and Central University in Taiwan, and the Polytechnic University in the U.S.

Dr. Chang was selected by *Fortune Magazine* as Asia's Power 25 in 2003; by *Time Magazine* and CNN as Top 25 of the Most Influential CEOs in 2001; by *Investor Relations Magazine* as the Best IR Officer in 2001. He was the recipient of the 2005 Nikkei Asia Prize, the IEEE Robert N. Noyce Award in 2000 for exceptional contributions to the microelectronics industry, and the "Exemplary Leadership Award" of the Fabless Semiconductor Association (FSA) in 1999. He was selected by *Business Week* as one of the "Top 25 Managers of the year" and "Stars of Asia" in 1998; by *Common Wealth Magazine* as one of "The Most Admired Entrepreneurs" since 1999, and by BancAmerica Robertson Stephens as "One of The Most Significant Contributors in the 50 years of Semiconductor Industry" in 1998.

Dr. Chang is a member of MIT Corporation and the National Academy of Engineering (US); he is on the advisory boards of NYSE, Stanford University, and University of California at Berkeley.

Bacharuddin Jusuf Habibie

Former President, Indonesia; Founder and Chairman, The Habibie Center—Indonesia

Prof. Dr.-Ing. Dr. Sc. h.c. Bacharuddin Jusuf Habibie was born in 1936 in Pare-pare (South Sulawesi) Indonesia. On March 11, 1998, the People's Consultative Assembly (MPR) elected and installed B. J. Habibie as the seventh Vice President of the Republic of Indonesia. On May 21, l998, he took the oath of office as third President of The Republic of Indonesia. Under his leadership, Indonesia succeeded not only in conducting the first free and fair General Elections in 1999 but also succeeded in bringing about significant changes towards democratizing and reforming Indonesia.

In 1955 B.J.Habibie studied at the Technische Hochscule, Aachen, Germany. In 1960 he earned his Diplom-Ingenieur with *cum laude* at the Department of Aircraft Design and Construction, and earned his Doctor Ingenieur with *summa cum laude* at the same institution in 1965. He started his career in Germany by becoming the Head of Research and Development of Structure Analysis in the Hamburger Flugzeugbau Gmbh, Hamburg, Germany (1965 - 1969); Vice President and Technology Director MBB Gmbh, Hamburg and Munchen (1973 - 1978), and Technology Senior Advisor to the MBB Board of Directors (1978).

In 1978 he was appointed Minister of State for Research and Technology and, concurrently, head of the Agency for the Assessment and Application of Technology (BPPT). He maintained this job for five terms of office during Development Cabinet, until 1998. He was appointed as Chairman of the Indonesian Moslem Intellectuals Association (ICMI) in 1990. He is president

LTM AWARDS

of the Islamic International Forum for Science, Technology and Human Resources Development (IIFTIHAR) since 1997; founder and Chairman of the Board of Trustees of The Habibie Center (THC) since 1999. In 2001, he became a member of the Board of Founders of the Muslim World League (*Rabithah 'Alam Islami*) and in 2000 he became a member of InterAction Council (IAC) since 2000. B.J Habibie has 17 National and 16 International medals and decorations.

Gunnar Hambraeus

Member, Swedish Royal Academy of Science; Former President and Chairman, Royal Swedish Academy of Engineering Sciences—Sweden

Dr. Gunnar A Hambraeus was born in 1919. He received the MSc from Uppsala University, the M Eng S from the Royal Institute of Technology in Stockholm, and the Dr. Eng. S, hon from Chalmers Technical University in Gothenburg. He served from 1946—1953 as secretary in the Swedish Technical Research Council ; 1953—1970 as editor in chief of the leading technical periodical in Sweden (*Teknisk Tidskrift*) and later as president of Swedich Technical Press AB; and from 1971—1985 first as president and later as chairman of the Royal Swedish Academy of Engineering Sciences.

Dr. Hambraeus worked for Swedish industry as a member, and in some cases chairman, of the Board of Directors of some 20 leading Swedish companies, e g Volvo, Bofors, Pharmacia, Hasselblad and others. Presently he chairs the Scandinavia-Japan Sasakawa Foundation and the Sweden-Algeria Mixed Commission as well as some Price Juries.

As a member of the Swedish Royal Academy of Science, Dr. Hambraeus takes part in the election of Nobel Laureates in Physics, Chemistry and Economics. He is a member of many learned societies and academies inside and outside Sweden and carries decorations from the Swedish King and Swedish Parliament as well as orders from Sweden, France, Germany, Japan, Spain and Australia.

Pairash Thajchayapong

Permanent Secretary, Ministry of Science and Technology—Thailand

Dr. Pairash Thajchayapong was born in 1944 in Kamphaeng Phet, Thailand. In 2004 he became Thailand's Permanent Secretary, Ministry of Science and Technology. He served as President of the National Science and Technology Development Agency (NSTDA), Ministry of Science, Technology and Environment from 1998-2004. He is currently Chairman of the National Electronics and Computer Technology Center (NECTEC) (1998—present), and he is the Assistant Director for Engineering and Computer, Chulabhorn Research Institute (1988—present).

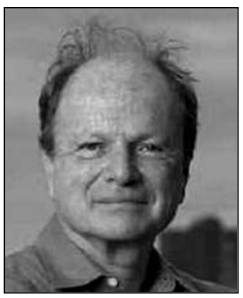
Dr. Thajchayapong was a professor at King Mongkut's Institute of Technology Ladkrabang, Thailand, from 1977-1998, where he also served as Rector (1992-1998) and as Director of the Computer Research and Services Center (1987-1998). From 1987-1998 he was Director of the National Electronics and Computer Technology Center. He received a B.Sc. in Electrical Engineering in 1969 from the Imperial College of Science and Technology, University of London, United Kingdom; and in 1973 a Ph.D. in Electronics and Computer Engineering from the University of Cambridge, United Kingdom.

Dr. Thajchayapong is a member of The Institute of Electrical and Electronics Engineers (IEEE) USA; The Royal Institute, Thailand; and The Science Society of Thailand under the Patronage of His Majesty the King, Thailand. He is Assistant Director of IT Project under the initiative of H.R.H.Princess Maha Chakri Sirindhorn, and Chairman, the Committee of Nomination Science and Technology Research Grants, Thailand Toray Science Foundation.

Eric von Hippel

Professor and Head of the Technological Innovation and Entrepreneurship Group, Massachusetts Institute of Technology, Sloan School of Management—United States

Eric von Hippel is Professor and Head of the Technological Innovation and Entrepreneurship Group at the MIT Sloan School of Management. He is a graduate of Harvard College (BA), MIT (MS) and Carnegie Mellon University (PhD). His research examines the sources of and economics of innovation, with a particular focus on the significant role played by "lead users" in the innovation development process. In a new book, Democratizing Innovation, he reports on the latest work in this field (MIT Press, 2005).



General Information

CONFERENCE FOCUS

As technology continues to be a dominant force in society, innovation is gaining increasing importance in developing and maintaining competitive advantage. Those who are able to create new ideas, develop new technologies and harness the capabilities generated by technologies are setting the standards and leading the way for the rest of the world. Global leadership in every field is shifting toward innovative use and effective management of technology. The key to leadership is resting in the management of the process of nurturing creative ideas, creating new technologies, developing new products and commercializing them in existing and new markets. In short, the technology-driven world is being defined by the way innovation is managed. Innovation management will be the critical challenge in the years to come. Those who succeed in it will be the emerging leaders in the technology-driven world; those who fail will cease to exist. Recognizing this enormous challenge, PICMET '05 takes a bold step and examines innovation management in the technology-driven world.

Portland Hilton

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 '05 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 '05 program consists of

- Workshops by experts on critical issues
- Plenary sessions by global leaders from industrial corporations, academic institutions and government agencies
- Research papers by cutting-edge researchers
- Applications papers by researchers and practitioners working on industry applications
- Panel discussions with interactions between panelists and the audience
- Tutorials on select topics by authorities in the field

PUBLICATIONS

There will be three publications at PICMET '05

- The "Bulletin" containing the symposium schedule and abstracts of each presentation
- The "Proceedings" containing all of the papers on CD-ROM
- The book, Technology Management: A Unifying Discipline for Melting the Boundaries, containing 53 papers selected as a representative collection for the cross section of the field.

REGISTRATION POLICY

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

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

General Information

** The one-day and student registration fee does not include the evening social events. 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: 08:00-9:30 B: 10:30-11:30 C: 11:30-13:30 D: 13:30-15:00 E: 15:30-17:00
Third and fourth digits show the room	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: Executive 12: Senate 13: Galleria-1 14: Galleria-2 15: Galleria-3 16: Parlor-A 17: Parlor-B 18: Parlor-C

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 13:30-15:00 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, please follow the guidelines below:

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

SPEAKER GUIDELINES

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

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

AUDIO/VISUAL EQUIPMENT

Each session is equipped with an LCD projector and screen. The 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.

E-MAIL

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. For those of you with laptop computers and Wi-Fi, we will have wireless access 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 finding a replacement bulb for the projector, 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

MAX Red Line

Portland's public transportation is made up of the MAX (Metropolitan Area Express) train, Tri-Met buses, and the Portland Streetcar. All are free within the downtown area and across the Willamette River as far as the Lloyd Center stop. Outside this "Fareless Square," fares range from $1.40 to $1.70, less for seniors, the disabled and youths. Tickets are interchangeable and can be purchased aboard buses or from ticket machines along the MAX or Streetcar lines.

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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. Get off the train at the Pioneer Square stop 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 $1.70 and can be purchased at the ticket machine inside the airport close to the MAX line.

CLIMATE

The temperature in Portland generally varies between 56oF (13o C) in the evening to 80 o F (27o 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.

Portland, otherwise known as "The City of Roses," is a robust and vibrant city with endless things to see and do. Voted #1 of "America's Top Five Cleanest Cities" by *Reader's Digest* magazine in 2005, Portland shines as a popular tourist destination. 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. We hope you will venture out and experience Portland while you are town. Following is a sampling of what you will find.

EVENTS

OREGON BREWER'S FESTIVAL, JULY 28-31, 2005, TOM MCCALL WATERFRONT PARK

Celebrating its 18th year in 2005, the Oregon Brewers Festival is North America's largest gathering of independent brewers. This grassroots event has developed a reputation as being one of the finest craft beer festivals in the world. Seventy-two breweries offer handcrafted brews to 50,000 beer lovers during the four-day event. There is no judging at this event; rather, it is an opportunity for beer lovers to enjoy handcrafted products from some of the nation's finest breweries.

Joining the breweries are industry exhibits by hop growers, maltsters, homebrewers, alephenalia collectors, and national beer writers. Oregon Beverage Works presents the Crater Lake Soda Garden with free handcrafted root beer and other flavored sodas for children and designated drivers (no mug purchase required). Seven local restaurants offer light meals and snacks. Live musical entertainment is offered throughout the weekend.

Admission: Free for entry to the festival. A one-time purchase 2005 souvenir mug costs $4 and is required for consuming beer. Tokens are required for purchase of beer. Tokens cost $1 apiece. Patrons pay four tokens for a full mug, or 1 token for a taste. (Thursday, July 28, gates open 15:30, taps open 16:00-21:00; Friday, July 29 and Saturday, July 30, gates open 11:30, taps open 12:00-21:00, gates close at 22:00; Sunday, July 31, gates open 11:30; taps open 12:00-19:00, gates close at 20:00)

WELLS FARGO SUMMER CONCERTS AT THE ZOO

Wells Fargo Summer Concert Series on Wednesdays

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features a variety of jazz, folk and ethnic music. Visitors picnic on terraced lawns in the outdoor amphitheater. The concerts are $9.50 general admission, which includes zoo admission.

On Wednesday, August 3, enjoy a concert by Emeline Michel, one of Haiti's most popular singers. Her fellow countrymen love her for her unique combination of traditional rhythms and relevant lyrics. The Haitian Queen of Song resounds inspirational songs about political and social issues facing Haiti. Her unique mix of styles and lovely voice are surely not to miss for a glimpse in to the unique culture of the Haitian people. (concert starts at 19:00; seating is on the lawn, so take a blanket or tarp to sit on; arrive early to get a good seat—these concerts are very popular)

Wednesday Farmers Market

WEDNESDAY PORTLAND FARMERS MARKET

Local farmers provide fresh produce, flowers and other items to the business crowd and downtown residents. The Wednesday market bustles with activity and is located in the Park Blocks between SW Salmon and Main behind the Arlene Schnitzer Concert Hall. (hours: 10:00—14:00)

LIVE AFTER FIVE SUMMER BLUES CONCERT

Enjoy a free blues concert at Pioneer Square on Thursday, August 4, at 17:00. Jesse Samsel & Crosstown Traffic is the featured band. (701 SW 6th Ave., Portland)

FIRST THURSDAY GALLERY WALK

First Thursday is an after-hours evening gallery walk that takes place on the first Thursday of each month. PICMET attendees still in town on Thursday, August 4, can stroll through galleries in the Pearl District or in the Skidmore District (roughly between Front and Fourth Aves. from SW Oak to NW Glisan St.).

PORTLAND BEAVERS BASEBALL

Portland's Triple-A, Pacific Coast League affiliate of the San Diego Padres, will play against the Iowa Cubs, an affiliate of the Chicago Cubs, 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. Iowa Cubs, Sunday July 31, 14:05
- Beavers vs. Iowa Cubs, Monday, August 1, 19:05
- Beavers vs. Iowa Cubs, Tuesday, August 2, 12:05

WINE EVENTS

Oregon is famous for its wines and wineries. Following is a calendar of events related to wine in and around Portland.

July 26

"A Little Chocolate with Your Wine." A one-day Portland Community College class (CRN 33343). Discover the insider tricks for creating the ultimate dessert in about five minutes. At the Wine Cellar, NW Portland, 19:00-21:30, $19 tuition, $20 tasting fee. (phone: 503 614-7308)

July 27

Music in the Winery." Wine tasting. Music with SKIP vonKuske "Diva Series" and Ariel Tebben. At Edgefield Winery, Edgefield Village, Troutdale, Oregon, 19:00. No cover charge. (phone: 503 669-8610)

July 28

"Summer Concert." Music with Norton Buffalo and the Knockouts, and Pepe and the Bottle Blondes. Wine available from Willamette Valley Vineyards. Food and beverages also available. Sand chair and blanket seating preferred. At the Amphitheater, Oregon Garden, Silverton, Oregon, 19:00, $18, additional charge for food. (phone 503 874-8100)

"Eve-of-IPNC Winemaker Dinners." Multi-course gourmet dinners paired with wines. Meet the winemakers and learn about the wines. All dinners are open to the public. Contact participating wineries for pricing, availability and additional arrangements.

- Rex Hill Vineyards, Newberg, Oregon (phone: 503 538-0666)
- Cuneo Cellars, Carlton, Oregon (phone: 503 853-0002)
- Ponzi Vineyards, Beaverton, Oregon (phone: 503 628-1227)

"Hip Chicks Do Wine." Portland, Oregon, 5-course meal prepared by chef Peter Greene (New Leaf Bistro), paired with wines, $75 per person, reservations required. (503 753-6374)

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July 29

"Al Fresco Vintners' Dinner." Four-course menu paired with wines from Edgefield Winery. At Edgefield Village, Troutdale, Oregon, 19:00, $45 per person, reservations required. (phone: 503 669-8610)

"Music in the Winery." Wine tasting, music by Mary Flower. At Edgefiled Winer, Edgefield Village, Troutdale, Oregon, 19:00, no cover charge. (phone: 503 669-8610).

July 29-31

"International Pinot Noir Celebration." Tickets are still available for this outstanding weekend of Pinot Noir from around the world. Meals prepared by nationally recognized chefs. All 3 days of wine and food included in admission charge. Linfield College, McMinnville, Oregon, $795 per person, reservations required. (phone: toll free 1-800-775-4762)

July 30

"Music in the Winery." Wine tasting. Music with Terra. At Edgefield Winery, Edgefield Village, Troutdale, Oregon, 19:00, no cover charge (phone: 503 669-8610)

August 4

"Summer Concert." Music with Clint Black. Wine available from Willamette Valley Vineyards. Food and beverages available. Sand chair and blanket seating preferred. At the Amphitheater, Oregon Garden, Silverton, Oregon, 19:00, $39.50 per person. Additional charge for food. (phone: 503 874-8100)

"First Thursday." Wine tasting by Hip Chicks. Music with DJ. At adidas Originals, Pearl District, NW Portland, 18:00-22:00. (phone: 503 223-3109)

ATTRACTIONS

PIONEER COURTHOUSE SQUARE

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.

Pioneer Square, Portland's Livingroom

OREGON MUSEUM OF SCIENCE AND INDUSTRY (OMSI)

Situated on the east bank of the Willamette River, the Oregon Museum of Science and Industry (OMSI) is the fifth-largest science museum in the country. Among OMSI's many attractions are six exhibit halls, the multi-storied OMNIMAX Theater and the Murdock Sky Theater. Visitors can play computer games, explore new technologies and even beam a message into space.

OMSI's current featured exhibit is "Magic: The Science of Illusion." In this unique exhibit, see original video presentations by professional magicians Penn & Teller, Goldfinger & Dove, Max Maven, and Jade. Then go backstage to put yourself in the illusion and experiment with hands-on science activities. See real artifacts and photographs as you're captivated by tales of famous magicians from the past. Learn some close-up magic to take home, and find out how basic science, math, psychology, culture and the art of performance come together in creating a successful illusion. (1945 SE Water Avenue, Portland, Oregon; phone: 503 797-6674)

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.

PORTLAND ART MUSEUM

The Portland Art Museum lays claim to an impressive painting collection and also houses permanent

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collections of Native-American, Asian, Pre-Columbian and West African art, as well as English silver and modern sculpture.

The museum's current featured exhibit is "Vanished Kingdoms: The Wulsin Photographs of Tibet, China and Mongolia 1921-1925." Discover feudal kingdoms, isolated rural tribes, and the first known color photographs of hidden Tibetan lamaseries from an expedition made just a few years before this land and its people were changed forever by political and social forces. Created during a 1,300-mile, nine-month-long journey into remote China, Inner Mongolia, and Tibet on foot, mule, camel, and raft, this exhibition's approximately 40 images reveal the vision of two young American explorers, Janet Elliott Wulsin and Frederick Roelker Wulsin. Faced with the continuing threat of warlords and bandits, violent sandstorms and a lack of water, the Wulsins developed their negatives at night in the field, using makeshift darkrooms. The results are astonishingly beautiful, otherwordly photographs and colored lantern slides, which were then meticulously hand tinted by accomplished artists in Beijing. With watercolor pigment and the smallest of sable brushes, along with their intimate knowledge of local customs, colors and scenery, these Chinese artists interpreted the Wulsins' images, providing an intriguing juxtaposition of an American photographer's eye and Chinese design sensibilities.

Portland's Chinese Garden

Call for hours. (1219 SW Park Ave., phone: 503 226-2811; Admission: $10 Adults; $9 seniors 55+ and students 18+; $6 children aged 5-18; and children under 4 are free of charge)

OREGON HISTORICAL SOCIETY

Located in the heart of Portland's Park Blocks, the Oregon History Center's permanent and changing exhibits deal with Oregon and the Pacific Northwest, yesterday, today and tomorrow.

The Historical Society's current featured exhibit is "A Fair to Remember: The 1905 Lewis and Clark Exposition." On June 1, 1905, the first world's fair to be held in the Pacific Northwest – the Lewis and Clark Centennial and American Pacific Exposition and Oriental Fair – opened in Portland, Oregon.

One century later, *A Fair to Remember* is the latest in a series of exhibits at the Oregon Historical Society to commemorate the 200th anniversary of the Lewis and Clark Expedition. The exhibit examines the genesis of the exposition, shows us what it looked like and what messages it conveyed, and considers its consequences and its legacy.

The 1905 exposition organizers' goal was to promote Portland as the commercial hub of the Pacific Northwest. The centennial of Lewis and Clark's nation-building journey across the continent in 1805 provided a perfect theme.

The fair offered attendees a slice of the world – entertainment, enlightenment, novel inventions and unique experiences awaited each visitor. It showcased the natural resource bounty of the region and offered Portland up as the gateway to commercial opportunities in and with Asia.

The Society's extensive collection of exhibition paraphernalia, official documents, photographs and keepsakes helps visitors imagine the remarkable and extravagant spectacle that staked Portland's claim to economic expansion, cultural preeminence and scientific advances. Call for hours and admission prices. (1200 SW Park Ave.; phone: 503 222-1741)

THE GROTTO

Spread out over 62 beautifully wooded acres, the Grotto serves as both religious shrine and breathtaking garden. Carved into the base of a 110-foot cliff, Our Lady's Grotto enshrines a marble replica of Michelangelo's Pietà. An elevator connects the upper and lower levels of the sanctuary, with the upper level offering sweeping views of the Columbia River and Mt. St. Helens. Call for hours. (NE 85th Ave. and Sandy Blvd.; phone: 503 254-7371)

PITTOCK MANSION

One thousand feet above the city of Portland towers the stately Pittock Mansion. This historic 1914 property is an elegant, 22-room estate that sits on 46 acres of manicured grounds. The numerous hiking trails that surround the property are open to the public daily until nightfall. The Fate Lodge Restaurant, once a gardener's cottage, now serves lunch and afternoon tea during the week. Call for hours and admission prices to the

City of Roses

mansion. (3229 NW Pittock Dr.; phone: 503 823-3624)

POWELL'S CITY OF BOOKS

To avid readers, Powell's is Mecca. More than just a bookstore, Powell's is a Portland institution. 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. (1005 W. Burnside; phone: 503 228-0540, ext 5482)

PORTLAND SATURDAY MARKET

In the great tradition of open-air markets, Portland's Saturday Market, located beneath the Burnside Bridge in downtown, is one of Portland's most frequented attractions. This weekend exhibition is filled with handmade items, food and sporadic entertainment. It runs every weekend from March through Christmas. It is open Saturdays from 10:00—17:00 and Sundays from 11:00—16:30. Admission is free.

PORTLAND CLASSICAL CHINESE GARDEN

The garden is one of Portland's newest attractions. Located in Portland's Old Town/Chinatown, the "Garden of Awakening Orchids" is a collaboration with Portland's Chinese sister city, Suzhou. Inside the walled city block is a mix of pavilions, rocks, plants and walkways surrounding an 8,000-square-foot pond. Call for hours and admission prices (Northwest Third and Everett St.; phone: 503 228-8131)

East Bank Esplanade

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

This award-winning, 64-acre zoo is home to more than 875 animals representing more than 200 species. Among the zoo's many highlights is its African savannah exhibit which spotlights black rhinoceroses, giraffes, impalas, birds and zebras. The zoo's Asian elephant breeding program is world renowned. Its much-loved Packy, born in 1962, was, at the time, the first Asian elephant born in the Western Hemisphere in 44 years. Call for hours and admission prices. (4001 SW Canyon Rd.; http://www.oregonzoo.org/AboutZoo/main.htm)

JAPANESE GARDEN

Portland's Japanese Garden is considered one of the most beautiful and authentic Japanese gardens outside of Japan. Five gardens make up these gorgeous grounds--the traditional Flat Garden (*Hira-niwa*), the serene Strolling Pond Garden (*Chisen Kaiyui-Shiki*), the Tea Garden (*Rojiniwa*) which includes a ceremonial tea house, the Sand and Stone Garden (*Seki-Tei*), and a miniature Natural Garden (Shukeiyen). Call for hours and admission prices (611 SW Kingston Ave.; phone: 503 223-1321)

WORLD FORESTRY CENTER

The World Forestry Center's Discover Museum is a 20,000 square foot museum is located in Portland's beautiful Washington Park. Buiit in dramatic Cascadian style architecture, you will marvel at the intricate hand carvings and grand entry outside, and delight in all the new exhibits inside.

The museum reopened on June 30, 2005 after a $7 million, 6-month renovation. All new hands-on, interactive exhibits are family friendly and designed to engage visitors to learn about the sustainability of forests and trees of the Pacific Northwest and around the world. Call for hours and admission prices (4033 SW Canyon Rd.; phone: 503 228-1367)

HOYT ARBORETUM

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. (4000 SW Fairview Blvd.; phone: 503 865-8733)

INTERNATIONAL ROSE TEST GARDEN

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. (400 SW Kingston Ave.)

SHOPPING

SHOPPING PORTLAND'S DOWNTOWN

Here are just a few of Portland's downtown shopping staples:

At **Meier & Frank**, shoppers can update their wardrobe, buy a mattress and matching bedroom set, check out the gourmet kitchen gadgets, and pick out that stereo system for the kid's birthday or fine china for that friend's wedding. (621 SW 5th Ave.)

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)

Woodburn Company Stores, Oregon's newest and largest outlet center, features 80 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)

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)

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 scensters.

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.

GUEST PROGRAM

There is a very attractive "Guest Program" for the spouses and guests of PICMET '05 participants. The guest fee ($250) 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 on Monday through Thursday (August 1—4), in Alexander's Lounge on the 23rd floor of the Hilton, where the view is spectacular.
- Four daily excursions (Monday, August 1 – Thursday, August 4) described below.
- (Please note that the value of this package is $445.)

Portland skyline from the International Rose Test Garden
Portland Oregon Visitors Association/photo by Richard Stanley

DAILY EXCURSIONS

MONDAY, AUGUST 1, 2005
10:00—12:00

BEST OF PORTLAND WALKING TOUR

This walk features all the best that Portland has to offer, including a plethora of artwork, bridges, architecture, parks, and fountains. You will learn the history of the fur trade, the Oregon Trail, and hear stories about early Portland as we stroll around downtown, the Cultural district, and Historic Yamhill.

While we walk along the riverfront, your guide will easily show you why Portland is known worldwide as Bridgetown.

This tour also features the stop that everyone loves—the world's smallest city park. Other sites along the way include:

- Bronze drinking fountains from 1912
- Two weather machines
- Over 30 public art pieces (including Portlandia)
- A controversial marble statue with a unique nickname
- The 1985 City Hall building
- A fountain that changes every 15 minutes
- A park that was for women only
- A free electric car charging station
- And a lot more!

(Tour fee included in PICMET Guest Registration)

Japanese Garden
Portland Oregon Visitors Association

TUESDAY, AUGUST 2, 2005
10:00—12:00

WASHINGTON PARK INTERNATIONAL ROSE TEST GARDEN AND JAPANESE GARDEN

A trip to Portland, the City of Roses, would not be complete without visits to the Portland International Rose Test Garden and the Japanese Garden, both located in Washington Park. Guests will board MAX (Portland's light rail) for a short ride to Portland's West Hills for a wander through one of the most visited and cherished locations in the city.

The 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, the grounds (just over 5 acres) are gorgeous, and the incredible view of the city from the park makes this trip worth doing. Portland's internationally recognized Japanese Garden, open since 1967, represents a melding of Japanese traditional garden forms with American hurry.

(Light rail ticket and Garden entry fee included in PICMET Guest Registration)

GUEST PROGRAM

WEDNESDAY, AUGUST 3, 2005
10:00—13:00

OREGON HISTORICAL SOCIETY, FARMER'S MARKET, AND LUNCH AT SOUTHPARK SEAFOOD GRILL & WINE BAR.

The first stop will be the Oregon Historical Society, which is just a few blocks from the Hilton, for a look at the Lewis and Clark Bicentennial Exhibition. This

Portland Farmers Market
photos by Ann White

new exhibit commemorates Lewis and Clark's exploration of Oregon in 1805-1806 and focuses on the world's fair in Portland held 100 years ago, an event that drew 1.6 million visitors and changed Portland forever from a small-town port to an international city. *A Fair to Remember* re-creates the Expo with rare artifacts and images and full-size replicas of key fair structures.

The second stop for this excursion will be the Portland Farmers Market, where you can purchase locally grown produce and other items being sold by vendors. Each week the market boasts organically grown produce, fresh-baked breads, seafood and seasonal flowers. All products offered for sale at the market must be grown, raised, produced, or gathered by the vendor in Oregon or Washington.

The final stop will be lunch at Southpark Seafood Grill & Wine Bar. Located in the heart of Portland's cultural district, Southpark draws upon the freshest Northwest seafood and produce and the finest imported specialty foods to create dishes inspired by the culinary traditions of the Mediterranean.

(Historical Society entry fee and lunch are included in PICMET Guest Registration)

Southpark Seafood Grill & Wine Bar
Portland Oregon Visitors Association/photo by Bob Woodward

THURSDAY, AUGUST 4, 2005
10:00—12:00

SHOPPING ON NW 23RD AVE.

The group will take Portland's streetcar to NW 23rd Ave., which is famous for its specialty shops, galleries and restaurants. Enjoy shopping tax free—there is no sales tax in Oregon!

Portland Streetcar in the Pearl District
Portland Oregon Visitors Association/photo by Richard Stanley

IEEE EMS Reception

IEEE ENGINEERING MANAGEMENT SOCIETY

OREGON CHAPTER MEETING AND DESSERT RECEPTION

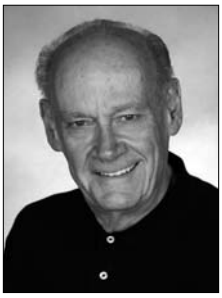
DATE: WEDNESDAY, AUGUST 3

TIME: 19:00 – 22:00

LOCATION: HILTON PAVILION

GLOBAL OUTSOURCING PROJECT MANAGEMENT

Professor Burton V. Dean, College of Business, San Jose State University, San Jose, California, USA



Global Outsourcing (GO) is continuing to be a primary means for US firms to increase their competitiveness and to achieve competitive advantages. GO is the movement of business processes in US firms to external service providers outside of the US. It is estimated that 3.3 million US service jobs will be moved overseas by 2015, equivalent to 7.5% of all current US jobs (Forrester Research).

Global outsourcing project management (GOPM) involves additional problems and skills beyond those in the case of typical project management. Results will be presented on the actual GOPM experiences of 20 Silicon Valley firms. What are the factors behind the increase in GO? Why have these firms outsourced projects? What are the typical steps in GOPM? What is the project evaluation and selection process? What are the actual costs and benefits of GO? How can GOPM be improved?

Burton Dean is known for his contributions to the fields of operations research, project management, and R&D/Technology Management. His current research on Global Outsourcing is an outgrowth of his Silicon Valley experiences as the founder/director of the Silicon Valley Center for Entrepreneurship and the founder/director of the SJSU Entrepreneurial Society, and based on his analysis of 50 Silicon Valley Global Outsourcing Projects. Currently he is serving on the Advisory Boards of the Environmental Business Cluster and Yakima Filters, Inc., and has co-founded Pyramid Technology, Inc. and Com Share, Ltd. He is the author/editor of six books, and has published more than 30 chapters and 120 papers.

This optional event is open to all PICMET participants, but is not included in the PICMET registration. Tickets can be purchased at the registration desk for $25 each.

Social Events

To facilitate the informal interaction of the participants, several social events have been scheduled during PICMET '05.

RECEPTION/BUFFET

DATE: SUNDAY, JULY 31

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 registration fee.*

DINNER AT THE WORLD TRADE CENTER

DATE: MONDAY, AUGUST 1

TIME: 19:00 – 22:00

LOCATION: WORLD TRADE CENTER, OUTDOOR PLAZA, 121 SW SALMON ST.

DRESS: INFORMAL

Enjoy a savory buffet of international dishes while you mingle and network with colleagues. After dinner, you will be entertained by The BeckerHeads, a local four-piece band playing covers and original compositions. Included in registration fee.*

The BeckerHeads will perform at the World Trade Center on August 1

AWARDS BANQUET

DATE: TUESDAY, AUGUST 2

CASH BAR: 18:00 – 19:00

BANQUET: 19:00 – 22:00

LOCATION: HILTON PAVILION

DRESS: BUSINESS ATTIRE

This is the premier social event of the conference. The PICMET '05 "Leadership in Technology Management," "Medal of Excellence" and "Outstanding Student Paper" awards will be presented at the banquet. The awards ceremony begins promptly at 19:00 and will be followed by dinner, so please be on time. Included in registration fee.*

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

Site Visits

Site visits to the following companies are offered during PICMET '05. Seating is limited, so sign up early ($40).

The times below include travel time; each tour is about 90 minutes long. Buses will board by the Hilton on SW Salmon St. beginning at 15 minutes past the hour, and will depart at 30 minutes past the hour.

XEROX

GROUP 1 – TUESDAY, AUGUST 2, 09:15 – 12:00

GROUP 2 – TUESDAY, AUGUST 2, 13:15 – 16:00

Xerox offers industry-leading color printers based on its exclusive solid ink technology, and the home of that technology is on the beautiful campus in Wilsonville, Oregon. You are invited to come tour our facilities, where printer configuration, testing, and inventory management take place. You will also learn about solid ink technology and how it differs from other printing technologies while touring the worldwide manufacturing plant for solid ink and solid ink print heads.

TEKTRONIX

WEDNESDAY, AUGUST 3, 09:15 – 12:00

See Tektronix's state-of-the-art, computerized manufacturing system capable of creating multiple types of products on a single conveyor-belt assembly line. Combining the flexibility of an individual task process with the efficiency of high-volume electronics manufacturing, Tektronix's new product line can produce five major oscilloscopes through a defined process on a single manufacturing line. Tektronix makes test, measurement, and monitoring solutions for communications, computer, and semiconductor industries worldwide.

TECHNICAL PROGRAM

PROGRAM OVERVIEW

The PICMET ’05 technical program consists of 135 sessions including 6 plenaries, 8 tutorials, 4 panel discussions, 1 special session and 117 paper sessions

The plenaries are scheduled from 08:00 to 09:30 every morning, Monday, August 1 through Thursday, August 4; and also from 13:30 to 15:00 on Tuesday, August 2, and Wednesday, August 3, 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 ’05 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 72 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 08:00-09:30 time slot. After that, there are up to 17 break-out sessions throughout the day, Monday through Thursday, with the exception of the plenary sessions on Tuesday, August 2, and Wednesday, August 3, from 13:30—15:00.

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

First, you will find a listing of topics. The topic areas correspond to the 39 tracks included in PICMET ’05.

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

The fourth set contains the same information as the third set, but the sessions are ordered by room number. This set is intended to give you a good picture of all the tracks in which the sessions are scheduled. The sessions in a track are kept in the same room as much as possible. By looking at the sessions in each room, you should easily be able to select the tracks which you would like to follow.

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 ’05.

THE TRACKS

TRACK	SESSIONS, PANELS, TUTORIALS
Accelerated Radical Innovation	MD-02, ME-02
Collaborations in Technology Management	MB-17, MD-17, ME-11, ME-17, TB-17, TE-17, WB-17
Competitiveness in Technology Management	MB-01, MD-01, HB-02
Cultural Issues in Technology Management	TB-18
Decision Making in Technology Management	TB-15, TE-15, WB-15, WE-15
E-Business	MD-06, ME-06
Entrepreneurship/Intrapreneurship	MB-15, MD-15, ME-15
Environmental Issues in Technology Management	MD-18, ME-18
Government Sector	TB-03, TE-03
Information/Knowledge Management	MB-02, MB-09, MD-09, ME-09, WB-09, WE-09, HB-09
Innovation Management	MB-08, MD-08, ME-08, TB-08, TE-08, WB-08, WE-08, HB-08, HD-08
International Issues in Technology Management	TE-01, WB-01, HB-01
Management of Intellectual Capital	TE-04
Management of Technical Workforce	TB-06, TE-06
Manufacturing Management	MB-10, MD-10
New Product Development	MB-18, TE-18, WB-13, WE-13
New Venture Management	TB-10
Productivity Management	ME-10
Project/Program Management	MB-07, MD-07, ME-07, TB-02, TB-07, TE-07, WB-07, WE-07, HB-07, HD-07
R&D Management	TB-16, TE-16, WE-14
Resource Management	MD-03, ME-03
Science and Technology Policy	WB-03, WE-03, HB-03, HD-03
Semiconductor Industry	MD-14, ME-14
Service Industry	HD-02, MB-13
Software Process Management	MB-03
Strategic Management of Technology	MB-06, WB-06, WE-06, HB-06, HD-06
Supply Chain Management	MD-13, ME-13, TB-13, TE-13
Technological Changes	TB-01, WB-16, WE-16
Technology Acquisition	MD-04
Technology Adoption and Diffusion	MD-05, ME-05, TB-05, TE-05
Technology Assessment and Evaluation	MB-04, WB-04, WE-04, HE-04, HD-04
Technology Based Organizations	ME-04, TB-04
Technology Management Education	ME-01, WE-01
Technology Management Framework	MB-16, MD-16, ME-16, TE-02, HD-01
Technology Marketing	TB-09, TE-09
Technology Planning and Forecasting	MB-05, WB-05, WE-05, HD-09
Technology Roadmapping	WB-02, HB-05
Technology Transfer	MB-14, TB-14, TE-14, WB-14
Telecommunications Industry	TE-10, WB-10, WE-10, HB-10, HD-10

SHARE THE PICMET EXPERIENCE

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."

MONDAY, AUGUST 1, 2005

	01 Pavilion East	02 Pavilion West	03 Broadway-1	04 Broadway-2	05 Broadway-3	06 Broadway-4	07 Forum Suite	08 Council Suite
MA 8:00 AM-9:30 AM	PLENARY							
MB 10:00 AM-11:30 AM	Competitiveness in Technology Management-1	Tutorial: Knowledge Management: The Structure and Progress of Knowledge	Software Process Management	Technology Assessment and Evaluation-1	Technology Planning and Forecasting-1	Strategic Management of Technology-1	Project/Program Management-1	Innovation Management-1
MC 11:30 AM-1:30 PM								
MD 1:30 PM-3:00 PM	Competitiveness in Technology Management-2	Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-1	Resource Management-1	Technology Acquisition	Technology Adoption and Diffusion-1	E-Business-1	Project/Program Management-2	Innovation Management-2
ME 3:30 PM-5:00 PM	Panel: ETMERC Session	Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-2	Resource Management-2	Technology Based Organizations-1	Technology Adoption and Diffusion-2	E-Business-2	Project/Program Management-3	Innovation Management-3

TUESDAY, AUGUST 2, 2005

	01 Pavilion East	02 Pavilion West	03 Broadway-1	04 Broadway-2	05 Broadway-3	06 Broadway-4	07 Forum Suite	08 Council Suite
TA 8:00 AM-9:30 AM	PLENARY-2							
TB 10:00 AM-11:30 AM	Technology change management in the automotive industry	Tutorial: Program Management at Intel and Tektronix: Linking Execution to Strategy	Government Sector-1	Technology Based Organizations-2	Technology Adoption and Diffusion-3	Management of Technical Workforce-1	Project/Program Management-4	Innovation Management-4
TC 11:30 AM-1:30 PM								
TD 1:30 PM-3:00 PM	PLENARY-3							
TE 3:30 PM-5:00 PM	International Issues in Technology Management-1	Panel: Engineering and Technology Management Journals	Government Sector-2	Management of Intellectual Capital	Technology Planning and Forecasting-2	Management of Technical Workforce-2	Project/Program Management-5	Innovation Management-5

MONDAY (CONTINUED)

09 Directors Suite	10 Studio Suite	11 Executive Suite	13 Galleria-1	14 Galleria-2	15 Galleria-3	16 Parlor-A	17 Parlor-B	18 Parlor-C
Tutorial: Using the PICMET Abstracts, 1997-2005, in VantagePoint Reader on your Conference CD	Manufacturing Management-1		Service Industry-1	Technology Transfer-1	Entrepreneurship/ Intrapreneurship-1	Technology Management Framework-1	Collaborations in Technology Management-1	New Product Development-1
Better Technology Management through Better Technology Information	Manufacturing Management-2		Supply Chain Management-1	Semiconductor Industry-1	Entrepreneurship/I ntrapreneurship-2	Technology Management Framework-2	Present and Future of Collaboration	Environmental Issues in Technology Management-1
Information/ Knowledge Management-1	Productivity Management	Tutorial: Collaborating Across Boundaries to Generate Intangible Forms of Capital	Supply Chain Management-2	Semiconductor Industry-2	Entrepreneurship/ Intrapreneurship-3	Technology Management Framework-3	Collaborations in Technology Management-2	Environmental Issues in Technology Management-2

TUESDAY, (CONTINUED)

09 Directors Suite	10 Studio Suite	11 Executive Suite	13 Galleria-1	14 Galleria-2	15 Galleria-3	16 Parlor-A	17 Parlor-B	18 Parlor-C
Technology Marketing-1	New Venture Management		Supply Chain Management-3	Technology Transfer-2	Decision Making in Technology Management-1	R&D Management-1	Collaborations in Technology Management-3	Cultural Issues in Technology Management
Technology Marketing-2	Telecommunications Industry-1		Supply Chain Management-4	Technology Transfer-3	Decision Making in Technology Management-2	R&D Management-2	Panel: Melting the boundaries between acade-mia and industry for immediate impact	New Product Development-2

WEDNESDAY, AUGUST 3, 2005

	01 Pavilion East	02 Pavilion West	03 Broadway-1	04 Broadway-2	05 Broadway-3	06 Broadway-4	07 Forum Suite	08 Council Suite
WA 8:00 AM-9:30 AM	PLENARY-4							
WB 10:00 AM-11:30 AM	International Issues in Technology Management-2	Tutorial: Keeping a Technology Roadmap Alive By Applying the Technology Development Envelope (TDE) Approach	Science and Technology Policy-1	Technology Assessment and Evaluation-2	Technology Planning and Forecasting-3	Strategic Management of Technology-2	Project/Program Management-6	Innovation Management-6
WC 11:30 AM-1:30 PM								
WD 1:30 PM-3:00 PM	PLENARY-5							
WE 3:30 PM-5:00 PM	Technology Management Education-1		Science and Technology Policy-2	Technology Assessment and Evaluation-3	Technology Planning and Forecasting-4	Strategic Management of Technology-3	Project/Program Management-7	Innovation Management-7

THURSDAY, AUGUST 4, 2005

	01 Pavilion East	02 Pavilion West	03 Broadway-1	04 Broadway-2	05 Broadway-3	06 Broadway-4	07 Forum Suite	08 Council Suite
HA 8:00 AM-9:30 AM	PLENARY-6							
HB 10:00 AM-11:30 AM	International Issues in Technology Management-3	Tutorial: Business Process Management and Gap Analysis	Science and Technology Policy-3	Technology Asessment and Evaluation-4	Technology Roadmapping	Strategic Management of Technology-4	Project/Program Management-8	Innovation Management-8
HC 11:30 AM-1:30 PM								
HD 1:30 PM-3:00 PM	Tutorial: The Institute for Leadership in Technology and Management	Technology Management and the Service Sector	Science and Technology Policy-4	Technology Assessment and Evaluation-5		Strategic Management of Technology-5	Project/Program Management-9	Innovation Management-9
HE 3:30 PM-5:00 PM	Special Session: Planning for PICMET'06 and beyond							

WEDNESDAY (CONTINUED)

09 Directors Suite	10 Studio Suite	11 Executive Suite	13 Galleria-1	14 Galleria-2	15 Galleria-3	16 Parlor-A	17 Parlor-B	18 Parlor-C
Information/ Knowledge Management-2	Telecommunications Industry-2		New Product Development-3	Technology Transfer-4	Decision Making in Technology Management-3	Technological Changes-1	Collaborations in Technology Management-4	
Information/ Knowledge Management-3	Telecommunications Industry-3		New Product Development-4	R&D Management-3	Decision Making in Technology Management-4	Technological Changes-2		

THURSDAY (CONTINUED)

09 Directors Suite	10 Studio Suite	11 Executive Suite	13 Galleria-1	14 Galleria-2	15 Galleria-3	16 Parlor-A	17 Parlor-B	18 Parlor-C
Information/ Knowledge Management-4	Telecommunications Industry-4							
Tutorial: Introduction to Technological Forecasting	Telecommunications Industry-5							

SCHEDULE OF SESSIONS

SCHEDULE OF SESSION BY ROOM

Session	Number	Date	Time	Room	Session Title
MA	01	Monday	08:00 - 09:30	Pavilion	"PLENARY-1"
MB	01	Monday	10:00 - 11:30	Pavilion East	"Competitiveness in Technology Management-1"
MD	01	Monday	13:30 - 15:00	Pavilion East	"Competitiveness in Technology Management-2"
ME	01	Monday	15:30 - 17:00	Pavilion East	PANEL: "ETMERC"
TA	01	Tuesday	08:00 - 09:30	Pavilion	"PLENARY-2"
TB	01	Tuesday	10:00 - 11:30	Pavilion East	"Technology change management in the automotive industry"
TD	01	Tuesday	13:30 - 15:00	Pavilion	"PLENARY-3"
TE	01	Tuesday	15:30 - 17:00	Pavilion East	"International Issues in Technology Management-1"
WA	01	Wednesday	08:00 - 09:30	Pavilion	"PLENARY-4"
WB	01	Wednesday	10:00 - 11:30	Pavilion East	"International Issues in Technology Management-2"
WD	01	Wednesday	13:30 - 15:00	Pavilion	"PLENARY-5"
WE	01	Wednesday	15:30 - 17:00	Pavilion East	"Technology Management Education-1"
HA	01	Thursday	08:00 - 09:30	Pavilion	"PLENARY-6"
HB	01	Thursday	10:00 - 11:30	Pavilion East	"International Issues in Technology Management-3"
HD	01	Thursday	13:30 - 15:00	Pavilion East	TUTORIAL: "The Institute for Leadership in Technology and Management "
HE	01	Thursday	15:30 - 17:00	Pavilion East	SPECIAL SESSION: "Planning Session for PICMET '06 and Beyond"
MB	02	Monday	10:00 - 11:30	Pavilion West	TUTORIAL: "Knowledge Management: The Structure and Progress of Knowledge"
MD	02	Monday	13:30 - 15:00	Pavilion West	"Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-1"
ME	02	Monday	15:30 - 17:00	Pavilion West	"Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-2"
TB	02	Tuesday	10:00 - 11:30	Pavilion West	TUTORIAL: "Program Management at Intel and Tektronix: Linking Execution to Strategy"
TE	02	Tuesday	15:30 - 17:00	Pavilion West	PANEL: "Engineering and Technology Management Journals"
WB	02	Wednesday	10:00 - 11:30	Pavilion West	TUTORIAL: "Keeping a Technology Roadmap Alive By Applying the Technology Development Envelope (TDE) Approach"
HB	02	Thursday	10:00 - 11:30	Pavilion West	TUTORIAL: "Business Process Management and Gap Analysis"
HD	02	Thursday	13:30 - 15:00	Pavilion West	"Technology Management and the Service Sector"
MB	03	Monday	10:00 - 11:30	Broadway-1	"Software Process Management"
MD	03	Monday	13:30 - 15:00	Broadway-1	"Resource Management-1"
ME	03	Monday	15:30 - 17:00	Broadway-1	"Resource Management-2"
TB	03	Tuesday	10:00 - 11:30	Broadway-1	"Government Sector-1"
TE	03	Tuesday	15:30 - 17:00	Broadway-1	"Government Sector-2"
WB	03	Wednesday	10:00 - 11:30	Broadway-1	"Science and Technology Policy-1"
WE	03	Wednesday	15:30 - 17:00	Broadway-1	"Science and Technology Policy-2"
HB	03	Thursday	10:00 - 11:30	Broadway-1	"Science and Technology Policy-3"
HD	03	Thursday	13:30 - 15:00	Broadway-1	"Science and Technology Policy-4"
MB	04	Monday	10:00 - 11:30	Broadway-2	"Technology Assessment and Evaluation-1"
MD	04	Monday	13:30 - 15:00	Broadway-2	"Technology Acquisition"
ME	04	Monday	15:30 - 17:00	Broadway-2	"Technology Based Organizations-1"

Schedule of Sessions

TB	04	Tuesday	10:00 - 11:30	Broadway-2	“Technology Based Organizations-2”
TE	04	Tuesday	15:30 - 17:00	Broadway-2	“Management of Intellectual Capital”
WB	04	Wednesday	10:00 - 11:30	Broadway-2	“Technology Assessment and Evaluation-2”
WE	04	Wednesday	15:30 - 17:00	Broadway-2	“Technology Assessment and Evaluation-3”
HB	04	Thursday	10:00 - 11:30	Broadway-2	“Technology Asessment and Evaluation-4”
HD	04	Thursday	13:30 - 15:00	Broadway-2	“Technology Assessment and Evaluation-5”
MB	05	Monday	10:00 - 11:30	Broadway-3	“Technology Planning and Forecasting-1”
MD	05	Monday	13:30 - 15:00	Broadway-3	“Technology Adoption and Diffusion-1”
ME	05	Monday	15:30 - 17:00	Broadway-3	“Technology Adoption and Diffusion-2”
TB	05	Tuesday	10:00 - 11:30	Broadway-3	“Technology Adoption and Diffusion-3”
TE	05	Tuesday	15:30 - 17:00	Broadway-3	“Technology Planning and Forecasting-2”
WB	05	Wednesday	10:00 - 11:30	Broadway-3	“Technology Planning and Forecasting-3”
WE	05	Wednesday	15:30 - 17:00	Broadway-3	“Technology Planning and Forecasting-4”
HB	05	Thursday	10:00 - 11:30	Broadway-3	“Technology Roadmapping”
MB	06	Monday	10:00 - 11:30	Broadway-4	“Strategic Management of Technology-1”
MD	06	Monday	13:30 - 15:00	Broadway-4	“E-Business-1”
ME	06	Monday	15:30 - 17:00	Broadway-4	“E-Business-2”
TB	06	Tuesday	10:00 - 11:30	Broadway-4	“Management of Technical Workforce-1”
TE	06	Tuesday	15:30 - 17:00	Broadway-4	“Management of Technical Workforce-2”
WB	06	Wednesday	10:00 - 11:30	Broadway-4	“Strategic Management of Technology-2”
WE	06	Wednesday	15:30 - 17:00	Broadway-4	“Strategic Management of Technology-3”
HB	06	Thursday	10:00 - 11:30	Broadway-4	“Strategic Management of Technology-4”
HD	06	Thursday	13:30 - 15:00	Broadway-4	“Strategic Management of Technology-5”
MB	07	Monday	10:00 - 11:30	Forum Suite	“Project/Program Management-1”
MD	07	Monday	13:30 - 15:00	Forum Suite	“Project/Program Management-2”
ME	07	Monday	15:30 - 17:00	Forum Suite	“Project/Program Management-3”
TB	07	Tuesday	10:00 - 11:30	Forum Suite	“Project/Program Management-4”
TE	07	Tuesday	15:30 - 17:00	Forum Suite	“Project/Program Management-5”
WB	07	Wednesday	10:00 - 11:30	Forum Suite	“Project/Program Management-6”
WE	07	Wednesday	15:30 - 17:00	Forum Suite	“Project/Program Management-7”
HB	07	Thursday	10:00 - 11:30	Forum Suite	“Project/Program Management-8”
HD	07	Thursday	13:30 - 15:00	Forum Suite	“Project/Program Management-9”
MB	08	Monday	10:00 - 11:30	Council Suite	“Innovation Management-1”
MD	08	Monday	13:30 - 15:00	Council Suite	“Innovation Management-2”
ME	08	Monday	15:30 - 17:00	Council Suite	“Innovation Management-3”
TB	08	Tuesday	10:00 - 11:30	Council Suite	“Innovation Management-4”
TE	08	Tuesday	15:30 - 17:00	Council Suite	“Innovation Management-5”
WB	08	Wednesday	10:00 - 11:30	Council Suite	“Innovation Management-6”
WE	08	Wednesday	15:30 - 17:00	Council Suite	“Innovation Management-7”
HB	08	Thursday	10:00 - 11:30	Council Suite	“Innovation Management-8”
HD	08	Thursday	13:30 - 15:00	Council Suite	“Innovation Management-9”
MB	09	Monday	10:00 - 11:30	Directors Suite	TUTORIAL: “Using the PICMET Abstracts, 1997-2005, in VantagePoint Reader on your Conference CD”
MD	09	Monday	13:30 - 15:00	Directors Suite	“Better Technology Management through Better Technology

Schedule of Sessions

					Information”
ME	09	Monday	15:30 - 17:00	Directors Suite	“Information/Knowledge Management-1”
TB	09	Tuesday	10:00 - 11:30	Directors Suite	“Technology Marketing-1”
TE	09	Tuesday	15:30 - 17:00	Directors Suite	“Technology Marketing-2”
WB	09	Wednesday	10:00 - 11:30	Directors Suite	“Information/Knowledge Management-2”
WE	09	Wednesday	15:30 - 17:00	Directors Suite	“Information/Knowledge Management-3”
HB	09	Thursday	10:00 - 11:30	Directors Suite	“Information/Knowledge Management-4”
HD	09	Thursday	13:30 - 15:00	Directors Suite	TUTORIAL: “Introduction to Technological Forecasting”
MB	10	Monday	10:00 - 11:30	Studio Suite	“Manufacturing Management-1”
MD	10	Monday	13:30 - 15:00	Studio Suite	“Manufacturing Management-2”
ME	10	Monday	15:30 - 17:00	Studio Suite	“Productivity Management”
TB	10	Tuesday	10:00 - 11:30	Studio Suite	“New Venture Management”
TE	10	Tuesday	15:30 - 17:00	Studio Suite	“Telecommunications Industry-1”
WB	10	Wednesday	10:00 - 11:30	Studio Suite	“Telecommunications Industry-2”
WE	10	Wednesday	15:30 - 17:00	Studio Suite	“Telecommunications Industry-3”
HB	10	Thursday	10:00 - 11:30	Studio Suite	“Telecommunications Industry-4”
HD	10	Thursday	13:30 - 15:00	Studio Suite	“Telecommunications Industry-5”
ME	11	Monday	15:30 - 17:00	Executive Suite	TUTORIAL: “Collaborating Across Boundaries to Generate Intangible Forms of Capital”
MB	13	Monday	10:00 - 11:30	Galleria-1	“Service Industry-1”
MD	13	Monday	13:30 - 15:00	Galleria-1	“Supply Chain Management-1”
ME	13	Monday	15:30 - 17:00	Galleria-1	“Supply Chain Management-2”
TB	13	Tuesday	10:00 - 11:30	Galleria-1	“Supply Chain Management-3”
TE	13	Tuesday	15:30 - 17:00	Galleria-1	“Supply Chain Management-4”
WB	13	Wednesday	10:00 - 11:30	Galleria-1	“New Product Development-3”
WE	13	Wednesday	15:30 - 17:00	Galleria-1	“New Product Development-4”
MB	14	Monday	10:00 - 11:30	Galleria-2	“Technology Transfer-1”
MD	14	Monday	13:30 - 15:00	Galleria-2	“Semiconductor Industry-1”
ME	14	Monday	15:30 - 17:00	Galleria-2	“Semiconductor Industry-2”
TB	14	Tuesday	10:00 - 11:30	Galleria-2	“Technology Transfer-2”
TE	14	Tuesday	15:30 - 17:00	Galleria-2	“Technology Transfer-3”
WB	14	Wednesday	10:00 - 11:30	Galleria-2	“Technology Transfer-4”
WE	14	Wednesday	15:30 - 17:00	Galleria-2	“R&D Management-3”
MB	15	Monday	10:00 - 11:30	Galleria-3	“Entrepreneurship/Intrapreneurship-1”
MD	15	Monday	13:30 - 15:00	Galleria-3	“Entrepreneurship/Intrapreneurship-2”
ME	15	Monday	15:30 - 17:00	Galleria-3	“Entrepreneurship/Intrapreneurship-3”
TB	15	Tuesday	10:00 - 11:30	Galleria-3	“Decision Making in Technology Management-1”
TE	15	Tuesday	15:30 - 17:00	Galleria-3	“Decision Making in Technology Management-2”
WB	15	Wednesday	10:00 - 11:30	Galleria-3	“Decision Making in Technology Management-3”
WE	15	Wednesday	15:30 - 17:00	Galleria-3	“Decision Making in Technology Management-4”
MB	16	Monday	10:00 - 11:30	Parlor-A	“Technology Management Framework-1”
MD	16	Monday	13:30 - 15:00	Parlor-A	“Technology Management Framework-2”
ME	16	Monday	15:30 - 17:00	Parlor-A	“Technology Management Framework-3”
TB	16	Tuesday	10:00 - 11:30	Parlor-A	“R&D Management-1”
TE	16	Tuesday	15:30 - 17:00	Parlor-A	“R&D Management-2”

SCHEDULE OF SESSIONS

WB	16	Wednesday	10:00 - 11:30	Parlor-A	"Technological Changes-1"
WE	16	Wednesday	15:30 - 17:00	Parlor-A	"Technological Changes-2"
MB	17	Monday	10:00 - 11:30	Parlor-B	"Collaborations in Technology Management-1"
MD	17	Monday	13:30 - 15:00	Parlor-B	"Present and Future of Collaboration"
ME	17	Monday	15:30 - 17:00	Parlor-B	"Collaborations in Technology Management-2"
TB	17	Tuesday	10:00 - 11:30	Parlor-B	"Collaborations in Technology Management-3"
TE	17	Tuesday	15:30 - 17:00	Parlor-B	PANEL: "Melting the Boundaries Between Academia and Industry for Immediate Impact"
WB	17	Wednesday	10:00 - 11:30	Parlor-B	"Collaborations in Technology Management-4"
MB	18	Monday	10:00 - 11:30	Parlor-C	"New Product Development-1"
MD	18	Monday	13:30 - 15:00	Parlor-C	"Environmental Issues in Technology Management-1"
ME	18	Monday	15:30 - 17:00	Parlor-C	"Environmental Issues in Technology Management-2"
TB	18	Tuesday	10:00 - 11:30	Parlor-C	"Cultural Issues in Technology Management"
TE	18	Tuesday	15:30 - 17:00	Parlor-C	"New Product Development-2"

SCHEDULE OF SESSIONS BY DATE
MONDAY, AUGUST 1, 2005

Session	Number	Date	Time	Room	Session Title
MA	01	Monday	08:00 - 09:30	Pavilion	"PLENARY-1"
MB	01	Monday	10:00 - 11:30	Pavilion East	"Competitiveness in Technology Management-1"
MB	02	Monday	10:00 - 11:30	Pavilion West	TUTORIAL: "Knowledge Management: The Structure and Progress of Knowledge"
MB	03	Monday	10:00 - 11:30	Broadway-1	"Software Process Management"
MB	04	Monday	10:00 - 11:30	Broadway-2	"Technology Assessment and Evaluation-1"
MB	05	Monday	10:00 - 11:30	Broadway-3	"Technology Planning and Forecasting-1"
MB	06	Monday	10:00 - 11:30	Broadway-4	"Strategic Management of Technology-1"
MB	07	Monday	10:00 - 11:30	Forum Suite	"Project/Program Management-1"
MB	08	Monday	10:00 - 11:30	Council Suite	"Innovation Management-1"
MB	09	Monday	10:00 - 11:30	Directors Suite	TUTORIAL: "Using the PICMET Abstracts, 1997-2005, in VantagePoint Reader on your Conference CD"
MB	10	Monday	10:00 - 11:30	Studio Suite	"Manufacturing Management-1"
MB	13	Monday	10:00 - 11:30	Galleria-1	"Service Industry-1"
MB	14	Monday	10:00 - 11:30	Galleria-2	"Technology Transfer-1"
MB	15	Monday	10:00 - 11:30	Galleria-3	"Entrepreneurship/Intrapreneurship-1"
MB	16	Monday	10:00 - 11:30	Parlor-A	"Technology Management Framework-1"
MB	17	Monday	10:00 - 11:30	Parlor-B	"Collaborations in Technology Management-1"
MB	18	Monday	10:00 - 11:30	Parlor-C	"New Product Development-1"
MD	01	Monday	13:30 - 15:00	Pavilion East	"Competitiveness in Technology Management-2"
MD	02	Monday	13:30 - 15:00	Pavilion West	"Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-1"
MD	03	Monday	13:30 - 15:00	Broadway-1	"Resource Management-1"
MD	04	Monday	13:30 - 15:00	Broadway-2	"Technology Acquisition"
MD	05	Monday	13:30 - 15:00	Broadway-3	"Technology Adoption and Diffusion-1"
MD	06	Monday	13:30 - 15:00	Broadway-4	"E-Business-1"
MD	07	Monday	13:30 - 15:00	Forum Suite	"Project/Program Management-2"

SCHEDULE OF SESSIONS

MD	08	Monday	13:30 - 15:00	Council Suite	"Innovation Management-2"
MD	09	Monday	13:30 - 15:00	Directors Suite	"Better Technology Management through Better Technology Information"
MD	10	Monday	13:30 - 15:00	Studio Suite	"Manufacturing Management-2"
MD	13	Monday	13:30 - 15:00	Galleria-1	"Supply Chain Management-1"
MD	14	Monday	13:30 - 15:00	Galleria-2	"Semiconductor Industry-1"
MD	15	Monday	13:30 - 15:00	Galleria-3	"Entrepreneurship/Intrapreneurship-2"
MD	16	Monday	13:30 - 15:00	Parlor-A	"Technology Management Framework-2"
MD	17	Monday	13:30 - 15:00	Parlor-B	"Present and Future of Collaboration"
MD	18	Monday	13:30 - 15:00	Parlor-C	"Environmental Issues in Technology Management-1"
ME	01	Monday	15:30 - 17:00	Pavilion East	PANEL: "ETMERC"
ME	02	Monday	15:30 - 17:00	Pavilion West	"Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-2"
ME	03	Monday	15:30 - 17:00	Broadway-1	"Resource Management-2"
ME	04	Monday	15:30 - 17:00	Broadway-2	"Technology Based Organizations-1"
ME	05	Monday	15:30 - 17:00	Broadway-3	"Technology Adoption and Diffusion-2"
ME	06	Monday	15:30 - 17:00	Broadway-4	"E-Business-2"
ME	07	Monday	15:30 - 17:00	Forum Suite	"Project/Program Management-3"
ME	08	Monday	15:30 - 17:00	Council Suite	"Innovation Management-3"
ME	09	Monday	15:30 - 17:00	Directors Suite	"Information/Knowledge Management-1"
ME	10	Monday	15:30 - 17:00	Studio Suite	"Productivity Management"
ME	11	Monday	15:30 - 17:00	Executive Suite	TUTORIAL: "Collaborating Across Boundaries to Generate Intangible Forms of Capital"
ME	13	Monday	15:30 - 17:00	Galleria-1	"Supply Chain Management-2"
ME	14	Monday	15:30 - 17:00	Galleria-2	"Semiconductor Industry-2"
ME	15	Monday	15:30 - 17:00	Galleria-3	"Entrepreneurship/Intrapreneurship-3"
ME	16	Monday	15:30 - 17:00	Parlor-A	"Technology Management Framework-3"
ME	17	Monday	15:30 - 17:00	Parlor-B	"Collaborations in Technology Management-2"
ME	18	Monday	15:30 - 17:00	Parlor-C	"Environmental Issues in Technology Management-2"

TUESDAY, AUGUST 2, 2005

TA	01	Tuesday	08:00 - 09:30	Pavilion	"PLENARY-2"
TB	01	Tuesday	10:00 - 11:30	Pavilion East	"Technology Change Management in the Automotive Industry"
TB	02	Tuesday	10:00 - 11:30	Pavilion West	TUTORIAL: "Program Management at Intel and Tektronix: Linking Execution to Strategy"
TB	03	Tuesday	10:00 - 11:30	Broadway-1	"Government Sector-1"
TB	04	Tuesday	10:00 - 11:30	Broadway-2	"Technology Based Organizations-1"
TB	05	Tuesday	10:00 - 11:30	Broadway-3	"Technology Adoption and Diffusion-3"
TB	06	Tuesday	10:00 - 11:30	Broadway-4	"Management of Technical Workforce-1"
TB	07	Tuesday	10:00 - 11:30	Forum Suite	"Project/Program Management-4"
TB	08	Tuesday	10:00 - 11:30	Council Suite	"Innovation Management-4"
TB	09	Tuesday	10:00 - 11:30	Directors Suite	"Technology Marketing-1"
TB	10	Tuesday	10:00 - 11:30	Studio Suite	"New Venture Management"
TB	13	Tuesday	10:00 - 11:30	Galleria-1	"Supply Chain Management-3"

SCHEDULE OF SESSIONS

TB	14	Tuesday	10:00 - 11:30	Galleria-2	"Technology Transfer-2"
TB	15	Tuesday	10:00 - 11:30	Galleria-3	"Decision Making in Technology Management-1"
TB	16	Tuesday	10:00 - 11:30	Parlor-A	"R&D Management-1"
TB	17	Tuesday	10:00 - 11:30	Parlor-B	"Collaborations in Technology Management-3"
TB	18	Tuesday	10:00 - 11:30	Parlor-C	"Cultural Issues in Technology Management"
TD	01	Tuesday	13:30 - 15:00	Pavilion	"PLENARY-3"
TE	01	Tuesday	15:30 - 17:00	Pavilion East	"International Issues in Technology Management-1"
TE	02	Tuesday	15:30 - 17:00	Pavilion West	PANEL: "Engineering and Technology Management Journals"
TE	03	Tuesday	15:30 - 17:00	Broadway-1	"Government Sector-2"
TE	04	Tuesday	15:30 - 17:00	Broadway-2	"Management of Intellectual Capital"
TE	05	Tuesday	15:30 - 17:00	Broadway-3	"Technology Planning and Forecasting-2"
TE	06	Tuesday	15:30 - 17:00	Broadway-4	"Management of Technical Workforce-2"
TE	07	Tuesday	15:30 - 17:00	Forum Suite	"Project/Program Management-5"
TE	08	Tuesday	15:30 - 17:00	Council Suite	"Innovation Management-5"
TE	09	Tuesday	15:30 - 17:00	Directors Suite	"Technology Marketing-2"
TE	10	Tuesday	15:30 - 17:00	Studio Suite	"Telecommunications Industry-1"
TE	13	Tuesday	15:30 - 17:00	Galleria-1	"Supply Chain Management-4"
TE	14	Tuesday	15:30 - 17:00	Galleria-2	"Technology Transfer-3"
TE	15	Tuesday	15:30 - 17:00	Galleria-3	"Decision Making in Technology Management-2"
TE	16	Tuesday	15:30 - 17:00	Parlor-A	"R&D Management-2"
TE	17	Tuesday	15:30 - 17:00	Parlor-B	PANEL: "Melting the Boundaries Between Academia and Industry for Immediate Impact"
TE	18	Tuesday	15:30 - 17:00	Parlor-C	"New Product Development-2"

WEDNESDAY, AUGUST 3, 2005

WA	01	Wednesday	08:00 - 09:30	Pavilion	"PLENARY-4"
WB	01	Wednesday	10:00 - 11:30	Pavilion East	"International Issues in Technology Management-2"
WB	02	Wednesday	10:00 - 11:30	Pavilion West	TUTORIAL: "Keeping a Technology Roadmap Alive By Applying the Technology Development Envelope (TDE) Approach"
WB	03	Wednesday	10:00 - 11:30	Broadway-1	"Science and Technology Policy-1"
WB	04	Wednesday	10:00 - 11:30	Broadway-2	"Technology Assessment and Evaluation-2"
WB	05	Wednesday	10:00 - 11:30	Broadway-3	"Technology Planning and Forecasting-3"
WB	06	Wednesday	15:30 - 17:00	Broadway-4	"Strategic Management of Technology-3"
WB	07	Wednesday	10:00 - 11:30	Forum Suite	"Project/Program Management-6"
WB	08	Wednesday	10:00 - 11:30	Council Suite	"Innovation Management-6"
WB	09	Wednesday	10:00 - 11:30	Directors Suite	"Information/Knowledge Management-2"
WB	10	Wednesday	10:00 - 11:30	Studio Suite	"Telecommunications Industry-2"
WB	13	Wednesday	10:00 - 11:30	Galleria-1	"New Product Development-3"
WB	14	Wednesday	10:00 - 11:30	Galleria-2	"Technology Transfer-4"
WB	15	Wednesday	10:00 - 11:30	Galleria-3	"Decision Making in Technology Management-3"
WB	16	Wednesday	10:00 - 11:30	Parlor-A	"Technological Changes-1"
WB	17	Wednesday	10:00 - 11:30	Parlor-B	"Collaborations in Technology Management-4"
WD	01	Wednesday	13:30 - 15:00	Pavilion	"PLENARY-5"

SCHEDULE OF SESSIONS

WE	01	Wednesday	15:30 - 17:00	Pavilion East	"Technology Management Education-1"
WE	03	Wednesday	15:30 - 17:00	Broadway-1	"Science and Technology Policy-2"
WE	04	Wednesday	15:30 - 17:00	Broadway-2	"Technology Assessment and Evaluation-3"
WE	05	Wednesday	15:30 - 17:00	Broadway-3	"Technology Planning and Forecasting-4"
WE	06	Wednesday	15:30 - 17:00	Broadway-4	"Strategic Management of Technology-3"
WE	07	Wednesday	15:30 - 17:00	Forum Suite	"Project/Program Management-7"
WE	08	Wednesday	15:30 - 17:00	Council Suite	"Innovation Management-7"
WE	09	Wednesday	15:30 - 17:00	Directors Suite	"Information/Knowledge Management-3"
WE	10	Wednesday	15:30 - 17:00	Studio Suite	"Telecommunications Industry-3"
WE	13	Wednesday	15:30 - 17:00	Galleria-1	"New Product Development-4"
WE	14	Wednesday	15:30 - 17:00	Galleria-2	"R&D Management-3"
WE	15	Wednesday	15:30 - 17:00	Galleria-3	"Decision Making in Technology Management-4"
WE	16	Wednesday	15:30 - 17:00	Parlor-A	"Technological Changes-2"

THURSDAY, AUGUST 4, 2005

HA	01	Thursday	08:00 - 09:30	Pavilion	"PLENARY-6"
HB	01	Thursday	10:00 - 11:30	Pavilion East	"International Issues in Technology Management-3"
HB	02	Thursday	10:00 - 11:30	Pavilion West	TUTORIAL: "Business Process Management and Gap Analysis"
HB	03	Thursday	10:00 - 11:30	Broadway-1	"Science and Technology Policy-3"
HB	04	Thursday	10:00 - 11:30	Broadway-2	"Technology Asessment and Evaluation-4"
HB	05	Thursday	10:00 - 11:30	Broadway-3	"Technology Roadmapping"
HB	06	Thursday	10:00 - 11:30	Broadway-4	"Strategic Management of Technology-4"
HB	07	Thursday	10:00 - 11:30	Forum Suite	"Project/Program Management-8"
HB	08	Thursday	10:00 - 11:30	Council Suite	"Innovation Management-8"
HB	09	Thursday	10:00 - 11:30	Directors Suite	"Information/Knowledge Management-4"
HB	10	Thursday	10:00 - 11:30	Studio Suite	"Telecommunications Industry-4"
HD	01	Thursday	13:30 - 15:00	Pavilion East	TUTORIAL: "The Institute for Leadership in Technology and Management "
HD	02	Thursday	13:30 - 15:00	Pavilion West	"Technology Management and the Service Sector"
HD	03	Thursday	13:30 - 15:00	Broadway-1	"Science and Technology Policy-4"
HD	04	Thursday	13:30 - 15:00	Broadway-2	"Technology Assessment and Evaluation-5"
HD	06	Thursday	13:30 - 15:00	Broadway-4	"Strategic Management of Technology-5"
HD	07	Thursday	13:30 - 15:00	Forum Suite	"Project/Program Management-9"
HD	08	Thursday	13:30 - 15:00	Council Suite	"Innovation Management-9"
HD	09	Thursday	13:30 - 15:00	Directors Suite	TUTORIAL: "Introduction to Technological Forecasting"
HD	10	Thursday	13:30 - 15:00	Studio Suite	"Telecommunications Industry-5"
HE	01	Thursday	15:30 - 17:00	Pavilion East	SPECIAL SESSION: "Planning Session for PICMET'06 and Beyond"

PERSONAL SCHEDULE

	Sunday	Monday	Tuesday	Wednesday	Thursday
07:00 – 08:00 Bright Start					
8:00 – 9:30 (A)		Plenary (Hilton Pavilion)	Plenary (Hilton Pavilion)	Plenary (Hilton Pavilion)	Plenary (Hilton Pavilion)
9:30 – 10:00 Coffee Break					
10:00 – 11:30 (B)					
11:30 – 13:30 Lunch Break					
13:30 – 15:00 (D)			Plenary (Hilton Pavilion)	Plenary (Hilton Pavilion)	
15:00 – 15:30 Coffee Break					
15:30 – 17:00 (E)					PICMET '06 and beyond Planning Session (Pavilion East)
19:00 – 22:00	Ice Breaker (Hilton Pavilion)	Dinner World Trade Center	Awards Banquet (Hilton Pavilion) (Cash Bar 18:00 – 19:00)	IEEE – EMS Meeting and Dessert Reception (Hilton Pavilion)	

Notes:

PLENARIES

PLENARY SESSION — 1

DATE: MONDAY, AUGUST 1, 2005

TIME: 08:00—09:30

ROOM: PAVILION ROOM, PLAZA LEVEL

KEYNOTE-1

Nam P. Suh, MIT, United States

"Technology Innovation and Technology Management"

To most effectively manage and promote technology innovation within a given industry, the manager of technology must first understand innovation processes and then create an infrastructure that enables the achievement of specific business goals. It will be a significant academic milestone in the field of technology management if we are able to teach corporations to design innovative technology systems and processes based on a set of basic principles rather than depending on the current ad hoc policies and methods in use. Doing so will enable corporations to operate at their most efficient, productive and inventive levels. Unfortunately, there is currently no unified theory or methodology that is being used to direct the technology innovation process, although there are many ideas published on innovation processes based on case studies.

In this presentation, a hypothetical theory of the technology innovation process will be presented based upon an analysis of real experiences in technology innovation and management. Examples will be drawn from many different fields to identify the common features that must be present to advance technology innovation across industries.

Positions Held at MIT: Associate Professor of Mechanical Engineering, 1970-1975; Director, MIT-Industry Polymer Processing Program 1973-1984; Professor of Mechanical Engineering, 1975-Present; Director, Laboratory for Manufacturing and Productivity, 1977-1984; Cross Professor, 1989-Present; Director, Manufacturing Institute, 1990-Present; Department Head, 1991-2001;.....[Non-MIT Positions Held:] National Science Foundation, 1984-1988, (Assistant Director for Engineering, Presidential Appointee); University of South Carolina, 1965-69 (Assist./ Assoc. Professor); USM Corporation, 1961-65; Guild Plastics, 1958-60 Honors and Awards: Gustus L. Larson Memorial Award, Pi Tau Sigma and ASME, 1976; Election to CIRP, 1978; Citation Classic of ISI, 1979; Best Paper Award of SPE, 1981; Blackall Award of ASME, 1982; Who's Who in America; Honorary D Eng. Worcester Polytechnic Institute, 1986; The F.W. Taylor Research Award, SME, 1986; Fellow, ASME 1987; Federal Engineer of the Year, NSPE, 1987; Distinguished Service Award, NSF 1987; Honorary LHD, University of Mass., 1988; Foreign Member, Royal Swedish Academy of Engineering Science, 1988; Centennial Medallion Award, ASEE, 1993; The Ennor Manufacturing Technology Award, ASME, 1993; The KBS Award for Scholarly Achievements, 1995; Korean Academy of Science and Technology Life Member, 1995; The 1997 Ho-Am Prize for Engineering, Ho-Am Foundation, 1997; Honorary Doctor (Tekn. Hedersdoktor), Royal Institute of Technology, Sweden, 2000; The Mensforth International Gold Medal, The Institution of Electrical Engineers, United Kingdom, March 15, 2001; The Hills Millennium Award of the Institution of Engineering Designers of the United Kingdom (First recipient), June 4, 2001.

KEYNOTE-2

John McDougall, President and CEO Alberta Research Council, Canada

"Networked Innovation: A National Model"

We've all heard of the innovation gap. Understanding it, facing this challenge, and bridging the gap on a national level requires a whole new approach. John McDougall, president and CEO of the Alberta Research Council, shares his approach to driving Canada's innovation agenda, by strengthening the capacity of that country's small and medium sized enterprises (SMEs) to commercialize.

John McDougall has served as President and CEO of the Alberta Research Council since the fall of 1997. He is also Chairman of CFER Technologies; President and General Manager of McDougall & Secord, Limited; and a Director of PFB Corporation.

An active participant in professional and community affairs, Mr. McDougall is a Director of the Canadian Academy of Engineers and St John Ambulance, special representative to the Alberta Chamber of Resources and serves on several advisory boards and committees including IRAP, NSERC, AUTO 21 and the Conference Board Leaders Forum on Technology Commercialization. He is also the Past-President of the

PLENARIES

Canadian Council of Professional Engineers, APEGGA and the Edmonton Chamber of Commerce.

Mr. McDougall is a fellow of the Canadian Academy of Engineers, Honorary Colonel of the 8 Field Engineer Regiment, honorary life member of APEGGA and honorary member of the Mexican College of Civil Engineers. He has served as an advisor to federal and provincial governments on economic development, construction, trade, technology and human resources.

He is listed in Who's Who *in Canada,* Who's Who *in Canadian Engineering and* Who's Who *in America and was named one of the 50 most influential Albertans in 1998.*

PLENARY SESSION — 2

DATE: TUESDAY, AUGUST 2, 2005

TIME: 08:00—09:30

ROOM: PAVILION ROOM, PLAZA LEVEL

KEYNOTE-1

Youngrak Choi, Chairman of Korea Research Council of Public Science & Technology (KORP), Korea

"The Role of Government in Technological Innovation: East Asian Perspectives"

The role of government in technological innovation is considered crucial in general. Is it? Aren't there any other critical factors? Dr. Choi explores this fundamental question by examining the innovation policies in three East Asian countries with particular emphasis on government-business relations.

Dr. Choi explains the patterns and processes of industrial development in Korea, Taiwan and Singapore, which have managed the shift from light industries to high-technology reasonably well. Korea's approach to technological innovation through large enterprises (so-called Chaebol), Taiwan's emphasis on small- and medium-sized enterprises (SMEs) and Singapore's success with multinational enterprises (MNEs) are described. The role of government policies in technological innovation such as the cultivation of key R&D players, mobilization of resources, development of the R&D infrastructure, etc. is discussed. In particular, similarities and differences in government policies are emphasized, and the change of government policies after 90s, when self-growing S&T capability was the key issue, is explored.

The presentation focuses on the crucial role of government policy in technological innovation, but it also articulates that the role of private enterprises is equally essential. Examples of private firms are given which have made massive in-house R&D efforts and succeeded in establishing strong R&D capability in response to government initiatives. Dr. Choi concludes with lessons learned from these East Asian perspectives.

Dr. Youngrak Choi is Chairman of Korea Research Council of Public Science & Technology (KORP). Previously, he was the president of STEPI (Science & Technology Policy Institute) in S. Korea. He is the President of the Korean Society for Technology Management & Economics and a member of the Presidential Advisory Council for Science & Technology.

KEYNOTE-2

Rosalie Zobel, Director, IST Research; Information Society and Media Directorate-General, European Commission, Belgium

"The Lisbon Agenda Revisited: The Key Role of the 7th Framework Programme for Research"

Five years ago the European Union launched an ambitious agenda, aiming at Europe to become the largest knowledge-based economy in the world by 2010. At half-time, the Commission is reviewing the progress made. This process has led to a vigorous debate at European and national level amongst all those with an interest in Lisbon's success. The Commission has benefited from the work of a High Level Group, chaired by the former Dutch Prime Minister Wim Kok, that reported last November. The result of this assessment is that Europe is still far from achieving its potential for change that the Lisbon strategy offers. While the diagnosis and the remedies are not contested, the reality is that not enough progress has been made.

At their Spring Council meeting, 22-23 March 2005, in Brussels, Europe's Heads of State and Government reaffirmed their commitment to the principles of the Lisbon Agenda, and reinvigorated measures around two principal tasks – delivering stronger, lasting growth and creating more and better jobs. The renewed Lisbon

Action Programme identifies new action at European and national level which will help to see the Lisbon vision achieved.

One of the key elements of this action plan is an increased commitment to R&D and innovation. A doubling of the resources for the next European Framework Programme for Research (2007-2013) has been proposed by the European Commission.

The presentation will highlight the novelties in terms of research content as well as in terms of a new management approach to R&D that the Commission has proposed in order to strengthen the European R&D base and to move research into innovation more effectively.

Rosalie A. Zobel was born in England. She received a bachelor's degree in physics from Nottingham University, UK, in 1964, and a PhD in radiation physics from London University in 1967.

She started her career in the Information Technology industry in ICL in 1967, and later held positions as a systems engineer in CERN (Centre Européen pour la Recherche Nucléaire), Geneva, Switzerland, the Atomic Energy Research Establishment, Harwell, UK, and the Max-Planck Institut für Plasmaphysik, Garching, Germany. At the latter she became operations manager of the first CRAY Supercomputer centre in continental Europe.

In 1981 she moved to the USA and took up a position in the AT&T Headquarters, Basking Ridge, USA. She held positions as senior marketing manager for open systems software both for the USA and international markets, and was responsible from 1983-1986 for the international UNIX business. In 1986 she became senior marketing manager for information technology products in AT&T Japan.

She returned to Europe in 1988 as Deputy Head of Unit of the European Community's ESPRIT Business Systems unit. In 1991 she launched the initiative in Open Microprocessor systems (OMI). From 1995 she was the Head of unit "Business systems, multimedia and microprocessor applications", and EU-coordinator of the G7 Pilot Project "Global Marketplace for SMEs". From 1999-2002 she was Director of "New Methods of Work and Electronic Commerce". From 2003 she is Director of "Components and Systems" in the Information Society and Media Directorate-General of the European Commission.

PLENARY SESSION — 3

DATE: TUESDAY, AUGUST 2, 2005

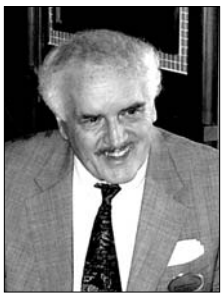
TIME: 13:30—15:00

ROOM: PAVILION ROOM, PLAZA LEVEL

Bulent Atalay, University of Mary Washington and University of Virginia, United States

"Integration of Art and Science"

Bulent Atalay presents science through art, and art through science, and approaches the larger goal of achieving a synthesis of the two fields. He invokes the model of Leonardo – part-time artist, passionate scientist, consummate inventor. The qualities of timelessness and universality in Leonardo's miraculous works speak eloquently for themselves. With



Leonardo's model providing the unifying thread, however, it becomes possible, first, to glimpse Leonardo's restless intellect, that extraordinary psyche; second, to see whence the ideas for his works of art came; and ultimately to appreciate his art at a different level. What also emerges is a timeless message: Leonardo's model can assist in bridging the cultural divide prevailing in our age of specialization, and it can help make us all more creative.

Dr. Bulent Atalay is a scientist and an artist. He lectures around the world on art, archaeology, astrophysics, and atomic physics. After his early education in Eton (UK) and St. Andrew's School (Delaware), Dr. Atalay received BS, MS, MA and Ph.D. degrees and conducted post-doctoral work in theoretical physics at Georgetown, UC-Berkeley, Princeton and Oxford. Now, he is a professor of physics at the University of Mary Washington, and an adjunct professor at the University of Virginia. He is also a member of the Institute for Advanced Study at Princeton.

Dr. Atalay's research areas include theoretical nuclear physics; perturbation theory for projected states; alternate future sources of energy; high tech archaeology; integrating science and art; and the art and science of Leonardo da Vinci. He is also a successful artist with works in the permanent collections of the Smithsonian Institution, White House and Buckingham Palace.

As an accomplished artist, Atalay has presented his works in London and Washington. His two books of

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lithographs; Lands of Washington and Oxford and the English Countryside are in the permanent collections of Buckingham Palace, the Smithsonian, and the White House. His most recent, and highly acclaimed book, Math and the Mona Lisa, is a powerful discussion of the power of cross-semination of disciplines in the manner practiced by Leonardo da Vinci. Powell's Bookstore will host a book signing after the session.

PLENARY SESSION — 4

DATE: WEDNESDAY, AUGUST 3, 2005

TIME: 08:00—09:30

ROOM: PAVILION ROOM, PLAZA LEVEL

KEYNOTE-1

Seiichi Watanabe, Executive General Manager, Terumo Corporation; Chairman of Study Group at JATES, Japan

"Technology Driven Business Creation - Carve-out Methodology and Frameworks for Enhancement"

As the economy changes, the technology side is expected to take initiatives in creating significant corporate values for the future. One effective way is the "carve-out venturing." Flexible corporation systems such as LLC in the US are extensively used in relation to such efforts. Similar systems are being studied and employed in Europe and Japan. The joint study at JATES (Japan Techno-Economics Society) aims to find appropriate methodologies for such initiatives including "carve-out venturing." The speaker would like to discuss how "carve-out venturing" can be effectively undertaken and how corporation systems can assist in such efforts.

Dr. Seiichi Watanabe is Research Advisor, Terumo Corporation. Previously, he served as Advisor at Sony since June 2004 when he retired as Executive Vice President responsible for Environmental Affairs. He was responsible for research and development at Sony as Director of Research Center and President of Frontier Science Laboratories from 1989 to 1993 and 1998 to 2001 respectively. He promoted many innovative research projects in developing key technologies for major businesses of the company, including compound semiconductors for lasers and high frequency devices, lithium ion batteries, magnetic recording materials, etc.

His primary field has been semiconductor technology. In 1967 he started his career at Sony as an engineer responsible for development of high frequency semiconductor devices. His professional experience includes discrete devices, MOS LSI and compound semiconductors. Later he served as President of Sony's Semiconductor Company from 1994 to 1998. In developing semiconductor devices, he was involved in incubating a number of businesses that have made the company grow, for example, Compact Disks, Mini-discs, PlayStation 2, and the Portable Video Tape Recorder.

At JATES (Japan Techno-Economics Society) he represents Sony Corporation since 1990 and now serves as Chairman of the Committee for the Study on R&D Initiated Corporate Value Creation. The Study group consists of representatives of major companies located in Japan and seeks to generate formulas that can be utilized at member companies wishing to effectively manage business creation under R&D initiatives.

He hopes that technology management will serve to turn technological innovations into businesses that are successful both economically and environmentally. He lived in Minnesota, US, from 1959 to 1960 as an American Field Service exchange student where he experienced the importance of mutual understanding to overcome culture barriers.

KEYNOTE-2

T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami; President, International Association for Hydrogen Energy, United States

"Hydrogen Civilization"

Fossil fuels (i.e., petroleum, natural gas and coal), which meet most of the world's energy demand today, are being depleted fast. Also, their combustion products are causing the global problems, such as the greenhouse effect, ozone layer depletion, acid rains and pollution, which are posing great danger for our environment and eventually for the life in our planet. Many engineers and scientists agree that the solution to these global problems would be to replace the existing fossil fuel system by the Hydrogen Energy System. Hydrogen is a very efficient and clean fuel. Its combustion will produce no greenhouse gases, no ozone layer depleting chemicals, little or no acid rain ingredients and pollution. Hydrogen, produced from renewable energy (e.g., solar) sources, would result in a permanent energy system, which we would never have to change.

PLENARIES

It is expected that during the present century the whole world will convert to the Hydrogen Energy System or to Hydrogen Economy (since energy is the locomotive of the economy). Three major economies of the world, U.S.A., Europe and Japan have worked out Road Maps for conversion to Hydrogen Economy. The United Nations has established the United Nations Industrial Development Organization - International Centre for Hydrogen Energy Technologies (UNIDO-ICHET) in Istanbul, Turkey, to assist developing countries in converting to the Hydrogen Energy System.

The Metal Hydrogen Electric Batteries are already commercial. Hydrogen Fueled Buses are already available for sale. Toyota and Honda companies are leasing Hydrogen Fueled cars in California and Japan. Airbus Company is working on a Hydrogen Fueled passenger plane. German Navy has decided that their new generation of submarines should be hydrogen fueled. There are already various types of Hydrogen Fuel Cells producing Electric power. Soon, there will be very small Hydrogen Fuel Cells in the market in order to provide electricity for mobile phones.

As a result of Hydrogen Economy, not only the Global Environmental Problems will disappear, but also noise levels in the streets will be greatly reduced and the landscape pollution produced by electric power lines in the cities and between the cities will disappear.

Using any and all primary energy sources available to it, each country will be able to produce the fuel, hydrogen, it needs to support its economy. They will not have to spend foreign exchange to buy petroleum or natural gas, which is concentrated in certain locations of the globe. Consequently, petroleum wars will disappear; each country will speed up its economy to improve the standard of living for its people, slow down and stop the population growth, and reach a sustainable state.

In summary, Hydrogen will provide the World Economy with a clean and efficient fuel, which will end the environmental problems, petroleum wars and will provide the humankind with higher quality of life and sustainable future, or the Hydrogen Civilization.

Dr. Veziroglu, a native of Turkey, 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, Mechanical Engineering (initiating the first Ph.D. Program in the College of Engineering), Chairman of the Department of Mechanical Engineering, and the Associate Dean for Research. Presently, he is the Director of the Clean Energy Research Institute.

Dr. Veziroglu teaches Heat Transfer, Mass Transfer, Nuclear Engineering, Solar Energy and Hydrogen Energy. His research interests are instabilities in Boiling Water Reactors, Interstitial Heat Transfer, Renewable Energy Sources and Hydrogen Energy System. He has published some 350 scientific reports and papers, edited 200 volumes of proceedings, and is the Editor-in-Chief of the monthly scientific journals International Journal of Hydrogen Energy. He has been an invited lecturer and/or consultant on energy research and education to many countries, including Argentina, Australia, Bahrain, Brazil, Canada, China, Columbia, Egypt, England, France, Germany, India, Italy, Japan, Kuwait, Malaysia, Nepal, Pakistan, the Philippines, Russia, Saudi Arabia, Switzerland, Turkey, Ukraine and Venezuela, and to several universities and research organizations in the United States.

Dr. Veziroglu organized the first major conference on Hydrogen Energy: The Hydrogen Economy Miami Energy (THEME) Conference, Miami Beach, March 1974, and proposed the Hydrogen Energy System. Subsequently, he organized several conferences and symposia on Alternative Energy Sources, Environment, Hydrogen Energy, Heat and Mass Transfer, and Remote Sensing.

Dr. Veziroglu has membership in some twenty scientific organizations, has been elected to the Grade of Fellow in the British Institution of Mechanical Engineers, the American Society of Mechanical Engineers and the American Association for the Advancement of Science, and is the Founding President of the International Association for Hydrogen Energy.

Dr. Veziroglu has been the recipient of several international awards, including 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

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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.

PLENARY SESSION — 5

DATE: WEDNESDAY, AUGUST 3, 2005

TIME: 13:30—15:00

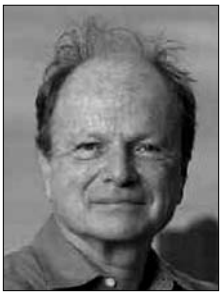
ROOM: PAVILION ROOM, PLAZA LEVEL

Eric von Hippel, MIT Sloan School of Management, United States

"Democratizing Innovation"

Innovation is rapidly becoming democratized. Users, aided by improvements in computer and communications technology, increasingly can develop their own new products and services. User innovation, the data show, is strongly concentrated among "lead users." These lead users--both individuals and firms—often freely share their innovations with others, creating user-innovation communities and a rich intellectual commons. The trend toward democratized innovation is visible both in information products like software and also in physical products. Lead user innovation provides a valuable feedstock for manufacturer innovation and produces an increase in social welfare relative to a manufacturer-only innovation system.

Freely revealed innovations by users form the basis for a user-centric innovation system that is so robust that it is actually driving manufacturers out of product design in some fields. I will suggest ways that manufacturers can redesign their innovation processes to adapt to newly-emerging user-centric innovation systems. Changes should also be made to governmental legislation and policies, such as the Digital Millennium Copyright Act, that inflict "collateral damage" on user innovation. The emergence of democratized innovation systems will be disruptive to some, but I propose that the end result is well worth striving for.



Eric von Hippel is Professor and Head of the Technological Innovation and Entrepreneurship Group at the MIT Sloan School of Management. He is a graduate of Harvard College (BA), MIT (MS) and Carnegie Mellon University (PhD). His research examines the sources of and economics of innovation, with a particular focus on the significant role played by "lead users" in the innovation development process. In a new book, Democratizing Innovation, he reports on the latest work in this field (MIT Press, 2005). Powell's Bookstore will host a book signing after the session.

PLENARY SESSION — 6

DATE: THURSDAY, AUGUST 4, 2005

TIME: 08:00—09:30

ROOM: PAVILION ROOM, PLAZA LEVEL

KEYNOTE-1

Bob Colwell, President, R & E Colwell and Associates, and former Fellow, Intel Corporation - United States

"Where Computing is Going...and how not to get there"

The computer industry has always prided itself on how fast it changes. But for the past two decades, those changes have been planned, predictable, and monotonic -- Moore's Law told you the rough shape of what was coming. Not any more. The industry is attempting to navigate a sharp turn in the road, forced upon it by physics (power dissipation), and a maturing base of users with a finite appetite for performance. The challenges we face now will not be like what we have faced before. This talk will outline these challenges and some technical management tactics that we must also leave behind.

Bob Colwell was Intel's chief IA32 microprocessor architect from 1992-2000, and managed the IA32 Arch group in Intel's Hillsboro, Oregon facility through the P6 and Pentium 4 projects. He was named the Eckert-Mauchly award winner for 2005, the highest honor in the field of computer architecture, for "outstanding achievements in the design and implementation of industry-changing microarchitectures, and for significant contributions to the RISC/CISC architecture debate." He was named an Intel Fellow in 1996.

Previously, Colwell was a CPU architect at VLIW pioneer Multiflow Computer, a hardware design engineer at workstation vendor Perq Systems, and a member of technical staff at Bell Labs. He has published many technical papers and journal articles, is inventor or co-inventor on 40+ patents, and has

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participated in numerous panel sessions and invited talks. He is thePerspectives editor for IEEE Computer Magazine, and writes the At Random column. He is currently an independent consultant. Colwell holds the BSEE degree from the University of Pittsburgh, and the MSEE and PhD from Carnegie Mellon University.

KEYNOTE-2

Jay Lee, University of Cincinnati; Director of NSF Industry/University Cooperative Research Center for Intelligent Maintenance Systems (IMS) Center, United States

"Infotronics Technologies for Innovative Service Business"

For the past decade, the impact of web-enabled and tether-free technologies has added velocity and transparency to business productivity in globally integrated enterprises. Today's competition in industry depends not just on lean manufacturing, but also on the abilities to provide customers with proactive services for sustainable value.

This presentation introduces how Infotronics technologies can transform today's service industry to value-added innovative business. Infotronics technologies provide precision information to enable products and systems to predict their performance and autonomously request service and synchronize business decision.

Dr. Jay Lee is an Ohio Eminent Scholar and L.W. Scott Alter Chair Professor in Advanced Manufacturing at the Univ. of Cincinnati and is founding director of National Science Foundation (NSF) Industry/University Cooperative Research Center (I/UCRC) on Intelligent Maintenance Systems (IMS) which is a multi-campus NSF Center between the University of Cincinnati and the University of Michigan-Ann Arbor. He also serves as a co-director for Industrial Innovation Center (IIC) at Shanghai Jiao Tong Univ. (www.iissjtu.com) in China.

Previously, he held a position as Wisconsin Distinguished Professor and Rockwell Automation Professor at the University. of Wisconsin-Milwaukee. Prior to joining UW-Milwaukee, he served as Director for Product Development and Manufacturing Department at United Technologies Research Center (UTRC), E. Hartford, CT, and was responsible for the strategic direction and R&D activities for next-generation products and manufacturing and service technologies. Prior to joining UTRC, he served as Program Directors for a number of programs at NSF during 1991-1998, including the Engineering Research Centers (ERCs) Program, the Industry/University Cooperative Research Centers (I/UCRCs) Program, and the Materials Processing and Manufacturing Program (MPM). In addition, he had served as an adjunct professor for a number of academic institutions, including Johns Hopkins University, where he was an adjunct faculty member for the School of Engineering and Applied Science as well as for the Hopkins Technical Management Program during 1992-1998.

His current research focuses on IT-enabled infotronics technologies for innovative product service systems. Currently, he serves as member of Board on Manufacturing and Engineering Design (BMAED) of National Research Council (NRC).

Dr. Lee received Milwaukee Mayor Technology Award in 2003 and was a recipient of SME Outstanding Young Manufacturing Engineering Award in 1992. He is also a Fellow of ASME and SME.

SPECIAL SESSIONS

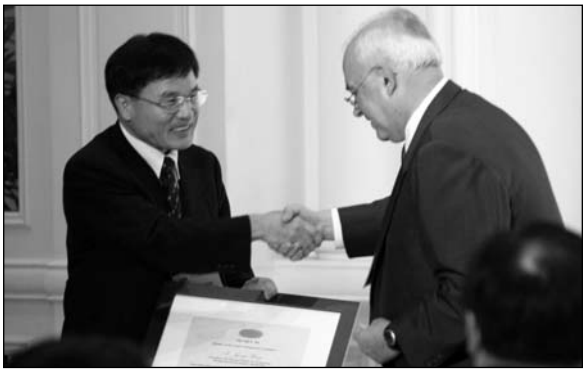
ETMERC PANEL DISCUSSION

DATE: MONDAY, AUGUST 1

TIME: 15:30—17:00

ROOM: PAVILION EAST

Panelists: John Aje, University of Maryland
Antonio J. Bailetti, Carleton University
Antonie de Klerk, University of Pretoria
William Flannery, University of Texas – San Antonio
Dundar F. Kocaoglu, Portland State University
Marthinus Pretorius, University of Pretoria



ETMERC (Engineering and Technology Management Education and Research Council) is the organization of the heads or their designees of the educational programs and departments in Engineering and Technology Management throughout the world. These include all programs with a variety of titles, including but not limited to Engineering Management, Technology Management, MOT, Innovation Management, etc.

ETMERC operates under the auspices of PICMET as an all-inclusive organization, not limiting its affiliation to any professional society. Its objective is to provide leadership in developing educational guidelines, curriculum strategies, evaluation criteria, and research agenda for the field.

All educators and academic researchers are invited to attend this panel to meet ETMERC's Executive Committee, to participate in ETMERC's strategy development for future activities, and to share ideas and experiences with colleagues from around the world.

SPECIAL SESSION: PLANNING SESSION FOR PICMET '06 AND BEYOND

DATE: THURSDAY, AUGUST 4

TIME: 15:30—17:00

ROOM: PAVILION EAST

Please join us in providing feedback on PICMET '05 and developing the plans for upcoming PICMETs. All PICMET attendees are invited to participate in helping make future PICMET meetings as productive as possible.

TUTORIALS

KNOWLEDGE MANAGEMENT: THE STRUCTURE AND PROGRESS OF KNOWLEDGE

MONDAY, AUGUST 1; 10:00 – 11:30, PAVILION WEST

Speaker: Eliezer Geisler, Illinois Institute of Technology, United States

What is the state of the art of Knowledge Management (KM)? What do we know about the structure of knowledge and how it progresses? How effective are knowledge warehouses and databases in the diffusion of technological knowledge? How do we measure knowledge and its diffusion?

Eliezer (Elie) Geisler is Professor and Associate Dean for Research at the Stuart Graduate School of Business, Illinois Institute of Technology. He holds a doctorate from Northwestern University. Dr. Geisler is the author of nearly 100 papers in the areas of technology and innovation management; the evaluation of R&D, science and technology; and the management of healthcare and medical technology. He is the author of 8 books, including: *The Metrics of Science and Technology* (2000), *Creating Value with Science and Technology* (2001) and *Technology, Healthcare and Management in the Hospital of the Future* (2003). He consulted for major corporations and for many U.S. federal departments such as Defense, Agriculture, Commerce, EPA, Energy, and NASA. His forthcoming books are *Knowledge Management: Concepts and Cases* (with Wicikramasinghe, 2006) and *The Structure and Progress of Knowledge* (2006). 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 several universities in 10 countries. He co-founded the systematic research of the management of medical technology and serves on various editorial boards of major journals.

USING THE PICMET ABSTRACTS, 1997-2005, IN VANTAGEPOINT READER ON YOUR CONFERENCE CD

MONDAY, AUGUST 1; 10:00 – 11:30, DIRECTORS SUITE

Speaker: Alan l. Porter, Georgia Institute of Technology, United States; Robert Watts, U.S. Army

PICMET is pleased to again provide an archive of PICMET abstracts for 1997, 1999, 2001, 2003 and 2005 on your Conference CD. The abstract collection is made available using VantagePoint Reader software. The intent is to put this management of technology literature resource "at your fingertips." We want you to EXPLOIT this resource to answer a range of practical research management questions:

- WHO: to identify and seek out colleagues who share interests with you while at PICMET 2005.
- WHAT: to profile your research domain. What topical interests intersect? What new topics are being researched? What knowledge gaps offer the highest research potential?
- WHEN: to set out the MOT trends
- WHERE: to locate colleagues with whom to share information or collaborate: what research centers, in what countries, are working on issues that concern you?

This session will first explain how to use the software to get to the information you want. We will then collectively explore what sorts of knowledge can be gleaned from the progression of 5 PICMET conferences containing over 2,000 MOT paper abstracts.

Alan L. Porter's major concentration is technology intelligence, forecasting and assessment. He has led development of "technology opportunities analysis" – mining electronic, bibliographic data sources to generate intelligence on emerging technologies. He received a B.S. in Chemical Engineering from Caltech (1967) and a PhD in Engineering Psychology from UCLA (1972).

Dr. Porter is Director of R&D for Search Technology, Inc., Norcross, GA, pursuing application of VantagePoint software to analyze emerging technologies and profile research domains. He is author or editor of 12 books, some 175 articles, and co-founded the International Association for Impact Assessment (IAIA) in 1980, serving as president (1995 96). He is also Professor Emeritus of Industrial & Systems Engineering, and of Public Policy at Georgia Tech, where he remains involved with the Technology Policy and Assessment Center.

COLLABORATING ACROSS BOUNDARIES TO GENERATE INTANGIBLE FORMS OF CAPITAL

MONDAY, AUGUST 1; 15:30 – 17:00, EXECUTIVE SUITE

Speaker: Michael M. Beyerlein, University of North

Texas, United States

Capital represents resources – either tangible or intangible. Organizations rely on both but traditionally and formally have focused on the tangible – financial and physical assets. Although intangible resources have clearly been recognized and manipulated informally throughout history, deliberate attention to their role in the organization has only emerged in the past decade. Intellectual capital has been the primary focus, perhaps because of the transformation of the economy to a knowledge-based system. However, a large number of other types of intangible capital have been described in research journals, including: social, relationship, political, customer, organizational, human, structural, process, knowledge, market, innovation, and collaborative. Intangible forms can be converted into tangible forms and into other intangible forms. The production of capital in any of its forms depends on competencies at the individual, group, organizational, and inter-organizational levels.

In this tutorial, we will focus on the design of organizations where collaboration is a core competency and how that enables the generation of capital in a number of forms, including intellectual, social, and financial, by leveraging existing resources across boundaries. The principles of collaborative organization will be illustrated through an exercise that enables participants to identify ways collaboration generates various forms of capital in their organizations.

Dr. Michael Beyerlein is Director of the Center for the Study of Work Teams (www.workteams.unt.edu) and Professor of Industrial/Organizational Psychology at the University of North Texas. His research interests include all aspects of collaborative work systems, organization transformation, work stress, creativity/innovation, knowledge management and the learning organization, and complex adaptive systems. He has published in a number of research journals and has been a member of the editorial boards for TEAM Magazine, Team Performance Management Journal, and Quality Management Journal. Currently, he is senior editor of the JAI Press/Elsevier annual series of books Advances in Interdisciplinary Studies of Work Teams and the new series of books for Jossey-Bass Pfeiffer on collaborative work systems. His latest books include:

- Beyond Teams: Building the Collaborative Organization
- The Collaborative Work Systems Fieldbook
- The Strategic Journey to Collaborative Work Systems: An Implementation Guide

He has been involved in change projects at the Center for the Study of Work Team with such companies as Boeing, Shell, NCH, AMD, Westinghouse, and Xerox and with government agencies such as Veterans Affairs, DCMAO, EPA, and the City of Denton.

PROGRAM MANAGEMENT AT INTEL AND TEKTRONIX: LINKING EXECUTION TO STRATEGY

TUESDAY, AUGUST 2; 10:00 – 11:30, PAVILION WEST

Speakers: Russ Martinelli, Intel Corporation, United States; Jim Waddell, Tektronix, Inc., United States

It is quite common for the terms 'program management' and 'project management' to be used interchangeably. Unfortunately, this serves to reinforce the confusion between the two disciplines. At Intel Corporation and Tektronix, Inc., program management is a critical business and operational function that provides the means by which new products are conceived, developed and brought to market. This tutorial describes how the program management model is utilized to link business and technology strategy to product development execution. Key topics include:

- The definition of program management as it pertains to product development
- How program management serves as the link between strategy and execution
- Key distinctions between program and project management
- Why Intel and Tektronix utilize the program management model to develop products
- Managing the program
- Program level risk management

Russ Martinelli is Manager of Program Management Methods at Intel, where he focuses on the definition and implementation of program management best practices across Intel. Additionally, Russ is the chairperson on Intel's global Program Management Community of Practice, and an adjunct professor for Graduate Business Management at the University of Phoenix in Portland, Oregon.

During his career, Russ has held a variety of positions in Systems Engineering, General Management, Operations Management, and Project and

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Program Management in the high-tech computing and aerospace industries. He has authored and co-authored numerous published papers on the subjects of program management and product development practices, and has been a featured speaker at industry conferences nationwide. Russ holds a Bachelor of Science degree in Electrical Engineering and a Masters degree in Business Management.

Jim Waddell, independent consultant and former Director of Program Management for Tektronix, Inc.

Jim has held a wide spectrum of managerial and operational roles ranging across engineering, marketing, systems and manufacturing in the high tech, energy and construction industries. Jim has taught classes at the university level and has been a speaker at various conferences nationwide.

KEEPING A TECHNOLOGY ROADMAP ALIVE BY APPLYING THE TECHNOLOGY DEVELOPMENT ENVELOPE (TDE) APPROACH

WEDNESDAY, AUGUST 3; 10:00 – 11:30, PAVILION WEST

Speakers: Nathasit Gerdsri, Portland State University/ Dundar Kocaoglu, Portland State University

Technology Development Envelope (TDE) is a new concept and methodology for identifying the optimum path in developing a technology roadmap in which technology strategies and business strategies are combined. The TDE is developed to transform the technology roadmapping approach to the level in which it is dynamic, flexible, and operationalizable. This new approach provides an effective way to help organizations overcome the challenge of keeping a roadmap alive. This tutorial explains the TDE methodology and processes applied to technology roadmapping. An example is presented for a detailed application of TDE to develop a company's roadmap of emerging technologies in the electronics industry.

Nathasit Gerdsri is Visiting Assistant Professor in the Department of Engineering and Technology Management (ETM) at Portland State University. Dr. Gerdsri received B. Eng in mechanical engineering from Chulalongkorn University in Thailand, dual M.S. degrees in Mechanical Engineering and Engineering Management, and Ph.D. in Systems Science/Engineering and Technology Management from

Portland State University. His dissertation was on the development of technology development envelope (TDE) for roadmapping of emerging technologies. His other research areas include strategic technology management, technology roadmapping, strategic decision making, project management, and international management. Dr. Gerdsri joined Intel Corp. as a graduate intern during the summers of 2001 and 2002. Currently, Dr. Gerdsri is the President of the Omega Rho International Honor Society-PSU Chapter and a member of the Honor Society of Phi Kappa Phi.

Dundar F. Kocaoglu is Professor and Chairman of the Department of Engineering and Technology Management at Portland State University in Portland, Oregon, USA. He is the President and CEO of PICMET (Portland International Conference on Management of Engineering and Technology). Dr. Kocaoglu was the

series editor for the Wiley Book Series on Engineering and Technology Management from 1984 through 1999, and the Editor-in-Chief of **IEEE Transactions on Engineering Management** from 1988 through 2002. He has published and presented more than 50 papers, and authored, co-authored or edited five books on management of R&D, engineering and technology. He is listed in *Who's Who in America*, *Who's Who* in the World and about a dozen other reference publications.

BUSINESS PROCESS MANAGEMENT AND GAP ANALYSIS

THURSDAY, AUGUST 4; 10:00 – 11:30, PAVILION WEST

Speakers: Alptekin Erkollar, University of Applied Sciences Wiener Neustadt, Austria/ Birgit J. Oberer, UPC Ltd., Austria

In this tutorial will be presented tools, concepts and optimization strategies for Process Management and Process Organization within production enterprises and service sectors based an international project experiences.

Prof. Dr. Alptekin Erkollar is head of the Department of Business Organization and Business Informatics, eLearning Competence Center, at the University of Applied Sciences Wiener Neustadt, Austria. He is also CEO of ETCOP Education Training Consulting Organization and Process Management Europe.

TUTORIALS

He has over 15 years of experience in the area of academic education (e.g. University of Central Florida UCF/USA, University of Klagenfurt/Austria, University of Applied Sciences Joanneum Graz/Austria, University of Applied Sciences WN/Austria, University of Applied Sciences Liechtenstein/Liechtenstein, and University of Applied Sciences Nuremberg/Germany). Dr. Erkollar has several books in the areas of eCommerce, eGovernment, project management and software reference models. He has over 170 papers published in various international publications.

Birgit J. Oberer is a CPM at UPC Ltd., Austria, and Chief Process Manager at ETCOP Education-Training-Consulting-Organization and Process Management, Europe. She has over 10 years of experience in the area of academic education (e.g. University of Applied Sciences Joanneum, University of Klagenfurt/Austria and University of Applied Sciences Wiener Neustadt, Austria). She has authored several books in the area of eGovernment, eCommerce and Production Management; contributed to American textbooks in the area of information technology and economics; and published over 70 papers in international publications.

INTRODUCTION TO TECHNOLOGICAL FORECASTING

THURSDAY, AUGUST 4; 13:30 – 15:00; DIRECTORS SUITE

Speaker: Joseph P. Martino, Yorktown University

This tutorial will introduce the attendee to basic methods of technological forecasting, including Delphi, growth curves, trend extrapolation, environmental scanning, and probabilistic methods.

Dr. Joseph P. Martino is an independent scholar and consultant. From 1975 to 1993 he was a Senior Research Scientist at the University of Dayton Research Institute. From 1953 to 1975 he served as an officer in the U.S. Air Force, retiring in the grade of Colonel. He received the A.B. degree in Physics from Miami U., the M.S. in Electrical Engineering from Purdue, and the PhD in Mathematics from Ohio State. He is a Fellow of the Institute of Electrical & Electronics Engineers and the American Association for the Advancement of Science. He is an Associate Fellow of the American Institute of Aeronautics & Astronautics. He is chairman of the Technical Education Committee of the Engineers Club of Dayton. He has written four books, and is the author of two dozen articles in technical journals. He is a recipient of the Centennial Award of the Institute of Electrical & Electronics Engineers.

THE INSTITUTE FOR LEADERSHIP IN TECHNOLOGY AND MANAGEMENT

THURSDAY, AUGUST 4; 13:30 – 15:00; PAVILION EAST

Speaker: Stephen C. Stamos Jr., Bucknell University, United States

This is a tutorial devoted to the presentation and analysis of Bucknell University's Summer Institute for Leadership on Technology and Management. This is a special two-summer program for Management and Engineering students. The ILTM program has been running for 12 years. It is a program that has a very unique 6-week full-time interdisciplinary academic program that incorporates real-time corporate consulting group projects, field trips, and internships. This program is an educational initiative that embraces the practitioner community. This is a story that we hope PICMET attendees will find to be important and interesting.

Dr. Stephen C. Stamos is Presidential Professor of International Relations and Economics. He is also director of the International Relations Program and has been a member of the Bucknell faculty since 1974. Previously he taught at the University of Massachusetts, Amherst, and the University of California, San Diego. His teaching and research interests include international economics and finance, energy and environmental economics, Latin American development, macroeconomics, and financial markets.

Dr. Stamos is a core faculty member of the Institute for Leadership in Technology and Management. He received the Lindback Award for Distinguished Teaching, and is Co-Author of six books and numerous scholarly publications. Dr. Stamos received the B.A. in Economics from San Diego State University; the M.S. in Social & Applied Economics from Wright State University; and the Ph.D. in Political Economy from The Union Institute.

DOCTORAL COLLOQUIUM

COLLOQUIUM FOR DOCTORAL STUDENTS AND JUNIOR FACULTY

"MAXIMIZING THE RETURN ON INVESTMENT IN MY PH.D.: SUCCESS STORIES AND OPPORTUNITIES"

DATE: SUNDAY, JULY 31, 2005

TIME: 13:00 – 17:00

LOCATION: BROADWAY I & II

REGISTRATION: PARTICIPANTS REGISTER FOR THE COLLOQUIUM WHEN THEY REGISTER FOR PICMET. THERE IS NO ADDITIONAL FEE FOR ATTENDING THE COLLOQUIUM.

As the topic suggests, the goal of this colloquium is to inform doctoral students in engineering and technology management about the opportunities associated with a Ph.D.

Guest speakers will share success stories: Dr. Nathasit Gerdsri of Portland State University will speak about formalizing the PhD process; Dr. Antonie Jetter of Rheinisch Westfaelische Technische Hochschule will talk about various tracks to success.

Guest lectures will be followed by a question and answer session in which open discussion and questions from students are encouraged. We encourage international students to attend the colloquium because their perspective allows us to compare and contrast opportunities in different countries.

Finally, if you can report a success story that is related to your Ph.D., we would like to hear from you prior to the conference (info@picmet.org).

WORKSHOPS

Workshop - 1

Sunday, July 31, 2005, 08:30 - 12:30

COLLABORATION + CREATIVITY + LEARNING = COMPETENCE ADVANTAGE

Speakers: Michael Beyerlein, Ph.D., University of North Texas; and Jill Nemiro, Ph.D., California State Polytechnic University, Pomona, USA

Contemporary organizations need to be designed and have leaders to guide them that are able to "melt away the boundaries" between the various disciplines in technology management to build innovation capability, and as a result a competitive advantage. Innovation depends on sharing knowledge, ideas, and focus. A competitive advantage results from an organization emphasizing and supporting collaboration, creativity and continuous learning. In this workshop, you will learn how your organization can excel in these processes by working through eight key components: Mapping out Design, Crafting Culture, Selecting Resources, Establishing Norms, Understanding and Implementing Work Processes, Defining and Gaining Acceptance for New Roles for Leaders, Planning for Employee Empowerment, and Aligning Support Systems. We will work with a series of practical tools to assess and begin to build or strengthen the key components in your organization. Designing organizations and developing leaders that encourage and support collaboration, creativity, and learning are crucial if we are to pull together the myriad of specialties that need to interact in the complex world of technology management today.

Dr. Michael Beyerlein is Director of the Center for the Study of Work Teams (www.workteams.unt.edu) and Professor of Industrial/Organizational Psychology at the University of North Texas. His research interests include all aspects of collaborative work systems, organization transformation, work stress, creativity/innovation, knowledge management and the learning organization, and complex adaptive systems. He has published in a number of research journals and has been a member of the editorial boards for TEAM Magazine, Team Performance Management Journal, and Quality Management Journal. Currently, he is senior editor of the JAI Press/Elsevier annual series of books Advances in Interdisciplinary Studies of Work Teams and the new series of books for Jossey-Bass Pfeiffer on collaborative work systems. His latest books include:

- *Beyond Teams: Building the Collaborative Organization*
- *The Collaborative Work Systems Fieldbook*
- *The Strategic Journey to Collaborative Work Systems: An Implementation Guide*

He has been involved in change projects at the Center for the Study of Work Team with such companies as Boeing, Shell, NCH, AMD, Westinghouse, and Xerox and with government agencies such as Veterans Affairs, DCMAO, EPA, and the City of Denton.

Dr. Jill Nemiro is an Associate Professor in the Psychology and Sociology Department at California State Polytechnic University, Pomona, USA. She recently authored Creativity in Virtual Teams: Key Componenets for Success (Pfeiffer, 2004) and co-edited The Collaborative Work Systems Fieldbook: Strategies, Tools, and Techniques (Jossey-Bass/Pfeiffer, 2003). Professionally, Jill worked for 20 years on many teams (both virtual and co-located) in the entertainment industry, as a film and videotape editor. She has also worked as a consultant in creativity training, instructional design, and program development and evaluation. Dr. Nemiro received her Ph.D. in Organizational Psychology from Claremont Graduate University. She may be contacted at jenemiro@csupomona.edu.

WORKSHOPS

Workshop - 2
Sunday, July 31, 2005, 13:30 - 17:30

LEADING HIGH-PERFORMING TECHNOLOGY PROJECT TEAMS

Speaker: Hans J. Thamhain, NPDP, PMP, Ph.D.; Bentley College

In technology-intensive project environments, innovation and creativity are crucial for success. This workshop will analyze the factors that drive project team performance, such as commitment, cross-functional communications, and the ability to deal with risk, conflict and mutual trust. We will discuss the drivers and barriers for organizing and managing high-performing technology teams, and the criteria for effective team leadership in today's ultra-competitive world of business.

Dr. Hans J. Thamhain specializes in technology-based project management. He is a Professor of Management and Director of Project Management Programs at Bentley College, Boston. His management experience includes 20 years of management with high-technology companies: GTE/Verizon, General Electric and ITT. Dr. Thamhain has written over 70 research papers and five professional reference books in project and technology management. He received the Distinguished Contribution Award from the Project Management Institute in 1998 and the IEEE Engineering Manager of the Year 2000 Award. He is certified as NPDP, and PMP, and profiled in Marquis *Who's Who in America*.

Workshop - 3
Sunday, July 31, 2005, 13:30 - 17:30

DESIGNING A BEST-PRACTICE INVESTMENT PORTFOLIO MANAGEMENT PROCESS TO BOOST PROFITABLE GROWTH AT HEWLETT-PACKARD (HP)

Speaker: Michael Menke, Ph.D., Product Process Organization, Global Operations & IT, Hewlett-Packard

HP has made a number of major changes over the past five years and weathered a high-tech recession. HP has also successfully streamlined the business design and scope, merged with Compaq to achieve scale and cost leadership, and vigorously pursued a strategy of high-tech, low cost and best customer experience. So why isn't HP stock higher? The answer is: HP must restore its long-standing growth record.

This workshop will cover all elements of designing a best practice investment portfolio management process to boost growth. Specific topics include extensive benchmarking of industry best practices, mapping those against the current state and desired state, and designing a multi-level, end-to-end strategic portfolio process to align resource allocation from corporate strategy and goals through the major business units and their key initiatives down to the R&D, marketing, operations and new business creation projects that execute the strategy. The impact of culture, organization, business process, performance management, metrics and people will also be discussed using the Total Innovation Management framework.

Dr. Michael Menke is a business and technology strategy consultant for HP. He advises working teams at all levels and in all segments of HP on strategy development, decision making, risk analysis, portfolio management and new business creation. Before joining HP he was a founding partner of Strategic Decisions Group, a consultancy where many of the portfolio management approaches in use today by leading companies were initially developed. At SDG he consulted with Alcoa, Bayer, CIBA-Geigy, DuPont, Exxon, Ford, Kodak, Lilly, Mitsubishi, Pfizer et al. on strategy, major decisions and/or portfolio management. He has also been an invited speaker at dozens of international conferences on these topics.

SESSIONS

MA-01 PLENARY-1

DATE: MONDAY, AUGUST 1
TIME: 08:00 – 9:30
ROOM: PAVILION

KEYNOTE
Nam P Suh; Massachusetts Institute of Technology, United States

"Technology Innovation and Technology Management"

To most effectively manage and promote technology innovation within a given industry, the manager of technology must first understand innovation processes and then create an infrastructure that enables the achievement of specific business goals. It will be a significant academic milestone in the field of technology management if we are able to teach corporations to design innovative technology systems and processes based on a set of basic principles rather than depending on the current ad hoc policies and methods in use. Doing so will enable corporations to operate at their most efficient, productive and inventive levels. Unfortunately, there is currently no unified theory or methodology that is being used to direct the technology innovation process, although there are many ideas published on innovation processes based on case studies. In this presentation, a hypothetical theory of the technology innovation process will be presented based upon an analysis of real experiences in technology innovation and management. Examples will be drawn from many different fields to identify the common features that must be present to advance technology innovation across industries.

KEYNOTE
John McDougall; Alberta Research Council, Canada

"Networked Innovation: A National Model"

We've all heard of the innovation gap. Understanding it, facing this challenge, and bridging the gap on a national level requires a whole new approach. John McDougall, president and CEO of the Alberta Research Council, shares his approach to driving Canada's innovation agenda, by strengthening the capacity of that country's small- and medium-sized enterprises (SMEs) to commercialize.

MB-01 Competitiveness in Technology Management-1
Monday, 8/1/2005, 10:00 - 11:30 **Room: Pavilion East**
Chair(s): Charles M. Weber; Portland State University

MB-01.1 [R] Making Sense of Roadmapping Practices in Dynamic Contexts

Meng Li; Shanghai Jiaotong University, China
Lei Wang; Japan Advanced Institute of Science and Technology, Japan
Akio Kameoka; Japan Advanced Institute of Science and Technology, Japan

Roadmapping technique increasingly draws more attention from worldwide industries, but few researches raise questions about why firms are willing to invest efforts to incorporate an additional technology management tools. This paper aims at answering the essential question: why firms or organizations would consider applying the roadmapping technique, even though they have owned and been familiar with some approaches in their new product development, technology forecasting and planning.

MB-01.2 [A] Target Cost Management of Taiwanese Manufacturers in China: A Case Study of Sporting Good Manufacturers

Man-Li Lin; Tung-Hai University, Taiwan
Ren-Jye Liu; Tung-Hai University, Taiwan

Taiwanese manufacturers have dominated the world's largest shoe, bicycle and apparel manufacturing plants, now located in China for the past decade. The competitive strength of Taiwanese manufacturers no longer depends on low labor costs and cost reductions in the production stages. Beyond Just-in-time (JIT) saving cost in production phase, target costing management has become a powerful technique for managing product costs in the early stages of product development, which is an approach to help companies achieve significantly lower product costs. The mechanism of target costing management provides good criteria for examining the pricing process in product development of Taiwanese manufacturers. The target costing influencing factors can be examined from both organizational and technical perspectives. We examine three specific cases in which manufacturers received orders from multinational companies and leading brands in order to enable us analyze how Taiwanese manufacturers manage their cost and if target cost management techniques have applied, and then construct propositions to discover why Taiwanese manufacturers can maintain their competitive advantages.

MB-01.3 [R] The Effect of Intellectual Property Portfolio on Competitive Advantage of SMEs in China

Gongmin Bao; Zhejiang University, China
Zhirong Yang; Zhejiang University, China
Zhangshu Xie; Zhejiang University, China
Jing Yang; Zhejiang University, China

Intellectual property protection in the domestic and global marketplace is increasingly intertwined with corporate competitiveness in the knowledge-based economy. As China gain access to the World Trade Organization (WTO), it becomes more and more important for Small and Medium Enterprises (SMEs) to build an effective IP portfolio to enhance competitive advantages. This paper analyses the effect of IP portfolio on competitive advantage of SMEs in China based on the data collected from interviews. It will focus on answering two questions: What is the status quo of offensive and defensive IP strategies' application in Chinese SMEs, and how to develop a more effective strategy of IP portfolio for Chinese SMEs to gain competitive advantage?

MB-01.4 [R] Study of Collaboration Through Japanese Biotechnology Companies: Analysis and Implication

Takeshi Shimada; Japan Advanced Institute of Science and Technology, Japan
Akio Kameoka; Japan Advanced Institute of Science and Technology, Japan

Many Japanese biotechnology companies are developing technologies and commercializing products through collaboration activities with Japan and overseas companies, universities and research institutes. Compared to R&D and commercializing products by biotechnology companies alone, collaborative operation such as alliance and licensing brings better results. The reasons include: • Can achieve economies of scale through pooling the resources of multiple organizations as required • Can avoid the wastage of multiple organizations pursuing duplicate themes • Can compensate for engineering development under capacity • Can reduce the R&D outlay • Can research themes unable to be handled individually and increase the R&D investment Nowadays, collaboration seems to be a crucial step for a technology management strategy for biotechnology companies. This paper surveyed the collaboration activities of 170 Japanese biotechnology companies and analyzed the 3600 cases focusing on collaboration.

MB-02 TUTORIAL: Knowledge Management: The Structure and Progress of Knowledge
Monday, 8/1/2005, 10:00 - 11:30 **Room: Pavilion West**
Speaker(s): Eliezer Geisler; Illinois Institute of Technology

What is the state of the art of Knowledge Management (KM)? What we know about the structure of knowledge and how it progresses? How effective are knowledge warehouses and databases in the diffusion of technological knowledge? How to measure knowledge and its diffusion.

MB-03 Software Process Management-1
Monday, 8/1/2005, 10:00 - 11:30 **Room: Broadway-1**
Chair(s): Kal Toth; Portland State University

MB-03.1 [A] Optimizing the Management of System Software Releases: Experiments with Different Paradigms

Gary Western; Motorola, United States
Mark W. Werwath; Northwestern University, United States

This research is focused on optimizing the large system software release development process by focusing on the planning aspects and the use of changing the paradigms used to manage these releases. One paradigm currently in use in the telecom industry is to develop large system releases with dozens or perhaps hundreds of intricate and inter-dependent features which are specified, designed and delivered to the market bundled together in a single system release. This paper explores the opportunities of changing this paradigm to a "factory based" paradigm, i.e. one of specifying, designing and possibly delivering individual features to customers in releases containing only one feature. It is postulated that this de-bundling of releases could result in much more higher throughput and efficiencies while also shortening the cycle times that are apparent to the customer and reducing the need for early lock-down dates while streamlining the entire process. The research question explored in this paper is what are the characteristics of the development cycle times, feature throughput and development costs of complex system software releases as mapped against order quantity and determine the economic order quantity for the number of features mapped to a system release. The methodology used in this research is a case study method where the case study would involve a recent set of experiments held at a local telecommunications organization to determine the efficiencies that could be experienced versus the processing and logistical issues associated with implementing such a scheme. A simulation was then developed to demonstrate the behavior of the case study which was then adapted to implement the new paradigm. To determine the economic order quantity, the experiments will test the limits of releases as currently bundled and the new bundling scheme of specifying, developing and delivering features in releases as small as one feature, and for several points in between. These experiments, as conducted in the telecom industry, have shown that the new development release mechanism is viable, improves feature throughput and hence reduces cycle time resulting in improved customer satisfaction.

MB-03.2 [R] Perspectives of Software Engineering in China

Loretta Evans; The George Washington University/Loop Technology, China

China is sometimes referred to the "next India" when it comes to software development for the world. China is producing many highly qualified technical professionals to assume a greater share of the software development industry. Chinese software engineering in academic and professional levels is examined. Perspectives from educators and professionals in both China are discussed based on the collection of perception data in China. Chinese students and instructors have very interesting perspectives when looking at the future of software engineering and their role in the future. A software engineering survey was sent to all students in the School of Electronics and Information Engineering about their perceptions of the future of software engineering. A similar software engineering survey was issued to the professors and administrators in the same university. The results of the surveys and an analysis of those results are included in this paper. Perspectives from academic administrators are included and reviewed. An American perspective is also included since the study was conducted by an American living and working in China.

MB-03.3 [R] The Role of Framework Models in IT Curriculum Design

Hannu Jaakkola; Tampere University of Technology, Finland
Harri Keto; Tampere University of Technology, Finland
Timo Mäkinen; Tampere University of Technology, Finland
Markku Nevanranta; Tampere University of Technology, Finland
Timo Varkoi; Tampere University of Technology, Finland

Universities are responsible for higher education in information technology (IT). From one hand the curricula provided must be adaptable in the changing needs of the environment, and from the other hand they must provide permanent skills applicable over the fast changing technology trends. Even the educational task of the university is twofold: the education provided for degree studies, and the training of specialists in different kind of professional training programs. It is clear, that the goal of the industrial training is more practically oriented and more directly applicable, than the education planned for university degree purposes. Because of that, these two activities are usually separated and also organized by different bodies of the university. Does it really have to be so? In the organization of the authors a new kind of approach is applied. The CoSE approach is based on the close interaction between curriculum studies, professional (industrial) training programs and academic research. Different kinds of trials have been made to find the right path to implement new elements to the studies. The curriculum framework models have been found useful in the development work both to guide the contents of the curriculum and to provide a means for coverage and focus analyses. This paper introduces and analyzes the framework models. Experiences in the application of these framework models are reported. The experiences and good practices to apply "learning organization" principle in the development of new curriculum contents are reported.

MB-03.4 [R] The State of the Practice in Software Engineering in Brazil

Andre L Fleury; Universidade de Sao Paulo, Brazil
Antonio Carlos Tonini; Universidade de Sao Paulo, Brazil
Mauro M Spinola; Universidade de Sao Paulo, Brazil

This paper presents the survey "State of the Practice in Software Engineering in Brazil". This exploratory survey aimed to evaluate current commercial and development practices among software development companies in Brazil. The questionnaire presented three hundred questions, including questions about market, strategy, workforce, requirements, design, codification, tests and documentation. Thirty eight companies completed the survey, and respondent profile was diverse. Obtained results created an interesting framework to analyze the links between commercial and software development practices among Brazilian companies, evidenced corporate characteristics that may be used to establish different categories of software producer companies, and made possible comparisons among Brazilian and international companies.

MB-04 Technology Assessment and Evaluation-1

Monday, 8/1/2005, 10:00 - 11:30 **Room: Broadway-2**
Chair(s): Tugrul Daim; Portland State University

MB-04.1 [R] An Interdisciplinary Perspective on Business Appraisals for Technology Potentials

Marcel Dissel; University of Cambridge, United Kingdom
Clare Farrukh; University of Cambridge, United Kingdom
Emre Kazancioglu; University of Cambridge, United Kingdom
David Probert; University of Cambridge, United Kingdom
Francis Hunt; University of Cambridge, United Kingdom
Rob Phaal; University of Cambridge, United Kingdom

Appraising the benefits of new technologies is a commonly accepted challenge for any organisation and is a prime area for technology management research. As the future potential of any technology is always associated with some level of uncertainty it is thus important to either reduce or better understand this uncertainty in order to make appropriate business decisions. A wide variety of methods are available that intend to service this need, such as net present value calculations, real options, portfolio methods, road-mapping, expert systems, etc. Technology companies often use a selection of or hybrid models. The problem is thus inherently interdisciplinary. The techniques used to appraise new technologies range from "hard" mathematics, often taken from the finance sector, to more "softer" techniques that enable people to systematically structure the potential outcomes and their underlying uncertainty. Furthermore, the use or purpose of the techniques can vary as well. Methods can be applied to justify decisions and judgements made, but also to support the process of shaping this judgement, or to provide boundary conditions and hence enable the decision making process. This paper aims to provide an overview of prevailing methods and tools and evaluate their relative value in the process of business appraisals. We will elaborate on the overlaps and gaps and conclude with recommendations for future research.

MB-04.2 [R] A Technology Selection Model for Green Energy

Neil K Brown; Portland State University, United States
Don Hallum; Portland State University, United States

Basel Jaffal; Portland State University, United States
Piyawan Jhetson; Portland State University, United States
Elmer Wong; Portland State University, United States

This paper proposes the technology selection model for a best-fit green energy generation technology for an Oregon-based company using Hierarchical Decision Modeling (HDM). The paper begins with a definition of HDM and then discusses the intricacies of the chosen criteria and technologies at-length. The various criteria were selected through group consensus following individual research and collaboration. The team narrowed down acceptable green energy technologies to five core choices and assigned one technology to each team member for detailed research. Through the use of pair wise comparisons, the team provides step-by-step analysis for both quantitative and qualitative measures. By using local surveys, expert opinions and research results, the team formalized their findings. This paper concludes, through model results and recommendations, that the top-ranking alternative green technology for this Oregon energy company is hydroelectric. Finally, situations are noted that may justify a change in technology selection from hydroelectric to wind, and eventually indifference between the remaining technologies of solar, biomass and stationary fuel cells.

MB-04.3 [R] Study for the Performance Evaluation Framework of Chinese Regional Technology Innovation Ecosystem

Yafei Luo; Beijing University of Technology, China
Lucheng Huang; Beijing University of Technology, China

This paper proposes a generic framework for the performance evaluation of regional technology innovation systems based on the ecosystem because the issue of how to evaluate the performance of regional technology innovation ecosystem (RTIE) is one of key areas in the study of RTIE in China. In the paper, we advance a new concept, the performance of a regional technological innovation ecosystem, and put forward the criteria that helps us to make up the evaluation framework for the performance of regional technology innovation ecosystem. Then we design the content of the evaluation framework for the performance of RTIE and choose some indicators to reflect the content. Finally, we emphasize that the research of a complex system such as RTIE needs to use a multidisciplinary approach to study it.

MB-05 Technology Planning and Forecasting-1

Monday, 8/1/2005, 10:00 - 11:30 **Room: Broadway-3**
Chair(s): Fred Phillips; Maastricht School of Management

MB-05.1 [A] Study on Demand and Development Trend of Home Automation Systems with Technological Forecasting Method

Tsai-Hua Kang; National Chiao-Tung University, Taiwan
Benjamin J. C. Yuan; National Chiao-Tung University, Taiwan
John Huang; National Chiao-Tung University, Taiwan
James K. C. Chen; National Chiao-Tung University, Taiwan

Due to the rapid progress of technology and economics, the world is running into a network times. Moreover, thanks to the fast updating in information, electronics, mechanics, electronics mechanics, automotive control and wireless communication areas, and in addition the changing of society, increase of GNP, all of these factors raise the demand of pursuing the convenience, safety, comfort and economy in home life, it also does help to form the idea of "Home Automation". Many techniques which are used to improve the productivity and competitiveness in industry and commerce are transformed into the product which can improve convenience of home life now. So far, "Home Automation" had been realized in some ways, but there is not a world-wide leading standard, and related research of technological forecasting is lacking. So, this research uses MRI method to investigate consumer needs, along with interviews with the experts in this field, to study related techniques to try to find out the directions of product development, and furthermore, to provide a useful reference for future research.

MB-05.2 [A] Applying TDE Approach to Determining the Strategic Timing on Substitution of Emerging Technologies in Companies

Pisek Gerdsri; Portland State University, United States
Sung Han; Portland State University, United States
Nathasit Gerdsri; Portland State University, United States

Since the first demonstration of organic light emitting diodes (OLED) at Eastman Kodak in 1987, the development of OLED display technology has evolved to the point in which the technology promises many advantages over current display technologies, particularly to liquid crystal display (LCD). However, the full commercialization of OLED display technology is still expected for a few years to come at least not until the challenges and limitations on fabrication and degradation of OLED display devices can be overcome. This presentation reveals the preliminary analysis on applying the Technology Development Envelope (TDE) approach to help a hand-held device manufacturer determining the strategic timing when it should switch from LCD to OLED technology.

MB-05.3 [R] Measuring the Changing Capabilities of Computer Display Projectors Using TFDEA

Supachart Iamratanakul; Portland State University, United States
Timothy R Anderson; Portland State University, United States
Lane Inman; Veritas Software, Corp., United States

This paper applies technological forecasting using data envelopment analysis (TFDEA) to computer display projector (CDP) technology. The objective is to analyze the technological change CDP products. The results indicate that the rate of technological change for CDP technology is accelerating, which is consistent with an understanding of the industry. A methodological issue of infeasibility is described and methods for dealing with it are presented. Future work may extend to examine over additional years and product releases.

MB-06 Strategic Management of Technology-1

Monday, 8/1/2005, 10:00 - 11:30 **Room: Broadway-4**
Chair(s): John Whittaker; University of Alberta

MB-06.1 [A] Assessing Capabilities for Managing SME e-Business Based Networks

Jiwei Shi; Liverpool John Moores University, United Kingdom
Paul Otterson; Liverpool John Moores University, United Kingdom
Keith Porter; Liverpool John Moores University, United Kingdom
Ian Barclay; Liverpool John Moores University, United Kingdom

This paper describes the results from a three-year programme of work to develop five e-business based Small/Medium size Enterprises (SME) clusters using 25 independent, diverse SME companies. It shows how the development of a rapid, practical self-assessment tool for SMEs (based on key business practices) was used to define cluster inhibitors and enablers. The SME clusters were formed to promote innovative approaches to business growth and were based on mutual interests. However, it was found that this new and innovative way of working was hampered by the SMEs within a cluster being at various stages of self-development and e-business core competency. How the self-assessment tool allowed each SME to measure its own capability in key business practices is described. The tool was designed to support business growth and new ways of working by assessing best practice in a range of key business activities. This allowed each company in a cluster to define a programme of work that would lead to the convergence of operational activities and key core competencies.

MB-06.2 [R] The Treatment of Technology in Strategic Management Literature

Fernando E García-Muina; Rey Juan Carlos University, Spain
Jose E Navas-Lopez; Complutense de Madrid University, Spain

The management of technology has been considered one of the most important issues in strategic literature. This paper analyse the treatment that technological phenomenon has received, taking into account the main streams of thoughts in management science during last decades. Linking different economics and organizational perspectives, our article develops how Industrial Organization Economics, Organizational Economics, Evolutionary Economics, and the integrative resource-based view, (and the latter evolutions: capability and

knowledge-based views) tackle the technology management discipline. On the one hand, their more important contributions to the analysis of technology, as rent creation factor, have been analysed and, on the other hand, several key unanswered questions arised from each theory are presented too. The main conclusion is that each strategic theory contributes in a different manner to the analysis of managing technology as a resource of strategic value; so they are complementary approaches to develop a comprehensive understanding of this complex phenomenon.

MB-06.3 [R] Integrating Technology Strategy into Business Strategy: A Technology-Product/Industry Concordance Matrix

Si Hyung Joo; Seoul National University, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South

In the knowledge-based economy, technological innovation is the driver of firm's growth as well as national economic growth. For innovation-driven growth, technology strategy needs to be integrated into business strategy. The integrated technology strategy should be based on the information about the effect of technological innovation on product, firm and industry. However, not only intangible characteristics but also ever-changing nature of technology, industry and their relationship in terms of technology makes it even harder to identify the effect of technological innovation. Fortunately, the methodology based on the data-mining enables us to find clues for the questions above by integrating patents and scientific papers database with business information. In this research, based on technology-product/industry concordance matrix, a model integrating technology strategy into business strategy is suggested. The study first shows the method to construct the concordance matrix. The framework can embrace the country-specific and ever-changing nature of relationship between technology and product/industry and it can be easily adapted to other countries. The matrix can be used in many ways to derive implication for public policy and business strategy in terms of technology development. For example, if we combine the matrix with the information of technology roadmap, we can identify the research area that an organization should focus. The study will show some of the future research area that will utilize the matrix.

MB-07 Project/Program Management-1
Monday, 8/1/2005, 10:00 - 11:30 Room: Forum Suite
Chair(s): Terry Schumacher; Rose-Hulman Institute of Technology

MB-07.1 [R] What Makes Strategic Projects into 'Great' Projects

Dov Dvir; Ben Gurion University of the Negev, Israel
Aaron Shenhar; Stevens Institute of Technology, United States

Although almost every company today is involved in projects, many of them do not achieve special attention or outstanding results. However, from time to time we see a project that is standing out, one that has an enormous impact on the industry and that creates unprecedented value to its parent company. What makes such projects unique? What is the secret of their success? And what distinguishes between great projects that change entirely the competitive position of the organization from 'regular' or average project success? To study great projects we selected from our data-base a few exceptional projects that surpassed every expectation, some publicly known and others less known cases, for a total of 17 projects. Our findings suggest that there are common elements to most great projects. Some of these elements were implicit and not publicly acknowledged; others were clearly articulated and planned for. Our research indicates there is a consistent pattern that accompanies great projects. Executives would perhaps look at creating a culture that will nurture these common elements if they wish to improve their project management environment.

MB-07.2 [R] How Strategic Are Your Projects?

Joca Stefanovic; Stevens Institute of Technology, United States
Aaron Shenhar; Stevens Institute of Technology, United States

Most studies on project success show that projects are often late, above budget, and do not deliver what is expected; many projects are being terminated before completion for running into trouble or not being aligned with company strategy; and even when finished, many projects do not contribute to the company's business success. Our research is focused on the difference between managing projects in a strategic way versus an operational way. We evaluate strategic extent of project management in contemporary practice, and to what extent companies treat their projects in a strategic way. The goal of our research is to enhance our understanding of the relationship between strategic extent in project management, project success and context variables, and to verify the assertion that higher strategic extent in project management is associated with better project success. We intend also to examine what conditions, if any, affect the relationship. We use a case study method of analysis to validate the framework of Strategic Project Leadership, which encompasses the operational, strategic and human aspects of project management. Quantitative research, survey based, will be used in later phase to examine relationship between strategic extent of project management, project success, and other constructs.

MB-07.3 [R] The Make-up of Project Management Elements as Influenced by Business Strategy: A Case Study Approach

Sabin Srivannaboon; Portland State University, United States
Dragan Z Milosevic; Portland State University, United States

Developed through case study research by extensively studying eight case studies across different industries that are the major users of project management, our theoretical framework offers multiple propositions that describe the interaction between project management and business strategy. Here, the study classifies the business strategy using Porter's generic strategies, whereas project management elements are identified from the extant literature, including project strategy, project organization, project process, project tools, project metrics, and project culture. Following such an inductive logic of specific to general practices, the study develops propositions based on the content analyses, which follow the within- and cross-case analyses. Then, the propositions are further refined into typology-free propositions to illustrate the general impact of business strategy on project management elements. In sum, the study suggests that the competitive attributes of business strategy drive the focus and content of project management elements. In doing so, the company selects one and determines its competitive attributes. Then, the company correspondingly selects its project management elements from the space of the multitude options. The chosen competitive attributes are used to determine the focus and content of project management elements. At the same time, the focus and content of project management elements are expected to support the business strategies' competitive attributes by providing a feedback for a better deployment of the business strategy.

MB-08 Innovation Management-1
Monday, 8/1/2005, 10:00 - 11:30 Room: Council Suite
Chair(s): Christian Marxt; Swiss Federal Institute of Technology Zurich

MB-08.1 [A] User-Centered Technology Innovation: Implications for Technology Managers

Herman D'Hooge; Intel, United States

A common mindset with technology developers has been that good technology will just always sell itself. With end-users having an ever richer set of product choices, technology is only as valuable as the end-user experience delivered through the technology. This paper describes how the role and scope of the engineer or technologist changes as product definition is increasingly informed by techniques such as ethnography and user experience design, which are typically not something engineers are either trained for or particularly suited for. It also highlights a systematic and step-by-step process for translating ethnography research findings into familiar and actionable engineering requirements, and highlights the role of the engineer or technologist and their management.

MB-08.2 [R] Where Do Inventors Get Their Ideas?

Sherwat Ibrahim; Stevens Institute of Technology, United States
Hosein Fallah; Stevens Institute of Technology, United States

Innovation is the engine of sustainable competitive advantage for technology firms. While companies provide for research and development and bring new products and services to market, every innovation can be traced back to a person's or a group of people's creativity

and their ability to solve problems. The knowledge creation by individuals is what leads to new ideas or solutions that could become inventions and in turn innovations if they become commercialized and create economic value. This paper examines the individual knowledge creation process and explores sources of knowledge that influence the process. The paper presents the results of a nationwide survey of inventors in the telecommunication industry on the types and sources of knowledge that influenced them in coming up with their inventions. The study distinguishes between different types of knowledge- individual and collective tacit knowledge, codified and non-codified explicit knowledge and between sources of knowledge whether internal or external. The study shows varying levels of influence by different types and sources of knowledge. Among these factors, the collective tacit knowledge of the inventors' organization has the most influence.

MB-08.3 [A] Concept Creation Management for Innovation

Kiyoshi Niwa; University of Tokyo, Japan

The effective management of concept creation is crucial for innovation. This paper discusses four methods of managing concept creation, which we have been developing for large technology intensive companies. The first two are for R&D department levels and are: (1) a human-computer cooperative method that combines tacit and explicit knowledge to create new knowledge relationships, and (2) an idea and comments integration method that facilitates idea improvements. The last two are for company levels and involve: (3) the separation of concept creation from actual implementation to enable discontinuous innovations, and (4) corporate bypass initiatives to combine Chief Technology Officers' strategies with researchers' destructive concepts.

MB-09 TUTORIAL: Using the PICMET Abstracts, 1997-2005, in VantagePoint Reader on your Conference CD
Monday, 8/1/2005, 10:00 - 11:30 Room: Directors Suite
Speaker(s): Alan I Porter; Georgia Institute of Technology
Robert J Watts; U.S. Army

PICMET is pleased to again provide an archive of PICMET abstracts for 1997, 1999, 2001, 2003 & 2005 on your Conference CD. The abstract collection is made available using VantagePoint Reader software. The intent is to put this management of technology literature resource "at your fingertips." We want you to EXPLOIT this resource to answer a range of practical WHO? To identify and seek out colleagues who – research management questions: WHAT? To profile your research – share interests with you while at PICMET 2005 domain – What topical interests intersect? What new topics are being researched? WHEN? To set out the MOT – What knowledge gaps offer highest research potential? WHERE: To locate colleagues with whom to share information or – trends collaborate: What research centers, in what countries, are working on issues that concern you? This session will first explain how to use the software to get to the information you want. We will then collectively explore what sorts of knowledge can be gleaned from the progression of 5 PICMET conferences containing over 2,000 MOT paper abstracts.

MB-10 Manufacturing Management-1
Monday, 8/1/2005, 10:00 - 11:30 Room: Studio Suite
Chair(s): Kathryn Stecke; University of Texas of Dallas

MB-10.1 [R] Understanding a Firm in a Holonic Conceptual Framework

Povl Erik Jensen; Ind. Eco. and Strategy/Copenhagen Business School, Denmark

In history, production has been organized in mainly two different ways: Hierarchical or heterarchical (as network and/or modularized). However, a third way has been introduced by using the concept a holonic system of production (Brussel, 1999). This concept is introduced and a model of a holonic system of production is used in analysing a concrete firm to demonstrate the advantages of this concept. Where the traditional analysis of a firm focus on capital, labour and raw material etc. (input) and the combination of these inputs in order of achieving a certain goal (output), the holonic approach sees machines and equipment as one of many artefacts where coordination and cooperation between human beings and between human beings and artefacts comes into focus. Analysing a production system using the holonic concept starts with the entity of a firm, the holon. The holon is defined as the smallest possible unit of production, which is able to produce on its own for a period of time, is self-regulating/autonomous and can communicate with other holons. The communication between holons in and outside a firm, ex stakeholders, is shown to be a very fruitful way to understand the existence of firms and why firms perform differently.

MB-10.2 [R] Information and Communication Technology Supported Total Quality Management

Stanislaus Lobo; University of Western Sydney, Australia
Krishnamurthy Ramanathan; University of Western Sydney, Australia

Creating value for the customer through quality is accepted as an important component of the competitive strategy of firms throughout the world. Its relevance and significance is well reflected by the importance attached to the "quality imperative" not only by firms but also by governments, international agencies, and business associations. The breakthrough gains that can be made through a well-implemented TQM program have prompted the development of award systems such as the Deming Prize, the Baldrige Award, the European Quality Award the Japanese Quality Award, and the Australian Quality Award, which also serve as frameworks for self assessment and improvement. The objectives of this paper are two fold. Firstly, based on a study of popular quality frameworks an integrated approach for assessing quality management practices at the firm level is proposed. Explicit attention is then paid to the role that information and communication technologies (ICT) can play in upgrading quality management practices. ICT is seen as an enabler that, through its influence on the elements of the proposed framework, can accelerate the movement of a firm towards ICT supported quality management and strengthen a firm's operative technological capability.

MB-10.3 [R] Manufacturing Flexibility with Product and Process Innovation: An Empirical Study of Small and Medium Sized Firms

Muammer Zerenler; University of Selcuk, Turkey

Flexibility is the ability of a manufacturing system quickly and economically to change between existing part types; change the operation routes of components; change the operations required to process a component; change production volumes, i.e. either expansion or contraction; add new part types and add new processes to the system. This study investigates the practice of manufacturing flexibility in small and medium sized firms. Using the data collected from 94 firms from textile industries in Konya from Turkey, we analysed and prescribed the alignment of various manufacturing flexibility dimensions with product and process innovation. Several practical approaches to developing manufacturing flexibility in small and medium sized firms were discussed. In addition, statistical results indicate that the compatibility between product and process innovation with manufacturing flexibility is critical to company performance. The one-to-one relationship between product and process innovation with manufacturing flexibility is established to enable managers to set clear priorities in investing and developing necessary manufacturing flexibility.

MB-10.4 [R] A Framework for the Analysis of Process Visibility Within an Organisation

Christopher E Love; Aston University, United Kingdom
Tarik Driouchi; Aston University, United Kingdom
Michel Leseure; Aston University, United Kingdom
David Bennett; Aston University, United Kingdom

Although a salient feature of Japanese operations management, the management and assessment of process visibility has received only little coverage in management literature. Process visibility management is used as a generic term to describe the activities, tools, and techniques through which managers get an accurate collective understanding of operations processes both at a micro and macro level of analysis. "Walking the shop floor", removing buffer inventory and using visual displays (andons) are among a few examples of techniques used to improve process visibility. As little has been written with reference to the identification, measurement and implementation of methods specifically designed to improve visibility, this paper uses an exploratory case study research method to analyse process visibility in European SMEs. A framework is presented based on the comparison of visibility issues in

two SMEs benchmarked against the visibility standards discussed in the relevant literature.

MB-13 Service Industry-1
Monday, 8/1/2005, 10:00 - 11:30 **Room: Galleria-1**
Chair(s): William Eisenhauer; Wells Fargo

MB-13.1 [R] Service Provider - Customer Interactions as a Key to Success of Innovative Services

Antje Hoffmann; TU Hamburg-Harburg, Germany
Cornelius Herstatt; TU Hamburg-Harburg, Germany

The majority of service providers have recognized the need to develop innovative services that meet sophisticated customer needs on time. Because of structural changes in the market, rising costs and shorter lifecycles of services and technologies this has become a more demanding task than ever before. Most of the existing research focuses on the development of products rather than services. However, research in service related innovation activities is highly rewarding, as the service market is about to become a dominant factor of economic development. The objective of this paper is to provide an overview of the current state of interaction research with special focus on service marketing and service purchasing processes. A short presentation of the most important theoretical results and findings from empirical studies will be given. Furthermore, we will present results from our own case study investigating the IT Service industry. In this context, we have identified three different approaches of successful interactions between service providers and potential buyers during marketing and purchasing processes with innovative results. We will describe these approaches, show their similarities and differences and as a result, provide recommendations for the service industry and potential buyers.

MB-13.2 [A] Integration of Six Sigma and IDEF0 Methodologies for Business Process Improvement

Halime I Sarihan ; Wells Fargo, United States
Brian Storts; Wells Fargo, United States

Business processes are becoming more complex because of external requirements such as globalization, advancing technology, shorter development cycles, and increasing competition. This paper discusses how six sigma and IDEF0 methodologies used for business process improvement projects in one of the major banking institutions. These methods are used to understand the business process complexity to improve and measure the process performance. IDEF0 (Integrated Definition for Function Modeling) is a universally accepted documentation system based on SADT (Structured Analysis Design Technique). Six Sigma is a disciplined data-driven approach and methodology for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process--from manufacturing to transactional and from product to service. We developed the "Innovative Process Improvement Model" which has nine phases. In this model we used six sigma and IDEF0. This paper will discuss details of the "Innovative Process Improvement Methodology" and its connection with six sigma and IDEF0.

MB-13.3 [A] Business Process Improvement Analysis by Using Simulation and Analytical Tools at a Major Banking Institution

And Ozbay; Wells Fargo, United States
Halime I Sarihan ; Wells Fargo, United States
William Eisenhauer; Wells Fargo, United States

Business Process Improvement is one of the important tools for management to increase efficiency and productivity in companies. One of the major banking institutions has established Management Science and Analytics (MSA) and Process Improvement (PI) groups under the Consumer Credit Group in order to improve its business processes by increasing its process efficiency and operational capabilities. This institution puts an emphasis on cross-selling to increase the number of products each customer uses. This strategy has proven profitable, as the company has consistently achieved double-digit growth over the past years. This distinguishes the company from the other key competitors in its sector. In order to identify opportunities for improving the number of cross-sells, MSA and PI groups analyzed the "Welcome Call" process. This paper presents tools and methodologies used in the analysis, as well as business process improvement methodology and phases that MSA and PI groups use for Process Improvement projects.

MB-14 Technology Transfer-1
Monday, 8/1/2005, 10:00 - 11:30 **Room: Galleria-2**
Chair(s): Al Herman; Quantric Corp.

MB-14.1 [R] Build, Rent or Sell: Options for Commercializing New Technologies Arising from University Research

Fred Pries; University of Waterloo, Canada
Paul Guild; University of Waterloo, Canada

The methods available to commercialize new technologies arising from university research have traditionally been thought of as licensing and start-ups. Drawing on economic theories of the firm and on accounting and legal concepts, we propose an alternative view of the options for commercialization that focuses on the substance of the available methods rather than their legal form. Specifically, we suggest that there are three primary methods of commercializing new technologies arising from university research: 1) Build – creating a new business based on the technology, 2) Rent – ongoing development and marketing of the technology to established firms that use the technology in their businesses and 3) Sell – disposition of the technology to an established firm. We provide examples of each of these methods and provide criteria for distinguishing between them. Finally, we attempt to demonstrate the usefulness of this new scheme by reframing existing research to identify a number of unexplored areas and areas of inconsistent findings and by developing a set of testable propositions related to the proposed scheme.

MB-14.2 [R] Examining CRADA Elements and Government Benefits from Technology Transfer

Richard M Franza; Kennesaw State University, United States
Kevin P Grant; University of Texas at San Antonio, United States

Technology transfer has become an increasingly important mission of federal laboratories over the past 10 to 15 years with results that benefit the government, private companies, and the nation's economy. The Cooperative Research and Development Agreement (CRADA) is the most commonly used mechanism to perform technology transfer from our nation's federal laboratories to the private sector. The first objective of this research is to determine and quantify the benefits realized by organizations that use CRADAs as a mechanism to transfer technology from federal laboratories to the private sector. Second, this research examines the CRADAs used to secure these benefits and identifies the CRADA elements that are most commonly used. Key findings include that CRADAs, in general, provide many types of important benefits to the government. Among the leading quantitative benefits the government receives through CRADAs are the value of the data received, the hardware received and reimbursements received. Leading non-quantitative benefits include improved laboratory image and improved laboratory morale. The most common CRADA elements used include copyright royalty rates, and facilities and equipment requirements. This paper concludes with recommendations for future research to assist technology transfer managers who will rely upon CRADAs to transfer technology.

MB-14.3 [A] University-Industry Relationships in Brazil: Diagnosis and Perspectives

Marli E Ritter dos Santos; Federal University of Rio Grande do Sul, Brazil
Jose Luis Solleiro; Universidad Nacional Autonoma de Mexico, Mexico

The objective of this study is to describe and to analyze the strategies adopted by thirteen Brazilian universities to carry out the interaction with industries, aiming to identify, among others aspects: a) the size of the companies which seek the interaction with the university; b) the main communication channels used to initiate the relation; c) the nature of the university-industry interaction activities; d) the nature of the financing; and e) the evaluation of the achieved results. Among the results obtained by the analysis carried out in 1065 interactions, it stood out that: a) of the companies which seek interaction with the university, the

majority are of large and medium sizes; b) the initiative of the interaction process is, usually, started by the company; c) related to the nature of the interaction, a great concentration in the technological services was observed; d) the activities of R&D represent about 30 percent of the interactions; e) the technology transfer through licensing of patents or softwares presented a low performance. From this diagnosis it was possible to set up some perspectives on the Brazilian university-industry interaction, aiming to obtain a better use by the local companies of the research results generated in the universities.

MB-15 Entrepreneurship/Intrapreneurship-1
Monday, 8/1/2005, 10:00 - 11:30 Room: Galleria-3
Chair(s): Thomas G Lechler; Stevens Institute of Technology

MB-15.1 [R] The Creation of Academic Biotech Spin-offs as the Commercialization Medium of Life Science: On the Basis of Cases of Hokkaido Biotech Cluster

Takao Fujiwara; Toyohashi University of Technology, Japan

Traditionally, there have been many government-university-industry cooperative biotech research projects in Japan. But in almost all cases, the university researchers have so far left patents of the research results to large-scale business partners, except for the copyrights of papers as is customary. Thus, if large-scale pharmaceutical firms can not find the promising possibilities of enough size markets in their ROI (Return on Investment) standards from those patents, they usually tended to make those the dormancy patents in order to prevent rival's use. But according to the successful influence of Bayh-Dole Act in the US as a factor, Japan's universities and national research institutes such as NIAIST are also becoming eager for technology transfer as the licensing and start-up incubation. In this paper, by focusing on Hokkaido biotech cluster as a recent emerging success model, Japan's style of academic and public support system for biotech spin-off, and cases of pioneering biotech start-ups, will be examined.

MB-15.2 [A] Florida Tech Systems Engineering Entrepreneurship

Carmo A D'Cruz; Florida Tech, United States
Muzaffar A Shaikh; Florida Tech, United States
Wade Shaw; Dept. of Eng Systems, Florida Tech, United States

While meeting the increasing demand for holistic, interdisciplinary education, innovative Engineering Entrepreneurship and Systems Engineering courses offered by the Department of Engineering Systems at Florida Tech have greatly enriched the students' educational experience, broadened their perspectives, served as community outreach forums and integrated experiential learning with academic programs. The four well-balanced and appropriately sequenced courses in Systems Engineering Entrepreneurship, Technical Marketing, High Tech Product Strategy and Technology Commercialization Strategies are offered successively over four semesters. As part of the course project requirements, students work in E-teams to commercialize innovative product or university/research lab developed technology. The E-teams can include outside technical experts as team members or advisors. The E-teams seek funding by completing NCIIA E-team proposals or SBIR/STTR proposals and presenting their business plans at investor-attended colloquiums and competitions. The "Entrepreneur in the Spotlight" seminar series is another innovative facet of the four course series. Struggling/successful local technical entrepreneurs visit the class and present their business plan for critique and recommendations by the class. These courses are supplemented by other regional outreach/networking forums organized by Florida Tech and entrepreneur support organizations. The Entrepreneur Club at Florida Tech also organizes seminars, workshops, boot camps, and other grass roots entrepreneurship awareness programs to complement the course offerings. The historical application of the 'systems approach' has been within technical disciplines, project management, and in modern times – to the evolution of systems engineering as a stand-alone discipline. Innovation in product/service design and commercialization that enables entrepreneurship can be successfully leveraged by applying systems principles. Concepts in marketing, strategy, organizational culture, and finance are integrated into these courses focusing on product development, quality, and systems integration. A unique "Systems Engineering Entrepreneurship" program is being pioneered at Florida Tech.

MB-15.3 [A] Entrepreneurial System: Application to Silicon Valley Nanotechnology Companies

Burton V Dean; San Jose State University, United States
Barbara I Nagel; San Jose State University, United States
Asbjorn Osland; San Jose State University, United States

This paper applies the soft systems methodology to establish the concept of an entrepreneurial system (ES). The main objectives of the paper are: (1) to establish the concept of the ES, (2) to apply this concept to the nanotechnology entrepreneurial system (NES) and (3) to identify the opportunities and risks for a nanotechnology startup company in Silicon Valley (SVNES). Specific goals in analyzing the SVNES are: identify a set of relationships to describe the interaction among subsystems; identify special characteristics of managing a nanotechnology startup company; identify critical factors that affect the successful creation and performance of a nanotechnology startup company; provide recommendations to overcome problems and to facilitate the process of creating a successful nanotechnology company. This NES research is focused on: (1) the relationships between start-up companies and customers, (2) the relationships between start-up companies and financial sources, and (3) the relationships between start-up companies and R&D centers. Relationships with competitors are described. The remaining NES components are briefly described but not addressed in depth, as they are outside of the scope of this paper. Each of these relationships is analyzed in terms of its impacts on other NES components.

MB-16 Technology Management Framework-1
Monday, 8/1/2005, 10:00 - 11:30 Room: Parlor-A
Chair(s): William R Peterson; Old Dominion University

MB-16.1 [R] Managing the Dilemma of Technical Choice: Fanuc's Successful Transition to New Technology

Tomoatsu Shibata; Kagawa University, Japan

TWith emerging new technology, firms face the dilemma of technical choice about which technology the firm should choose, emerging new technology or existing technology. The literature has pointed out that the firm could hardly survive emerging new technology due to dilemma of technical choice. Fanuc, a world leading company of Factory automation, has sustained competitive advantage by overcoming the dilemma of technical choice two times over 40 years. The first dilemma Fanuc survived is technical choice of servo motors between open-loop system and closed-loop system. The Second dilemma Fanuc survived is choice of architecture of controller between hard-wired system and soft-wired system which was made available by adopting intel MPU into FANUC controllers. In this paper, we have conducted in-depth case analysis of Fanuc history, and abstracted common mechanism of managing technical choice from these two dilemmas. We discuss the common mechanism has following three characteristics. The first is concurrent pursuing of both existing technology and emerging technology. The second, different department was dedicatedly assigned to different technology. The third, it is only one person who was responsible for coordination between these two departments.

MB-16.2 [R] Conceptualizing the Field of Technology Management

Alan Pilkington; University of London, United Kingdom
Thorsten Teichert; Universitat Hamburg, Germany

In this paper bibliometric (co-citation analysis) and social network analysis techniques are used to investigate the intellectual pillars of the technology management literature. By examining the citation patterns of the journal Technovation, it is possible to see the way that technology management has a bridging role in integrating ideas from several distinct disciplines. General management and strategy specific journals featured prominently alongside the technology management specific journals, with a cluster of operations management focussed titles also evident, whilst economics and marketing are less prominent. This suggests that there strategy and management are central to technology management which essentially relates to the firm rather than wider contexts and markets. A factor analysis of the co-cita-

tions tells us more about the relationships between the different aspects of technology management, and that in fact the field is organized along seven different concentrations of interest: strategy and technology, national systems and differences, sources of competitive strategies, manufacturing/operations/NPD, knowledge management and inventors, patents, and life-cycles/change/discontinuity. The findings clearly show how technology management can be differentiated from the more inwardly and methodologically concerned economic and public policy traditions.

MB-16.3 [R] Is Pragmatism a Philosophy of Engineering Management?

Terry Bristol; Inst. for Science, Engineering and Public Policy, United States

American Pragmatism (the philosophy of William James, Charles Sanders Peirce, John Dewey and Josiah Royce) failed to thrive in the latter half of the 20th century because it was interpreted within the university curriculum as a philosophy of science, when in fact it is a philosophy of engineering management. If the problem-solving activity of engineering is real and meaningful – as engineers themselves understand it – then as participant actors and learners in the universe, engineers can and do change the natural structure and course of events in the universe, despite what the scientists have maintained. James Lovelock's initially controversial but now standard Gaia Hypothesis clarifies how the activities of living organisms alter the structures and processes that would otherwise be expected on purely scientific (time-symmetric, physio-chemical) grounds. George Bugliarello's "biosoma" proposal sees human engineering as an extension of biological evolution. Unlike positivistic philosophies of science, where facts are real and value illusory, pragmatism is inseparable from a practical problem-solving theory of value and naturally extends the link from biology to society. Economics and politics are not – at best – scientific disciplines. They are engineering management disciplines where we should be asking engineering optimization, design questions, such as: How to design and manage a better economy? How to design and manage a better political system? Following Dewey I will outline an updated, pragmatic theory of knowledge (epistemology) – in response to Vincente's What Engineer Know and How They Know It – as well as an open systems, classically thermodynamic model of reality (ontology). Pragmatism, as a philosophy of engineering management, sees the macro engineering agenda (Wulf) as an ongoing R&D enterprise concerned with discovering while actualizing the design potential of the universe: bringing forth value.

MB-17 Collaborations in Technology Management-1
Monday, 8/1/2005, 10:00 - 11:30 Room: Parlor-B
Chair(s): Neil Berglund; Portland State University

MB-17.1 [A] Successful Industry-University Collaborations in Manufacturing Technology

Takehisa Seino; Toshiba Corporation / The University of Tokyo, Japan
Jeff A Coriale; University of Maryland, United States

Historically, many Japanese manufacturing companies have independently developed manufacturing technologies such as advanced processes and equipment, methods of analyzing manufacturing phenomena, and production management and quality control systems, which maintain the competitiveness of product development and production. Most of these companies are beginning to recognize the importance of collaborating with universities, where advanced technologies and methodologies are researched, as a way to adapt to the short lead-time requirements for research and development in manufacturing technology. Because of the many challenges to the success of joint research, the anticipated results are not always obtained. In this paper, key factors for the success of industry-university collaboration in the manufacturing technology field are discussed by demonstrating actual successful cases carried out by Toshiba and the University of Maryland.

MB-17.2 [A] Social Network Analysis for Opto-Electronics Industry of Southern Taiwan Science Park

Chihyen Huang; Feng Chia University, Taiwan
Ting Lin Lee; National University of Kaohsiung, Taiwan

Thanks to governments' policy planning, "North (Shin-Chu Science Park, SCSP) IC, South (Southern Taiwan Science Park, STSP) Opto-electronics," engines in the high-tech industry have been fuelled by two major focuses and each of them is located in different Parks. Obviously, each industry has developed an industry network along with its cluster in the Park. In order to understand relationships among optic-electronic corporations in the STSP, Social Network Analysis (SNA) approach is used in the research. The study classifies network data into four groups, including basic, business, financial, and external interaction networks. The outcomes will show the relationship among those corporations in many perspectives such as actors, resources, financial flows, and interactions, etc. The study will therefore explain how people and corporations in the same industry would interact with each other and further create lots of outputs and performances.

MB-17.3 [R] Analysis of Competitive and Cooperative Technology Strategies of Electronics Firms in the Greater China Region

Chung-Shing Lee; Pacific Lutheran University & Yuan Ze University, United States
Kuei-Hsien Niu; University of North Texas, United States
F.Thomas Sepic; Pacific Lutheran University, United States

This paper integrates several theoretical perspectives to discuss the attributes for successful implementing strategic alliance and supply chain management strategies in high-technology industries. A multiple-case study of Taiwanese and Chinese electronics industries is presented to demonstrate how and why different firms apply different technology strategies in alliance and supply chain formations. Due to intense global competition, technology integration, and product life-cycle time compression, Taiwanese and Chinese high-tech firms need to formulate and implement a coherent technology strategy to enhance their global competitiveness. By applying an integrated framework based on major theoretical perspectives to study the formulation and implementation of competitive and cooperative strategies, the results of this multiple-case study concludes that six closely related strategies, i.e., supply chain positioning, operation efficiency, strategic motives, resource complementarity, organizational learning and capabilities, and strategic flexibility, can be employed by business executives to assist them in formulating alliance and supply chain strategies. The research findings serve as an illustration of the multi-dimensionality and complexity of alliance strategies. The framework also provides a useful start to better understanding the dynamic nature of formulating competitive and cooperative technology strategies and to facilitate the effective evaluation of the conditions under these strategies might achieve optimal results.

MB-17.4 [R] Development and Upgrading of Industrial Cluster Based on Local and Global Interaction

Wei Ding; University of Shanghai for Science and Technology, China
Xing-san Qian; University of Shanghai for Science and Technology, China
Hu Wen; East China Normal University, China
Gang Qian; University of Central Oklahoma, United States

Industrial cluster has already become the important carrier of regional economy development; its competitiveness is promoted by not only strengthening local connection of inside actors, but also participating in global interaction and promoting its position in global value chain (GVC). Under the angle of view of value chain, local and global interaction based development and upgrading of industrial cluster is put forward in this paper for the first time. On the basis of a study of six case-firms in the Pudong IC industry and available secondary data, two issues are dealt with: how local and global interaction relationships are developed, and the impact they have on cluster's upgrading. Local interaction among firms can reinforce trust, enhance inter-firm cooperation and facilitate the transfer of tacit knowledge; global interaction provides cluster with effective recruitment, lead generation, general sharing of insights, and product upgrading. As well as some enlightenments and possible approaches of promoting Chinese clusters to develop and upgrade from two aspects of different industrial types and different development mode are illustrated.

MB-18 New Product Development-1
Monday, 8/1/2005, 10:00 - 11:30 Room: Parlor-C
Chair(s): Antonie Jetter; Aachen University of Technology

MB-18.1 [R] A Concept Creation Model for Innovative Product Development

Yasuo Kusaka; Dokkyo University, Japan
Masao Hirasaka; Teijin Limited, Japan

A company needs to develop innovative products with long-range competitive advantage under environmental changes. Though the importance of concept creation has been recognized for innovative product development (PD), research that treats concept creation as quantitative decision-making model has not been made so far. This study proposes creation, evaluation and selection process of concept alternatives for innovative PD, noticing the importance of novel concept supported by innovative technologies, and clarifies its validity: by (i) discussing essential roles of concept and defining operable concept, (ii) proposing Function-Technology (F-T) Matrix that can convert concept into a set of technologies, (iii) setting evaluation criteria from the viewpoints of both concept novelty and technology innovativeness, (iv) proposing decision-making method that selects concept alternatives from the above two criteria, and (v) clarifying the characteristics and validity of the proposed method through theoretical and Monte-Carlo simulation analyses. Conventional R&D decision is apt to be made based on tacit knowledge rather than explicit one because of its ill-structured nature and the difficulty of modeling approach. Thus, more quantitative models will be needed for rational decision-making based on explicit knowledge. This study is the first attempt that has quantitatively described concept creation process for innovative PD as a decision-making module, and it should be recognized as a new type of process-oriented research in the era of knowledge creation.

MB-18.2 [R] Customer Attributes for Wireless Internet Service Development

Seok Ji Park; ETRI, Korea, South

In this paper, we suggest some factors for making development directions of new services to activate the wireless Internet by analyzing the customer attribute and the actual situation of wireless Internet usage in Korea. Because the wireless Internet services are in their starting stage, it is very important to find innovating factors for R&D and to establish proper supporting for activating customer's actual usage of the services. We assume that the major customer attributes that influence the success of the services are networks quality, usage fees, contents, and the terminals. These four factors are divided into totally eight sub-attributes. We surveyed the experts of IT services to rank the importance ratio of sub-attributes by AHP (Analytic Hierarchy Process). We have found that usage fees and network quality were the two most important factors among the four attributes. When it comes to the sub-attributes, the usage fees and network speed were the most important factors. Further, we performed a customer survey to see the actual situation of wireless Internet usage. The result of customer survey was compared with the result of the expert survey. The customer survey result said that customers want lower usage fees and faster access speed, too. From these, we concluded that the usage fees and network quality are the most important factors for the success of wireless Internet. Based on these, we suggest the strategies and directions for the successful deployment of wireless Internet services in Korea.

MB-18.3 [R] Assessment of Customer Needs in New Product Development

Ecehan Sofuoglu; Bogazici University, Turkey
Nuri Basoglu; Bogazici University, Turkey

New product development may be the greatest source of profitability in the coming years as existing markets become saturated and price competitive. Innovation earns extra profits and return on investment by satisfying new customer needs with products and services that command premium margins. However, the process of new product development is fraught with risk and some other factors which should also be taken into consideration. As the market conditions go through competitiveness, the main focus becomes the "customer". The firms start to develop their new products according to customer desires. Furthermore, the satisfaction of the customers / users and its continuity becomes important after the development of the product. The aim of this study is to understand the needs of customers in terms of adoption process to the new product, the focus of which is software. Through which stages the user adoption goes, what factors become effective, how user needs are expressed and formulated into a product are some of the questions to be answered in this study. Not only software functionality, but also user interface design, flexibility and robustness issues will also be investigated and assessing need characteristics of software users will be the concentration point.

MD-01 Competitiveness in Technology Management-2: Status and Strategic Directions

Monday, 8/1/2005, 13:30 - 15:00 **Room: Pavilion East**
Chair(s): William Flannery; University of Texas at San Antonio

MD-01.1 [R] Two Foreign Trade Indicators of Technological-Economic Competitiveness of Nations: An Orientation for Technology Management

Heiner Muller-Merbach; Universitat Kaiserslautern, Germany

Big nations tend to export (and import, respectively) more value – in absolute terms – than smaller nations of a comparable state of development. However, small nations tend to export (and import, respectively) more value – in per capita terms – than big nations of a comparable state of development. The (mathematical) product of exports and per-capita exports (or imports and per-capita imports, respectively) lead to the new indicators of "Relative Export Strength" (RES), or "Relative Import Strength" (RIS), respectively. These indicators, RES and RIS, allow for the comparison of the foreign trade activities for nations of different size, i.e. different population. This will be demonstrated by 37 nations. The two new indicators are useful as a measure of the competitiveness of nations, in particular their maturity in management of technology. A four league classification is suggested: The United States and Canada, Japan, Hong Kong and Singapore, some ten EU nations, Switzerland and Norway play in the "first league", Mexico, Spain, Malaysia, Australia, China, Portugal etc. in the "second league", Chile, Brazil, Argentina, South Africa, Indonesia, Greece etc. in the "third league", India, Pakistan and many other poor nations in the "fourth league".

MD-01.2 [R] Impact of Information Technology on Competitiveness in the Financial Services Sector

Ferhan Cebi; Istanbul Technical University, Turkey
Dundar F Kocaoglu; Portland State University, United States

TThe results of a study conducted on the impacts of information technology (IT) on competitiveness in financial services sector in the United States are presented in this paper. The study identified the critical competitiveness factors and sub-factors and measured their impacts. Major IT systems used by the firms were evaluated, and their impacts on the firms' competitiveness and overall performance were determined.

MD-01.3 [A] Technology Management in the Chemical Industry: The Case Study in the Varnish Production

Miriam C Oishi; FECAP/UNISA, Brazil
Eolo M Pagnani; FECAP, Brazil

The technological innovation is one of the basic factors for the companies development, and can be understood as the concepts and techniques application that permit to use economic resource to obtain more productivity and income, creation of markets and customers. According many authors, the technology affects the competitive advantage if it will have significant paper in the determination of the relative cost position or the differentiation, being that the technologies that must be developed are those that give to greater contribution for the generic strategy of the company. The proposal of this research is to explore the technological management, investigating the process of innovation in the chemical industry (varnish production) that it seeks to keep the competitiveness in the market.

MD-02 Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-1

Monday, 8/1/2005, 13:30 - 15:00 **Room: Pavilion West**
Chair(s): John A Bers; Vanderbilt University
John P Dismukes; University of Toledo
Lawrence Miller; University of Toledo
Michael M Gallis; Michael Gallis & Associates

MD-02.1 [A] Roadmap for an Accelerated Radical Innovation Community of

Research and Practice

John A Bers; Vanderbilt University, United States
John P Dismukes; University of Toledo, United States

At a recent international conference on "Accelerating the Radical Innovation Process," fifty leading scholars and practitioners considered how to put the emerging discipline of accelerated radical innovation on a firmer footing and bring it into the mainstream of innovation practice. They proposed a three-stage roadmap: (1) develop a validated conceptual foundation for accelerated radical innovation, (2) develop tools and test beds to put the concepts into practice, and (3) create an international accelerated radical innovation network of scholars and practitioners. This paper summarizes their conclusions and recommendations…. a rationale, a vision, and a plan for a new global organizational network – the International Accelerated Radical Innovation Institute – that will facilitate the creation of a new domain (Accelerated Radical Innovation) that will be needed to address some of the most critical global challenges of the twenty-first century.

MD-02.2 [A] Insights Concerning the Critical Role of Information and IT in Accelerated Radical Innovation

Lawrence Miller; University of Toledo, United States

The results from the 2004 ECI 1st International Conference on Accelerating the Radical Innovation Process, the 2004 Indo-US Workshop on Innovation and Radical Innovation, and the 2005 International Workshop on Accelerated Radical Innovation have led the authors to draw several conclusions regarding the role of information and information technology in accelerating the radical innovation process, and to propose a methodology based upon a new framework for modeling the accelerated radical innovation process. A number of challenges to achieving ARI have been identified, including the critical need for nearly instantaneous access to information which influences or impacts accelerated radical innovation. Information and Information Technology will play a critical, lynchpin, role in accelerating radical innovation by providing solutions to a number of identified hurdles and challenges. Currently, the information which is needed to accelerate radical innovation is just not available in the short timeframes required. Existing IT tools are woefully inadequate for achieving this kind of rapid access to required information. Significant new advancements in IT will be vital in order for accelerated radical innovation to become a reality in the 21st century. We present a methodology of information-enhanced accelerated radical innovation incorporating information technology tools to catalyze, enhance, and speed up the innovation process with the intended result of dramatically reducing time and cost, and increasing the success rate of commercializing radical innovations.

MD-02.3 [A] Industrial Clusters and Accelerated Radical Innovation

Neil Reid; The University of Toledo, United States
Michael C Carroll; Bowling Green State University, United States

In recent years cluster-based economic development strategies have emerged as a cutting-edge tool to propel regional economies to higher levels of economic competitiveness and prosperity. Cluster-based economic development is based on the premise that companies (and by extension the regional economies within which they are located) can become more competitive by entering into strategic alliances with competitors located in the same geographic region. Such strategic alliances allow competitors to identify and implement solutions to problems that they are incapable (due to limited resources) of solving by themselves. Industrial clusters, and the strategic alliances upon which they are formed, are supported by appropriate infrastructure entities such as universities, economic development agencies, and think tanks. In this paper we explore the potential of industrial clusters to facilitate the process of accelerated radical innovation. Successful clusters have demonstrated higher rates of knowledge transfer, make innovation more "riskable", and reduce time-to-market for new products.

MD-03 Resource Management-1
Monday, 8/1/2005, 13:30 - 15:00 Room: Broadway-1
Chair(s): Kazuo Hatakeyama; CEFET-PR (Centro Federal Tecnológico do Paraná)

MD-03.1 [A] A Process Capability-based Framework for Determining Non-Product Investment at Ford Motor Company

Bimal Nepal; Wayne State University, United States
Ratna Chinnam; Wayne State University, United States
Eric Brush; Ford Motor Company, Canada
Colin Chisholm; Ford Motor Company, Canada
Mark Hearn; Ford Motor Company, Canada
John Petrycia; Ford Motor Company, Canada
Michael Meixner; Russell A. Farrow, Ltd, Canada

This paper presents a framework that predominantly employs process capability index (Cpk) data from manufacturing equipment to help determine the need for non-product investment for maintaining manufacturing facilities. Depending upon the quality of available data, the Cpk trend is analyzed over a period of time with respect to key part specifications produced by one or a group of machines. Based on Cpk trend, along with input from subject matter experts (SMEs) when necessary, we can identify the production stations and areas of weakness in a manufacturing facility. This helps us prioritize the needs and make the best of the limited budget resources typically available to maintain and upgrade facilities. A case study from Ford Motor Company's Essex engine plant is also presented to demonstrate the proposed methodology. The results from pilot implementation in the engine plant revealed that the proposed model was able to successfully facilitate prioritization of non-product investment. One distinct advantage with this method is that it does not result in substantial additional cost of data collection for it mostly employs existing Statistical Process Control (SPC) data.

MD-03.2 [R] A Framework for Understanding Adoption of Organizational Enterprise Resource Planning Systems

Onur Kerimoglu; Bogazici University, Beko Electronics, Turkey
Nuri Basoglu; Bogazici University, Turkey

As time goes by, business conditions become harder for many companies and they seek new ways of gaining competitive advantage. Enterprise Resource Planning (ERP) systems are life jackets for them. However, implementing these systems is not as easy as it is considered. Most of them are failures and inadequate user adoption is just one of the failure factors. The goal of that study is building a model that figures out how ERP systems are adopted by the users of the system. The framework consists of core TAM variables (perceived ease of use of ERP system, perceived usefulness of ERP system, attitude towards to use the ERP system, behavioral intention to use the ERP system) and factors that have an impact on knowledge of the system users' knowledge (effective project management, effective communication and training). According to the model, knowledge plays an important role on the perceived usefulness and perceived ease of use of the system users.

MD-03.3 [R] A Common Grid: A Note on Grid Computing and Common Goods

Oded Nov; Polytechnic University, New York, United States
Bharat Rao; Polytechnic University, New York, United States

Grid computing is gaining momentum in recent years, enabling the utilization of multiple and distributed resources for computing-intensive projects in areas such as high energy physics, weather forecasting, biomolecular simulations, structural analysis, high-energy physics, real-time data processing, etc. Grids come in different forms, with varying degrees of openness to resources and contributors. grid-based computing represents a new model and metaphor for a wider range of stakeholders, as they seek to maximize service delivery to a global audience by sharing their existing infrastructural resources. Despite this wider implication, grid computing has so far received little research attention beyond the computer-science and engineering literatures. In this paper we address the aforementioned gap by examining some of the socio-technical aspects of grid computing. In particular, we look at grids as a form of common good (using Hardin's Commons metaphor) – where accumulated resources are allocated with no direct relation to the users' contribution. In other words, we look at the motivations of key players involved (e.g. philanthropic, opportunistic) in grid commons, identify and distinguish between contributors and users, and examine some of the implications of the Commons aspect of grids. We focus on two distinctive threats these commons represent, namely (1) where users or groups of users get more resources than they contribute;

and (2) where users and contributors leave the common they were in for other commons. Finally, we discuss ways to address these potential threats.

MD-03.4 [R] A Mathematical Approach in the Study and Development of a Team Dynamics Model for Assessment of Overall Team Performance

Nagraj L Hiregoudar; BVB College of Engineering & Technology, India

The globalization trend has resulted in internationalization of manufacturing activities to produce world-class quality products and services. To cope up with this, many companies have ventured into reorganization and restructuring programs. Behind all such movements is the need to deviate from conventional individual working to team working.. As teamwork forms the core part in dynamic corporate management, it assumes critical importance to identify and understand the variables that affect the performance and behavior of teams under changing conditions. This paper considers three parameters – proficiency, diversity and communication - to develop a mathematical model. In order to form a team, the similarity coefficient algorithm of group technology (GT) technique is used in clustering team members based on proficiency level. Efficiency due to proficiency of team is calculated from the values of proficiencies of all members in relation to proficiency requirements of a team. In multi- functional teams, diversity of views is bound to arise because of high proficiency of team members. This is analyzed through efficiency because of proficiency. Communication efficiency of team network is computed based upon team size, communication links among team embers and communication density in the team. The efficiencies computed from proficiency, diversity, and communication then can be used to determine the overall team performance.

MD-04 Technology Acquisition-1
Monday, 8/1/2005, 13:30 - 15:00 Room: Broadway-2
Chair(s): Ivan Hernandez; Portland State University

MD-04.1 [A] Competence Mapping: A Portfolio Approach for Facilitating Technology Make or Buy Decisions

Martin G Inganäs; Swiss Federal Institute of Technology, Switzerland
Andrin Blauenstein; Swiss Federal Institute of Technology, Switzerland
Christian Marxt; Swiss Federal Institute of Technology, Switzerland

The accelerating pace of technological change exposes firms to increased complexities and puts firms under significant time and cost pressure. A response to this environment has been to increase external technology acquisition and limit the scope of internal development to a few core technologies. We argue this make or buy decision should rest upon the firm's core competencies. Yet trivial it may seem, many managers are not fully aware of their company's core competencies and decisions are made based on assumptions. Drawing on results from a recent in-depth case study with the R&D department of a Swiss technology-based company, this paper presents a portfolio approach for facilitating technology make or buy decisions. First, products, technologies and competencies are to be identified and assessed. Second, competencies and technologies are mapped, showing which competence corresponds to which technology. Finally, competencies are put into a portfolio showing competence relative strength on the one dimension, and competence potential on the other. The portfolio then allows for the derivation of different make or buy strategies.

MD-04.2 [R] Guidance on Software Sourcing: Results from a Questionnaire Survey

Francis H Hunt; University of Cambridge, United Kingdom
Noordin Shehabuddeen; University of Cambridge, United Kingdom
Scott Wilson; University of Cambridge, United Kingdom
David R Probert; University of Cambridge, United Kingdom

The decision of how to source software content for products is important and encountered with increasing frequency in industry. This paper reports the results from a questionnaire survey of companies aimed at establishing a measure of the importance of software sourcing decisions and at understanding which forms of guidance are perceived to be the most useful. Of 390 questionnaires delivered, 126 were completed and returned, a 32% response rate. Two thirds of those with software in their products thought software sourcing decisions were a significant concern and about two thirds of these indicated that guidance would be helpful. The two most popular forms of guidance were advice from colleagues and a checklist of issues to consider. As well as reporting the results, we discuss other insights from the survey. We also describe some of the subsequent work that has been done in response to the needs expressed, in particular to provide guidance in the form of a checklist.

MD-04.3 [A] Technology Acquisition in Indian Commercial Vehicle Manufacturing Company – A Case Study

Arvind Bhardwaj; National Institute of Technology, India
S K Sharma; National Institute of Technology, India
Dr. Sushil; Indian Institute of Technology, India

With the globalization and opening up of the economy in India, an era of change process started in Indian industry in general and the automotive industry in particular. A number of joint ventures came into existence, and technology was transferred from donor companies to recipient companies. With the technology transfer, a number of issues came to the fore. A case study of Swaraj Mazda Ltd., a joint venture between Punjab Tractors Limited (India) and Mazda Motor Corporation (Japan), has been taken in this paper to bring out the learning issues in connection with technology acquisition and adaptation. This joint venture came into existence in 1985 for the successful transfer of L.C.V. technology from Japan to India. Both the concerns resolved to have a commitment towards quality and performance. The case has been analyzed by taking into account the performance of the organization, hurdles in technology acquisition, the role of vendors in acquiring technology, training of employees and flexibility aspects. Learning issues are presented at the end of the paper.

MD-05 Technology Adoption and Diffusion-1
Monday, 8/1/2005, 13:30 - 15:00 Room: Broadway-3
Chair(s): Brent A Capps; Oregon Master of Software Engineering Program

MD-05.1 [R] Technology Strategy Audit – A tool for assessing Technology in Firms

Steven Walsh; University of New Mexico, United States
Jonathan Linton; Rensselaer Polytechnic Institute, United States

We present a decomposition model, which focuses on the objective actions of large and small firms. The model integrates manufacturing and technology intensity. Physical and service dimensions of a product offering are also incorporated into the framework. Finally, we integrate concepts that directly embrace the differing innovation models for various categories of products and services as well as concepts of technology competencies and managerial capabilities.

MD-05.2 [R] Planning for Adopting the Information Systems in Industry Across Two Sides: Case Study of Across Two Side Plastics Industry

James k Chen; National Chiao Tung University, Taiwan
Benjamin J. C. Yuan; National Chiao Tung University, Taiwan
Tsai-Hua Kang; National Chiao Tung University, Taiwan
Karen J Yuan; National Chiao Tung University, Taiwan
Yi-hsin Chen Chen; Providence University, Taiwan

In general, enterprises of finance and environment factors are the limitations for adopting information equipment systems. For promoting competitive environments, traditional enterprises have decide whether to lead their information system in consideration of finance, organization, enterprise environment, employee acceptance, its envisions and strategy. In this study, we use quantitative research methods of strategic planning, quality function deployment (QFD), analytic hierarchy process (AHP), and multiple attribute decision making (MADM) for adopting information systems (IS). Applying the technique for order preference by similarity to ideal solution (TOPSIS) for IS rankings, and also including group decisions for making analysis is used to estimate models to how enterprises can make a decision for adopting IS. A field study, "SolidYear CO., LTD", is an across two sides plastics industry also made in this research to be an illustrative example for other across two sides industries when they

plan for adopting the IS. Result, the market information systems of marketing IS was first thinking adopting it, secondly thinking adopting was goods logistics information systems of goods store information systems, lastly thinking adopting was finance information systems of finance IS.

MD-05.3 [A] A Quantitative Model of Risk Assessment for a Chemical Plant

Hiroshi Sato; Sekisui Chemical Co., Ltd., Japan
Yuji Sato; Mie Chukyo University, Japan

This study developed the quantitative model of risk assessment for a chemical plant. In the assessment, specifying both objective and subjective parameters concerning risk factor would be crucial issues. In this study, the correlation between risk management programs and the degree of risk reduction was clarified by applying the AHP.

MD-06 E-Business-1
Monday, 8/1/2005, 13:30 - 15:00 Room: Broadway-4
Chair(s): Scott Leavengood; Oregon State University

MD-06.1 [R] Assessing and Comparing Web Site Efficiency: A Distributed Cognition Framework

Corrado Lo Storto; Universita' di Napoli Federico II, Italy

This paper presents a framework based on the adoption of a distributed cognition perspective and a non parametric multicriteria assessment methodology (DEA) to measure and compare website efficiency. A model is proposed which is implemented to compare 40 websites of companies performing electronic commerce in the information technology market. A website is modelled as a black box capable to provide the user with a set of functionalities. When the user interacts with the website to perform a task, he/she is involved in a cognitive activity, sustaining a cognitive cost to search, interpret and process information, and experiencing a sense of satisfaction. The degree of ambiguity and uncertainty he/she perceives and the needed search time determine the effort size – and, henceforth, the cognitive cost amount – he/she has to sustain to perform task. On the contrary, task performing and result achievement induce a sense of gratification, satisfaction and usefulness. In total, 9 variables are measured, in a set of 3 macro-dimensions (user experience, site navigability and structure). A questionnaire to collect judgements for the websites considered in the study was designed and administered to a sample of 85 university students. Efficiency was assessed by implementing DEA.

MD-06.2 [R] Changes of Leading Business Method Patents in E-Business

Changwoo Choi; Seoul National University, Korea, South
Chulhyun Kim; Seoul National University, Korea, South
Yongtae Park; Seoul National University, Korea, South

Since the emergence of the internet, electronic business (e-business) has become one of the most widely investigated issues. E-business is considered to have the potential of generating considerable new values and the capability to transform the rules of competition in unprecedented ways. Therefore, many extensive researches have been carried out with various topics from the classification of e-business models to studies on detailed application of e-business. Most of these studies, however, have focused on the intuitive typologies or analysis of specific field in e-business. Therefore, in this study, we attempt to analyze the evolutionary changes of leading business models based on patent citation analysis. We identify the trends of e-business models by the business method patents and focused on the U.S. patents. For this objective, our research is performed in the following ways. First, we extract the bibliographical information and text of the patent document. Second, the extracted patents are classified by business models. Third, we analyze the leading business models based on patent citation analysis. Finally the changes of these leading business models are explored. In addition to patent citation analysis, supplementary methods such as network analysis and multivariate statistics are also performed. The result of this research will shown the development and evolution of business models in the e-business environment.

MD-06.3 [R] Using Web Services Composition to Facilitate Business Process Development

Chen-Sheng Wang; National Chiao Tung Univeristy, Taiwan
Min-Jen Tsai; National Chiao Tung University, Taiwan

To fulfill the business information demand within corporate intranet or process business through the Internet, many web programs have been built recently to efficiently retrieve data from a company's database or exchange data between business partners. Because of loosely coupling structure with open standard, Web service is thought of as an emerging standard among different approaches to exchange information across platforms. However, either inquiry of information or selection of a specific business partner during the transaction is often ad-hoc and dynamic. Due to these characteristics, the complex Web services should be composed from the simple services of different applications to fulfill the business function. Currently, SOAP, WSDL and UDDI are major core technologies to construct the Web services. While SOAP enables communications among services, WSDL defines the syntax description of Web services and UDDI provides the capabilities of publishing and inquiring for Web services. However, these technologies are only applicable to the simple Web services. To compose complex services, semantic descriptions of every service and the flows among services must be defined. In this paper, we propose to use BPEL + WSDL approach as the specification of business processes to address the problem of Web services composition. The implementation details will be explained and discussed with the example of sending newsletters in an enterprise.

MD-06.4 [R] Forming a Value Network for a Mobile Multiplayer Game

Mikko Pynnönen; Lappeenranta University of Technology, Finland
Martti Soininen; Lappeenranta University of Technology, Finland
Kimmo Suojapelto; Lappeenranta University of Technology, Finland
Petteri Laaksonen; Lappeenranta University of Technology, Finland

As the Mobile Internet emerges, firms adjust their strategies to respond the customers' demand for mobile life style. The convergence of the Internet and mobile communication technologies brings the existing Internet services to mobile customers but also creates a completely new market consisting of undetected business opportunities. Multiplayer games have already turned out to be very successful in the fixed Internet, and the same popularity is, to some extent, expected to move into the mobile Internet. In this paper we study if the value network of a mobile multiplayer game differs from the value network in fixed Internet. A case study research approach has been used to analyze three games. We analyze and compare the value networks of the case games to form an understanding into a possible structure of a mobile multiplayer game value network.

MD-07 Project/Program Management-2
Monday, 8/1/2005, 13:30 - 15:00 Room: Forum Suite
Chair(s): Terry Schumacher; Rose-Hulman Institute of Technology

MD-07.1 [R] Toward a Framework for Building a Value-Focused Project Management Approach

Aaron J. Shenhar, Stevens Institute of Technology
Peerasit Patanakul, Stevens Institute of Technology
Alan Maltz, Stevens Institute of Technology

The objective of this study was to propose a conceptual framework to address the issues of the value focused project management. Building upon our previous studies on project success, project effectiveness, and project strategy; we propose in this study a conceptual framework of the hierarchy of values created by projects. In the hierarchy, we distinguish between the values of projects to business focused companies, and non-profit or government organizations. We believe that a project should be perceived as a means to create value, rather than a process to create products. With this perspective, project managers would strategically lead a project with a long-term focus of value creation in addition to a short-term focuses of time, cost, and performance.

MD-07.2 [R] Toward a Theory Building on Contingency Use of Project Management Tools and Techniques

Boonkiart Iewwongcharoen; Portland State University, United States

Dragan Z Milosevic; Portland State University, United States

One critical function of project management is the use of Project Management Tools and Techniques (PMTT). Although the literature mentions that project managers should have adequate knowledge of and experience in the use of PMTTs, the literature typically neglects the fact that projects are contingent upon several factors. A monolithic best-practice project management may lead to the misuse of PMTTs that results in failed projects. This study is an attempt to develop a contingency theory on the use of PMTTs conducted on data collected by a survey of 412 projects. This empirical study investigates how the use of 39 PMTTs in four contingency factors (phases, technological uncertainties, system scope, and strategic foci) is associated with eight project success measures. The findings reveal that the use of PMTTs is dependent upon the contingency factors and differently impacts the success measures of each project.

MD-07.3 [R] The VRIO Framework of Competitive Advantage: Preliminary Research Implications for Organizational Innovations as Drawn from a Project Management Study

Kam Jugdev; Athabasca University, Canada

Inventions, innovations, and creativity are cornerstones of technology-based industries. Organizations working in technology-intensive industries must constantly balance creativity with order and innovation with efficiency. In this paper, I focus on organizational innovations as potential sources of competitive advantage. Strategic assets can be assessed with the VRIO framework. Strategic assets are "Valuable" (important), "Rare" (unique), "Inimitable" (hard to copy), and involve an "Organizational Focus" (VRIO). I am currently using the VRIO framework to assess project management as a source of competitive advantage. The approach I am using to assess project management can be applied to research on organizational innovations. The paper discusses the appropriate use of innovation dimensions, the use of innovation process performance as the dependent variable, and the selection of independent variables. The paper is relevant to innovation researchers interested in using the Resource Based View lens to study organizational innovations as a source of competitive advantage.

MD-08 Innovation Management-2

Monday, 8/1/2005, 13:30 - 15:00 **Room: Council Suite**
Chair(s): Yutaka Kuwahara; GVIN Limited

MD-08.1 [A] Assessing the Management of Innovation: A Case Study Using an Innovation Tool

Steffen Conn; ISPIM, United Kingdom
Marko Torkkeli; Lappeentanta University of Technology, Finland
Iain Bitran; Enterprizer Technologies Limited, United Kingdom

This paper presents a software-based innovation management tool: innovationEnterprizer and its application at a major supplier to the German automotive industry. InnovationEnterprizer promotes quality innovation management practice. It measures how well an organisation is managing for innovation against "best" practice benchmarks. Three dimensions capture this by assessing key success factors, combined with stakeholder opinions and their importance. The system in not a "black box" as it provides contextual aides throughout the process to ensure the pertinence of results and improvement prescriptions. Ten facilitated sessions were conducted with managers. The main results indicated that the project team (human and integration factors) were weak when compared to the formal side of innovation, for which the company had formal processes and scored highly. Furthermore, the consistency between business units was high, indicating that general innovation policy was not adapted to the unit-specific level. First, the paper introduces innovationEnterprizer; its origins, research basis and paradigm are related. Furthermore, the technology platform and application scenario are explained. The subsequent section outlines the innovation management practices in the company's business units. Section three presents the project in the company and reports on the results obtained. Finally, a conclusion highlights the key outcomes of the project.

MD-08.2 [R] The CUSVALIN Model: A Longitudinal Study of Customer Value Learning in Innovation, 1997 to 2002

Frances T.J.M. Fortuin; Wageningen University, Netherlands
Felix Janszen; Wageningen University, Netherlands
Onno Omta; Wageningen University, Netherlands

In large multinationals often a gap exists between R&D performance as perceived by the corporate R&D staff and their internal Business Unit (BU) customers. This problem is especially pressing in long life cycle industries, where typically a large time lag exists between idea conception and market introduction. This paper presents an instrument to bridge this gap: the CUSVALIN model (Customer Value Learning in INnovation). The model assesses the gaps between the self perception of the R&D staff and that of their internal customers of R&D performance in the different phases of the R&D process on four dimensions: strategic alignment, responsiveness, timeliness, and R&D - BU communication. The CUSVALIN model has been tested in a longitudinal survey from 1997 to 2002 inclusive (696 R&D and BU responses) in a large multinational technology intensive supplier company (+/- 30,000 employees world wide). It is concluded, that the CUSVALIN model is an effective instrument to monitor R&D - BU perception gaps, and that the feedback provided by the longitudinal application of this instrument leads to better alignment of R&D to corporate strategy and ultimately to higher R&D performance, as perceived by the internal customers.

MD-08.3 [A] The Adaptation of the Fourth Generation Innovation Model to the Product Innovation

Yasuyuki Suzuki; Matsushita Electric Industrial Co., Ltd., Japan
Ryoko Toyama; Japan Advanced Institute of Science and Technology, Japan
Akio Kameoka; Japan Advanced Institute of Science and Technology, Japan

In the 2004 PICMET, the author proposed one of the 4th generation innovation models, the interactive innovation model, for the solution businesses and verified the appropriateness of the 4th generation innovation model by using a concrete solution business case. As a result of carrying out several case studies after the last presentation in the 2004 PICMET, it was made clear that the 4th generation model is able to be applied into stand-alone product innovation cases. Moreover, through several studies, driving objectives and communication quality are key factors in the 4th generation interactive innovation management. In this paper, the author will address the possibility that the 4th generation model is able to be applied into stand-alone product innovation cases, and the relation between key factors such as driving objectives and communication quality and innovation management can be successfully done.

MD-08.4 [R] How Taiwan Fabless Firms Use Technology Roadmap in Product Development: A Preliminary Study

Der Chao Chen; Japan Advanced Insttitue of Science and Technology, Japan
Akio Kameoka; Japan Advanced Institute of Science and Technology, Japan
Ryoko Toyama; Japan Advanced Institute of Science and Technology, Japan

The technology roadmap already exists in various forms and is used to help different organizations forecast or estimate the potential of different technologies, products, and markets. However, there are not many empirical studies concerned about how technology roadmap and technology roadmapping are recognized and applied in one particular function of the firm. Here we report a preliminary result about the perception of technology roadmap and how technology roadmapping is used for product development in Taiwan's fabless firms. Our study showed there is a pervasive recognition for the definition for technology roadmap, but there are different scopes of project teams and diversified goals for using their technology roadmaps in product development. Further discussions and suggestions for future studies are also included.

MD-09 Better Technology Management through Better Technology Information

Monday, 8/1/2005, 13:30 - 15:00 **Room: Directors Suite**
Chair(s): Alan I Porter; Georgia Institute of Technology

MD-09.1 [R] Assessing the Recall of Science and Technology Indicators

Scott W Cunningham; Delft University of Technology, Netherlands

Output indicators are a useful technique for evaluating developments in science and technology. The origin of the technique stems from a need for the rational evaluation of national scientific funding: nonetheless the technique is increasingly used in private industry as well. Given interest in the method, much more knowledge is needed about validating these indicators. Clearly, invalid indicators lead to poor decisions about the management of technology. Previous efforts to study indicator validity have pin-pointed a diverse set of threats to the validity of indicators. While many of these threats have been addressed in subsequent work, quantifiable measures of indicator performance are still wanting. Information retrieval provides two such measures, which may be linked to the concept of statistical error. The paper proposes a process for evaluating recall which does not rely upon expert judgment of content. Bayes' theorem provides a framework for managing uncertain knowledge about indicator performance. We formulate a probabilistic model of indicator performance to derive the best a posteriori estimate of performance, given collected evidence. The validation method is applied to a case study of nanotechnology, using ten alternative queries of nanotechnology content. Evidence suggests that reasonable nanotechnology content queries yield highly varying results in both size and overlap. The most straightforward nanotechnology queries omit nearly 6 out of 7 articles. New and more thoroughly validated nanotechnology indicators based on a collection of more closely focused queries may be in order.

MD-09.2 [R] Mining Conference Proceedings for Corporate Technology Knowledge Management

Robert J Watts; TACOM, United States
Alan I Porter; Georgia Institute of Technology, United States

An organization's knowledge gained through technical conference attendance is generally isolated to the individual(s) attending the event. The aggregate corporate knowledge is extremely limited, unless the organization institutes a process to document and transfer that knowledge to the organization. Even if such a process exists, the knowledge gains are limited to the experiences and communication skills of the individuals attending the conference. Many conference proceedings are now published and provided to attendees in electronic format, such as on CD-ROM and/or published on the internet, such as IEEE conference proceedings listed at http://www.computer.org/proceedings/proceed_a-h.htm. These proceedings provide a rich repository that can be mined. Paper abstract compilations reflect "hot topics," as defined by the researchers in the field, and delineate the technical approaches being applied. R&D profiling can more fully exploit recorded conference proceedings' research to enhance corporate knowledge. This paper illustrates the potential in profiling conference proceedings through use of WebQL information retrieval and TechOasis (VantagePoint) text mining software. It shows how tracking research patterns and changes over a sequence of conferences can illuminate R&D trends, map dominant issues, and spotlight key research organizations.

MD-09.3 [R] Text Mining of White Papers: An Exploratory Study

Balaji Ravindran; University of New Orleans, United States
Cherie Courseault Trumbach; University of New Orleans, United States
Kenneth R Walsh; University of New Orleans, United States

In making corporate and IT decisions, vendor information plays an important role. One key method of communication used by technology organizations is the white paper. However, like every other form of communication in the information age, there can be an overwhelming amount of information to digest in white papers. This paper offers text mining as an approach to analyze white papers using as an example the field of "information systems integration." This text mining approach can allow managers to analyze more white papers in less time as well as uncover important emerging concepts that may have been overlooked otherwise.

MD-10 Manufacturing Management-2
Monday, 8/1/2005, 13:30 - 15:00 **Room: Studio Suite**
Chair(s): Hilary Martin; Intel

MD-10.1 [R] Determination of Output from A Unit of An Enterprise Architecture in Response to A Change in the Mode of Operation: A Blueprint for Process Modeling and Simulation

Bahman Ghorashi; Cleveland State University, United States
Jeff Stafford; Cleveland State University, United States

The enterprise architecture must specify how the business processes are to be accomplished. This would include the enterprise activities contained in the process and the logical and temporal arrangement of those activities. The objective of this study is to create a model for a generic manufacturing process that would enable the user to make changes in the inputs and parameters of the model and determine the domino-effect of the results. This will be particularly useful in examining down-stream effects on the process and personnel. For this particular study, a simple discrete-manufacturing process will be examined. The model will be built using the idea of Units of Behavior (UOBs) to describe particular units of activity within the process. Each UOB has its own set of activities and processes. The model will seek to predict if changes within one UOB will have any affect on other UOBs, and how the affected UOBs must be modified in order to accommodate the change.

MD-10.2 [A] Development and Application of a Closed Loop Inventory Control Model in a Plastics Manufacturing Environment

Santhanam Rajagopalan; University of Texas - Arlington, United States
Amit Inamdar; University of Texas - Arlington, United States
Sanya Yimsiri; University of Texas - Arlington, United States
Pat Simasathien; University of Texas - Arlington, United States
Jamie Rogers; University of Texas at Arlington, United States

In today's competitive marketplace driven by customer requirements, cost containment in manufacturing is one area in which every enterprise is striving for improvement. The number of factors that control a manufacturing process is very high. In this regard, this paper develops an industrial application of a closed loop inventory control model and applies it to monitor the resources that go in and come out of the production process. Our application is focused on the specific variances in "material planned" versus "material actually consumed" in various production processes. Our paper addresses the various sources of variablities within this dynamic industrial ambience. A "Cause and Effect" analysis is performed to identify and explore the possible sources of variablities. The remedial procedures taken as a result of the study to obviate the variabilities serve as the connecting link to close the feedback loop of the inventory control model. This model allows for better planning and management of critical resources and has been built to suit the dynamic nature of plastics manufacturing. However, recommendations and suggestions for modifying this model to fit the needs of any industry are given in the future research section of the paper.

MD-10.3 [A] Layout of Materials in a Warehouse of Product in Process Using Evolutionary Algorithms

Ninoska Maneiro; University of Carabobo, Venezuela
Ruth Yllada; University of Carabobo, Venezuela

This paper presents the results of a study performed by applying Evolutionary Algorithms Methodology for locating materials inside a warehouse of products in process. Paper production process requires by its technical characteristics a product in process warehouse among mills and conversion areas. This warehouse usually contains elevated amounts of reels to produce different products, according to the demand, and a routing excess observed, stops costs of material handling and breach of inventory policies. In order to solve this problem, the materials were classified by product families based on demand and routing. An evolutionary algorithm was designed and applied in order to find the best location of each material within the area available. Among the main results were the evaluation of multiple solutions that could not have been easily overcome by traditional methods, and the determination of a distribution in the warehouse that allows diminishing the routes compared with those currently used. The proposed evolutionary algorithm showed a very good convergence and robustness to its parameter setting and good quality solutions in an acceptable calculating time. Finally, it has been shown that evolutionary algorithms are a useful tool for solving real industrial problems.

MD-13 Supply Chain Management-1
Monday, 8/1/2005, 13:30 - 15:00 **Room: Galleria-1**

Chair(s): Al Herman; Quantric Corp.

MD-13.1 [R] Information Security Issues in the Management of the Supply Chain

Anand S Kunnathur; University of Toledo, United States
Sandra Pavuk; University of Toledo, United States

Strategic, logistical, and other operational issues in managing the supply chain have received a lot of attention from researchers. However, little attention appears to have been paid to ensuring the security of information flows in the supply chain. Security of the information flows is not only a necessity for ensuring smooth operation of the supply chain, but also for preserving relationships and for maintaining a competitive strategic posture. The weakest link, as the cliché goes, defines the chain. In trans-border, multinational environments, there are many links in the chain and not all of the same level of security. This research will frame the research questions, after surveying relevant literature, and develop in some additional detail the issues related to managing the supply chain in a global trans-border data flow environment.

MD-13.2 [A] Radio Frequency Identification (RFID) as a Competitive Advantage in Supply Chain Management

Arthur Cabanban; Portland State University, United States
Daniel Everding; Portland State University, United States
Susmita Kar; Portland State University, United States
Phanichandra Gunturu; Portland State University, United States
Fayez Hjouj; Portland State University, United States
Ihab Obeidi; Portland State University, United States

The concept of supply chain management has been around since prehistoric times. It has evolved over time with the optimization in manufacturing technologies. In today's business climate, it is a standard operating practice that companies are continually trying to perfect in order to be more competitive. Supply chain management is far from perfect; there are still many issues, inefficiencies, and challenges that must be resolved. The current issues include uncertainties of process, supply, demand, and control. Radio frequency identification (RFID) is an established technology that is finding a new use within supply chain management. An RFID tag can transmit its information via radio waves when queried by a tag reader. When assembled onto a product, case, pallet, or container, this information can provide visibility to a company's inventory system. This visibility can be extended throughout the supply chain. Since RFID tags do not need line-of-sight or contact, they can also be automated and provide benefits such as labor efficiencies, error reduction, labor savings, accurate asset tracking, and proactive stock management. Research was done through literature review of articles, websites, and white papers. Various examples demonstrated operational savings from the use of RFID within a supply chain. The variety of pilot studies and proposed implementations showed unlimited applications within supply chain management. The use of RFID in the supply chain is still in its infancy. There is a push by retailers and agencies to have the technology used. The use of RFID in supply chain management is not the cure for all the issues that a business may have. There is specific customization of the application as defined by business needs. The use of RFID in supply chain management still has future strategies that are currently unknown. Over the next decade, RFID will proliferate the supply chain due to usage maturity, decreasing tag prices, and better understanding of the technology.

MD-13.3 [R] An Integrative Model of Antecedents and Consequences of Trust and Cooperation in Supply Chain

Gongmin Bao; Zhejiang University, China
Jing Yang; Zhejiang University, China
Zhirong Yang; Zhejiang University, China

Trust play an important role and is the critical factor among supply chain partners. Interfirm trust can reduce transaction costs, improve effective communications and customer's satisfactions and facilitate dispute resolution and so on. Contrarily, distrust maybe result in all kinds of inefficient and ineffective performance. In this paper, we will discuss the impact of trust on supply chain, especially cooperation among supply chain partners. On the other hand, we will discuss how this trust can be built and which factors can effect the building of trust among supply chain partners. In this paper, we mainly consider two sides that lead to buyer's trust. One is the attribute of supplier including competence, benevolence and reputation. The other is buyer's experience. Last, a model of its antecedents and consequences of trust are presented. At the same time, we will introduce several research propositions based on this model. Furthermore, we conclude the implications of this research and discuss the limitations of the study and future research.

MD-14 Semiconductor Industry-1
Monday, 8/1/2005, 13:30 - 15:00 **Room: Galleria-2**
Chair(s): Nima Behkami; LSI Logic Corp

MD-14.1 [R] Capacity Investment Strategies in the Memory Chips Manufacturing Industry: A Research Approach

Jonathan C Ho; Yuan Ze University, Taiwan

The supply capacity and productivity of semiconductor chips manufacturing have been driven by the advancement of manufacturing technologies. Increasing in wafer size and shrinking in die size have greatly enhanced productivity and supply capacity simultaneously. Manufacturers of memory chips confront the dilemma of taking advantage of productivity and avoiding over capacity brought by the technologies. A system dynamic model is developed to simulate various capacity investment strategies for the memory chips manufacturing industry. Size and timing of investment, and demand condition are the factors that constitute various strategic scenarios for dynamic simulations. A payoff matrix is constructed with the simulation results of the scenarios. Decision on capacity investment is based on classical decision principles and the payoff matrix obtained with the scenarios.

MD-14.2 [A] Acceleration Management: The Semiconductor Industry Confronts the 21st Century

Melissa M Appleyard; Portland State University, United States
C. N. Berglund; Portland State University, United States
Craig Peterson; IPCore, United States
Richard W Smith; IPCore, United States

In the recent generations of semiconductor devices, the semiconductor industry has been accelerating towards the limits of the physical sciences. As a consequence, technology managers in that industry face seven major challenges, which will threaten progress: process, complexity, performance, power, density, productivity, and quality / reliability. We believe that confronting these challenges requires a new approach to technology management both within organizations and between organizations that form the backbone of the industry. We call this new approach Acceleration Management. Acceleration Management first requires that firms cultivate deep technical knowledge and inspire creative solutions to seemingly insoluble technical problems. The second stage of Acceleration Management requires the necessary expertise to be pooled, which often demands inter-organizational cooperation. This paper explores these managerial imperatives and analyzes how new semiconductor firms--particularly in China--have created niches in the value chain even during a tumultuous time in the industry's history.

MD-14.3 [A] A Strategic Assessment of the Photomask Manufacturing Industry

Charles M Weber; Portland State University, United States
C. Neil Berglund; Portland State University, United States

This document contains a report, which analyzes the economic environment of photomask manufacturing and assesses potential strategies for photomask manufacturers and integrated circuit manufacturers. The contents of the report can be summarized as follows: -Investigating the economic environment of photomask manufacturing has identified some of the major challenges of this industry. Mask making is plagued by high capital investments that are difficult to amortize, pricing pressure, the need for high yield and rapid turn-around, accelerating time-to-market pressure and potential market segmentation. -All these challenges increase the pressure for consolidation within the mask-making industry. Challenges associated with photomask cost escalation are likely to affect ASIC manufacturers and foundries more than they are expected to affect makers of microprocessors and high-vol-

ume memory chips. -An analysis of strategic threats to the photomask industry concludes that photomask manufacturing will continue to lose profit potential until these challenges are addressed. -The economic environment of photomask manufacturing suggests a candidate subset of best practices that could ameliorate the economic pressures under which photomask manufacturers find themselves. Candidates for best practices include importing yield-learning knowledge, coordinating development with makers of complementary technology, strategic positioning with respect to Moore's Law and vertical integration of key mask making capabilities by semiconductor manufacturers. However, interviews with experts in the industry suggest that currently many of these practices are not necessarily being practiced. Interviews with selected experts, while identifying a few best practices, were insufficient in scope and detail to identify many of the best practices that the authors of this report suspect exist. The authors consequently propose additional research to identify said best practices. The authors also recommend exploring and modeling future scenarios for the mask industry and its economic environment.

MD-15 Entrepreneurship/Intrapreneurship-2
Monday, 8/1/2005, 13:30 - 15:00 **Room: Galleria-3**
Chair(s): Al H Rubenstein; IASTA

MD-15.1 [R] The Sources of Social Capital Within Technology Incubators: The Roles of Historical Ties and Organizational Facilitation

Joanne L Scillitoe; Michigan Technological University, United States
Alok K Chakrabarti; New Jersey Institute of Technology, United States

There are currently three divergent views regarding the sources of beneficial social capital within collectivities or networks: historical ties, organizational facilitation, and trust-based shared pursuit of common goals. Technology incubators are newer organizational forms that are created to support and accelerate the development and success of affiliated technology-based ventures. However, it is unclear how social capital that benefits the technological development of affiliated ventures is created within technology incubators. Drawing from the social capital, technology, and organizational learning literature, this study seeks to understand how technology incubators can create social capital that enables accelerated technological learning of affiliated ventures. Based upon a survey of 43 technology-based ventures affiliated with U.S. and Finnish technology incubators, results of this study suggest that facilitated networking support of the technology incubator serves as the primary source of social capital that enables accelerated technological learning of affiliated technology-based ventures. However, results also suggest that less established or newer technology incubators enable accelerated technology learning better than more established incubators. This suggests that technology incubators are not able to maintain historical ties that benefit the technological learning of affiliated ventures.

MD-15.2 [R] A Simultaneous Equations Analysis of New Venture Profit-Growth Interrelations

Timothy C Koeller; Stevens Institute of Technology, United States
Thomas G Lechler; Stevens Institute of Technology, United States

The discussion of new venture growth and its determinants has largely been based on exploratory empirical studies, as noted by others. Theoretical explanations of alternative measures of new venture performance remain underdeveloped. The purpose of this research is to introduce and empirically test theoretical explanations of new venture profit and growth. We adapt Marris' [16] theoretical framework in which demand- and supply-side factors determine these two performance measures, and we incorporate disequilibrium explanations in order to analyze new venture growth and profit and their interrelations. We specify a simultaneous equations model to explain employment growth and profit during the ventures' early years. Statistical analysis employs two-stage least squares to avoid biases in the estimated coefficients measuring the interrelations between growth and profit. The study's data set consists of 159 high-tech new ventures. These firms are less than seven years old, their founders worked in the firm, they are independent ventures, and founders hold majority equity shares.

MD-15.3 [R] Industry Structure and Technological Discontinuity: The Contextual Demands of Entrepreneurial Activity

Jing Ma; Stevens Institute of Technology, United States
Jiyao Chen; Stevens Institute of Technology, United States

Seeing entrepreneur activity as both an externally and internally constructed phenomenon rather than a purely human-oriented outcome, we try to explore the influences of environmental constraints and incentives on entrepreneurial activity, which is insufficiently addressed in the existing literature. Building on the population ecology theory, we propose an ecological model of the relationships between industry structure, technology discontinuity and entrepreneurial activities, in which the evolution of industry structure and technology discontinuity is seen as an important source in explaining the variance of entrepreneurial activity. In addition, we propose that technology discontinuity not only has a direct effect on entrepreneurial activity but also moderates the relationship between industry structure and entrepreneurial activity. The first stage of technology discontinuity, before the establishment of technology dominant design, is known as the era of ferment change. During this period, the negative relationship between the rigidity of the industry structure and entrepreneurial activity will be weaker. In contrast, in the era of incremental change after the dominant design has been established, the rigidity of industry structure will have a stronger constraint effect on entrepreneurial activity. Implications of the results are discussed.

MD-16 Technology Management Framework-2
Monday, 8/1/2005, 13:30 - 15:00 **Room: Parlor-A**
Chair(s): Timothy G Kotnour; University of Central Florida

MD-16.1 [R] The Techno-Management Imagination

Fred Y Phillips; Maastricht School of Management, Netherlands

This paper explores the evolution of the techno-management imagination ("TMI"). This is the process by which, in times of crisis, managers think not just out of the box, but out of the very reality in which the box resides. Tacit social consensus, a.k.a. corporate culture, can lead to a shared, implicit, and incorrect view that certain actions are impossible. TMI transcends local culture, accessing technological solutions that are unknown and/or unimagined. Members of the organization tend to call such solutions "magic." The paper looks at social, perceptual, and managerial aspects of magic from a practical point of view that is grounded in research. It examines the risks of TMI and concludes with recommendations for scientists and managers.

MD-16.2 [R] Plain Talk for Managers of Technology

Charles W Thompson; Northwestern University, United States

A noted Anglophile (Anglophobe?) once said something to the effect that the United States and Great Britain were two countries divided by a common language. The appropriately ambitious theme of this Conference certainly includes the boundaries created by communication problems, both intentional and unintentional. Particularly for engineers and physical scientists who have grown up in the discipline of ratio scales, algorithms, scientific laws and principles, and lemmas, and the like, the language of what C. P. Snow would call the "other culture" is often difficult to understand. Algebraic symbols have a clarity and certainty not easily matched by the richness of verbal symbols. It is clear that one set of symbols "works better" on some problems and solutions, and the other on other problems and solutions. It is when the problems and solutions require cooperation between word people and number people that we have communication problems. This paper proposes to do the following: define a specific problem in communication; present some basic theoretical concepts; and add some general applications and specific examples.

MD-16.3 [R] Evolution from an Engineering Management Perspective

Terry Bristol; Inst. for Science, Engineering and Public Policy, United States

Sang Wook Yi's recent challenge (2003) of Sklar's account (Physics and Chance) of the reduction of classical (engineering) thermodynamics (TD) to statistical mechanics (SM) raises the question of the autonomy of the engineering perspective. In the business of understanding how the universe works, is engineering just the eternal hand-maiden of science? Or as Vincente posits (What Engineers Know, and How They Know It) the engineering per-

spective is perhaps independent and complementary to that of science. Ernst Mayr (What Makes Biology Unique?) argues for the autonomy of evolutionary biology, denying the reducibility to physics and chemistry. For Darwin it was the "blindness" of mutation that makes it random: variations do not arise as a result of the benefits which they subsequently confer on organisms. What "blindness" precludes here is any intelligent engineering. Evolution, on the scientific model, is the equivalent of the most inefficient engineering process conceivable: try all possible options at each stage on a random basis. Could this seeming absurdity be an artifact of the presuppositions of all scientific – time-symmetric – models of net historical change? If TD is not reducible to SM and engineering is not reducible to science, then there must be an autonomous engineering perspective in the evolution of life. Stephen Jay Gould defended the contingency implication of all time-reversible, scientific models of biological evolution in Wonderful Life. Simon Conway Morris, in Life's Solution: Inevitable Human in a Lonely Universe (2003), challenges Gould and the Neo-Darwinian orthodoxy – with engineering arguments – maintaining the inevitability of optimum (intelligent) evolutionary design solutions. George Bugliarello and others at the National Academy of Engineering have argued that human engineering enterprise should be understood as an extension of the planet's evolutionary biological history. Following these leads, in this paper, I will try to articulate the engineering management perspective on biological evolution and outline a positive Engineering Management Research Program to consider both the local and global engineering structures process inherent in biological evolution.

MD-17 Present and Future of Collaboration

Monday, 8/1/2005, 13:30 - 15:00 **Room: Parlor-B**
Chair(s): Alptekin Erkollar; University of Applied Sciences Wiener Neustadt

MD-17.1 [R] eGovernment in eWorld – The Future

Alptekin Erkollar; University of Applied Sciences Wiener Neustadt, Austria

Web based solutions can be used for different requirements and have an increasing influence for daily life of citizens. Applications like eTicketing or eHealth get increasing influence. The "e" is a tool for realization of economic requirements. The using of 'e' requires a fast learning and development and acceptance among citizens, customers and businesses. One proof of these changes caused by information technologies are electronic services like online-information procurement which are made available by industries, customers, citizens and businesses. The use of information and communication technologies enables the development of eGovernment and causes an improvement of the relationship between administration, customers, citizens and business. Within the process of establishing eGovernment in the public sector there has to be established a concept for all who are involved in these re-organizational processes to communicate, cooperate and to focus on former lessons learned. Currently, one possibility to support eGovernment incentives is to implement an eLearning concept to communicate and cooperate, both internal and among each other. In this paper there will be shown guidelines for implementing eGovernment incentives combined in view of use of different strategies to implement.

MD-17.2 [R] A Functional Agile Supply Chain Management Strategy Using Agent Directed Agility Domains

Alptekin Erkollar; University of Applied Sciences Wiener Neustadt, Austria
Paul Hayes; University of Applied Science, Liechtenstein
Siegfried Weinmann; University of Applied Science, Liechtenstein

The phrase supply chain management is used to characterize all of the interconnected components and processes required to ensure that an exact product is at the exact location, at the exact time, in the exact amount, in the exact form at the lowest possible cost. This optimization process requires consideration of multi parameters at the same time for the different goals and parameters. This dynamic process involves a constant flow of information and materials across numerous interacting business elements. Organizations are considered to be agile if they have interacting elements that posses the following: fast, resourceful, adaptable character, which can optimally accommodate a variety of change. The paper suggests a functional supply chain management strategy using distributed agent directed agility domains.

MD-18 Environmental Issues in Technology Management-1

Monday, 8/1/2005, 13:30 - 15:00 **Room: Parlor-C**
Chair(s): Dawood Abugharbieh; Portland State University

MD-18.1 [R] Commercial Alignment of Firms and Government Agencies Advancing Climate Change Technologies

Peter L Hoddinott; Carleton University, Canada
Tony Bailetti; Carleton University, Canada

This research investigated the commercialization of emerging climate change technologies by extending the application of an existing framework for explaining the proportion of profits that accrue to firms from the commercialization of a technical innovation. The first stage of the research developed operational definitions and a method to investigate the relationships between (i) firms' commercialization strategies for advancing climate change technologies, and (ii) government agencies' criteria for investing in the advancement of climate change technology. The second stage applied the definitions and method to examine the commercialization strategy of 16 firms in the fuel cell industry and the investment criteria of two government agencies. Results suggest: (i) there was diversity in the firms' commercialization strategies, while there was uniformity in the agencies' investment criteria, and (ii) the commercialization strategies of 12 of the 16 firms were misaligned with the two agencies' investment criteria.

MD-18.2 [A] Establishing the Key Factors for Industrial Environmental Accounting Implementation from Multivariate Statistical Perspective

Hua-Kai Chiou; National Chiao Tung University, Taiwan
Gwo-Hshiung Tzeng; National Chiao Tung University, Taiwan
Chien-Tsung Lee; Navy Logistics Support Headquarter, Taiwan

Business and environmental managers are facing increasing demands for environmental performance from regulators, consumers, and their shareholders. At the same time, marketplace competition more and more frequently emphasizes the environmental performance of firms and products. Environmental and financial information required to meet such expectations while maximizing shareholder value is unavailable in many firms. This need for accurate and consistent cost information for environmental projects has generated an interest by business in environmental accounting. Environmental accounting is an effective tool for a company's greener management practice. It also reveals potential cost reduction and profit maximization opportunities, thus encouraging environmentally and socially sound management and decision-making practices. This study examines the perceptions of managers and accounting professional on environmental performance from high-tech and traditional industries in Taiwan. Through this study, we can conclude that most companies have not shown great enthusiasm in providing environmental information; the lack of enthusiasm is probably influenced by the fear that environmental disclosures will give rise to liabilities. Furthermore, this study extracts key factor-by-factor analysis for implementing an environmental accounting system. Three factors extracted from fourteen significant indicators are promoting enterprise image, enhancing enterprise competitive advantage and improving environmental technology. It also examines professional accountants' perceptions of environmental disclosures. The results indicate that the vast majority of manager respondents considered environmental protection to be important for Taiwan, but a review of environmental disclosures contained in annual reports indicates that there was a gap between perceived importance of environmental performance and actual environmental disclosures.

MD-18.3 [A] Technological Catching-up and Leapfrogging in High Tech Industry of China: A Case Study on Digital Surveillance Equipment Industry

Xiaobo Wu; Zhejiang University China, China
Wei Zhang; Zhejiang University China, China
Suli Zheng; Zhejiang University China, China
Liping Qiu; Zhejiang University China, China

China has experienced a rapid growth since the open-door policy was initialized. The manufacturing industry accounted for most of the growth at the beginning stage. However, some high-tech industries emerged in the 1990s and then started a process of technological

catching-up. Nowadays, some of them have already achieved successful leapfrogging. The digital surveillance equipment (DSE) industry is a typical case. This paper examines the technological leapfrogging process in China's digital surveillance equipment industry by using our analytical model of technological and market catching-up to identify the facts in the process of technological capability building and to sort out the crucial factors for a leapfrogging to succeed. Our study reveals that the special requirements for products and service quality and the huge size of demand are the crucial external factors. The capability of tracking and utilizing adequate technological standards and the capability of offering timely and customized service are significant internal factors for catching-up. The research also shows that some Chinese high-tech firms which succeeded in catching-up went through a process from technological importing, assimilation, and absorption to secondary innovation, and firms attempting to leapfrog adopt the approach of post-secondary innovation, namely breaking through technological paradigms and leaping to new technological trajectories.

MD-18.4 [R] China's Theory and Practices of Regional Technology Innovation System Today and Its Further Development: Ecology Perspective

Lucheng Huang; Huazhong University of Science and Technology, China
Yafei Luo; Beijing University of Technology, China

After outlining the problems of conducting research on regional technology innovation system (RTIS) in China, the paper elucidates the characteristic of ecology and studies the present condition of applying ecology into many different kind of disciplines, and then analyzes the scientificalness and feasibility of conducting research on the based-ecology RTIS, finally put forward some suggestions for the research.

ME-01 PANEL: ETMERC
Monday, 8/1/2005, 15:30 - 17:00 **Room: Pavilion East**
Panelist(s): John Aje, University of Maryland
Tony Bailetti; Carleton University
Dundar F. Kocaoglu; Portland State University
Antonie de Klerk; University of Pretoria
William T Flannery; University of Texas - San Antonio
Marthinus W Pretorius; University of Pretoria

ETMERC (Engineering and Technology Management Education and Research Council) is the organization of the heads or their designees of the educational programs and departments in Engineering and Technology Management throughout the world. These include all programs with a variety of titles, including but not limited to Engineering Management, Technology Management, MOT, Innovation Management, etc.

ETMERC operates under the auspices of PICMET as an all-inclusive organization, not limiting its affiliation to any professional society. Its objective is to provide leadership in developing educational guidelines, curriculum strategies, evaluation criteria, and research agenda for the field.

All educators and academic researchers are invited to attend this panel to meet ETMERC's Executive Committee, to participate in ETMERC's strategy development for future activities, and to share ideas and experiences with colleagues from around the world.

ME-02 Introduction to a Proposed Accelerated Radical Innovation International Community of Research and Practice-2
Monday, 8/1/2005, 15:30 - 17:00 **Room: Pavilion West**
Chair(s): John A Bers; Vanderbilt University
John P Dismukes; University of Toledo
Michael M Gallis; Michael Gallis & Associates
Lawrence Miller; University of Toledo

ME-02.1 [R] Contributions of Social Constructionism to a Theory of Accelerated Radical Innovation

John A Bers; Vanderbilt University, United States

Radical innovation – the creation of major breakthroughs in performance or cost, or the creation of entirely new markets and industries – is one of the most promising arenas for addressing some of the world's most intractable problems, and yet it is one of the final frontiers of MOT yet to yield to disciplined management approaches or theoretical understanding. This paper explores some of the key difficulties encountered by the prevailing cyclical model of innovation (Schumpeter, Anderson and Tushman, etc.) in coming to grips with radical innovation and contrasts it with a more recent tradition, social constructionism (Constant, Bijker, Wenger, etc.), which places the user and his/her community of practice, rather than the designer, at the center of the innovation process. Examples of radical innovations from information technology, biotechnology, energy, telecommunications, and transportation are analyzed retrospectively from the two traditions. Social constructionism is found to shed new light on the genesis and path of radical innovation. Implications for a theory of radical innovation and for managing the radical innovation process are drawn.

ME-02.2 [A] The Global Response to the Accelerated Radical Innovation Challenge

John P Dismukes; The University of Toledo, United States
William N McCreary; Pilkington PLC, United States

A consensus has emerged that conventional incremental improvements and cost reduction strategies are no longer sufficient to provide a competitive advantage. Moreover, existing radical innovation strategies are too slow and uncertain in their development for viable creation of the high growth industries now required for sustained economic growth and job creation in the 21st Century. A dramatically accelerated process for affecting radical innovation has become critically important --- as highlighted in the papers presented at an ECI Conference in May 2004, and in the Council for Competitiveness report released in December 2004. This situation is the direct consequence of worldwide diffusion of knowledge and industrial capability, resulting in reduced costs of long distance transportation and an exponential growth in low cost internet and cellular transmission of data and information, that have irreversibly exposed North American manufacturing and service sectors to low cost labor regions of the world. This paper summarizes the conclusions and recommendations of two workshops organized to address these issues: the Indo-US Workshop on Innovation and Radical Innovation, Trivandrum, India, December 2004, and the International Workshop on Accelerated Radical Innovation, Toledo, Ohio, USA, March 2005

ME-02.3 [A] Technology, Innovation and Change in the Global Network

Michael M Gallis; Michael Gallis & Associates, United States

Over the past 500 of the 2,200 years since the beginnings of globalization, technology and innovation have become the principal drivers of major changes in the pattern and dynamics of the global network, global economy and global economic geography. Changes within the network have not been limited to the pattern and flow of trade, but also extend to the global distribution of wealth, political power and social and cultural influence. While change in the network is constant, the rate of change has not always been equal. Radical innovations along the way have significantly accelerated the rate of change, and have resulted in a significantly altered and reconfigured pattern in the network, the economy and the economic and political geography. Over the past 2,200 years five distinct periods of change have emerged. The four periods in the past 500 years have been dominated by the technologies that created the changes. Each of these periods has been marked by its own distinct patterns in the network, economy and geography. From this macro point of view, world history can be divided into a series of global ages, each of which is distinguished by a distinct pattern of global connectivity based on specific technological innovations. During each of these periods, the environment, economy, society and political structure of nations and the world have been transformed. Fifteen years ago, in 1990 the collapse of the Soviet Union and the release of previously secret military technologies combined to initiate a sixth period of global change. Now 15 years into a period of global transition, the patterns of wealth, political power, economic geography and the network are taking a new form. Throughout history, the societies and nations that were not well prepared for the impacts of change were left behind or disappeared, while those that were prepared prospered. Are nations, societies, political and business leaders prepared for the level of change the world will experience in the coming decades as technology and innovation accelerates the rate of change in the global network? This presentation will use a visual language utilizing maps, diagrams and images

researched and developed by Michael Gallis & Associates to illustrate these changes in the global network and the impact they have had on the world.

ME-03 Resource Management-2
Monday, 8/1/2005, 15:30 - 17:00 **Room: Broadway-1**
Chair(s): Kathryn Stecke; University of Texas at Dallas

ME-03.1 [R] An Axiomatic Design Model for Integrating Design and Cost Information

Taesik Lee; Massachusetts Institute of Technology, United States
Peter Jeziorek; Massachusetts Institute of Technology, United States

Large complex projects cost large sums of resource throughout their life cycle for a variety of reasons and causes. For such large programs, the credible estimation of the project cost, a quick assessment of the cost of making changes, and the management of the project budget with effective cost reduction determine the viability of the project. This paper introduces a logical framework, built upon Axiomatic Design process, to achieve effective cost engineering. The structure in the Axiomatic Design process provides a good foundation to closely tie engineering design and cost information together. The framework presented in this paper provides a systematic link between the functional domain (FRs), physical domain (DPs), cost domain (CUs), and a task/process-based model. The FR-DP map relates a system's functional requirements to design solutions across all levels and branches of the decomposition hierarchy. DPs are mapped into CUs, which provides a means to estimate the cost of design solutions from the cost of the physical entities in the system. The task/process model describes the iterative process of developing each of the CUs, and is used to estimate the cost of implementing CUs. By linking the four domains, this framework provides a superior traceability from requirements to cost information.

ME-03.2 [R] Data Integration for Traffic Incident Management

Paul P Salasznyk; Rensselaer Polytechnic Institute, United States
Earl E Lee II; Rensselaer Polytechnic Institute, United States
George F List; Rensselaer Polytechnic Institute, United States
William A Wallace; Rensselaer Polytechnic Institute, United States

In the wake of the terrorist attacks of September 11, 2001, incident management has acquired a new level of importance. Incident managers must be prepared to respond to conscious acts of terror, caused by individuals wanting to inflict harm, as well as the more traditional natural calamities and human errors. Incident response must be faster, more integrated, and more intelligent in responding to these events in order to reduce the human, environmental and economic losses. One key element of improved response is improving the ability of the first responders (fire, EMS, police, etc.) to share data in time to support decision making. While initial reports of events may go to one agency, the ability to rapidly distribute the data to other agencies on the event is critical. Improving data sharing requires rigorous systems analysis, including what data needs to be shared and what common form the shared data must be in. This paper will discuss methods for improving data sharing, including how communications and computing technologies can facilitate the integration. Finally, a description of ongoing research in improving traffic incident management in the Capital District region of New York State will be presented.

ME-03.3 [R] An Optimal Closeness Relationship Diagramming Algorithm for Facilities Layout Planning

Wandee Udomwongyont; Assumption University, Thailand
Chamnong Jungthirapanich; Assumption University, Thailand

A variety of heuristic approaches have been proposed by researchers to solve layout planning problems. The main objective is to arrange the facility in the best possible way. Whether developing the layouts manually or by using computer software, both methods rely heavily on qualitative data to generate desirable layouts. Thus far, there exists no layout planning method that can guarantee an optimal layout. This research represents a step toward the development of the optimal layout. A significant preliminary stage to obtaining an optimal layout is the closeness relationship diagramming. This paper presents an algorithm to develop an optimal relationship diagram by resolving any closeness rating conflicts. The proposed algorithm can be applied to four-node configuration. The developed relationship diagram insures optimal closeness between nodes. Any ratings in conflicts will be adjusted and weighted by its level of importance. The resulting optimal weighted ratings will then be tested for feasibility by actually drawing them in the diagrams. This algorithm can be adjusted to fit any number of nodes. According to the research findings, every combination of alternative relationship diagrams were tested and proved to be both feasible and optimal.

ME-03.4 [R] Analysis and Optimization of Flexibility in Technology Management

Feruccio Bilich; UNIEURO, Brazil
Ricardo G DaSilva; Universidade Catolica de Brasilia - UCB, Brazil
Paulo Ramos; UNIEURO, Brazil

The competitive advantage of an organization is usually contemplated in its superiority in the elaboration of its basic competence with the purpose of analyzing and optimizing its technology management. In order to attain this purpose, the new and important concept of flexibility is considered. The current competitive environments of the organizations exercise a constant pressure on the analysis and optimization of the flexibility of technology management of the organizations. A unifying discipline must provide leadership and guidance in bringing the various disciplines together, and melting the boundaries. Therefore, these contemplate strategy, innovation policies and technology management. Flexibility is a new and important key concept in the analyses of technology management. The objective is to apply an analysis and optimization model of flexibility in technology management in organizations employing the association of multivariate analysis (factor analysis) with multi-criteria methods. Among the several multi-criteria methods opted for was VIP (Variable Interdependent Parameters). An important conclusion of this work is that one can not only analyze but also optimize the flexibility of technology management through the application of multi-criteria methods. This allows an evolution in the learning process of technology management which underlies the dimensions of the flexibility in technology management.

ME-04 Technology Based Organizations-1
Monday, 8/1/2005, 15:30 - 17:00 **Room: Broadway-2**
Chair(s): George Farris; Rutgers University

ME-04.1 [R] Improving Knowledge Integration in Outsourcing Software Development Project: A Case Study in China

Yue Zhuo; Zhejiang University, China
Jiangdian Wang; Nanyang Technological University, Singapore
Tien Hua Yim-Teo; Nanyang Technological University, Singapore
Bo Zhou; Zhejiang University, China

Outsourcing has been a trend from the nineties. In the software development industry, increasingly western companies who want to decrease software development cost greatly use external resources from India and China. Nowadays, nearly 95 percent of the export market for software from China is controlled by hundreds of international software companies and industrial companies. These offshore software companies and teams in China provide software development, application development and consulting services. China software development industry indeed shows to the world its competitive advantages by offering an attractive labor cost advantage. Faced with turbulent environments characterized by increasingly fierce global competition, China software industry recognizes the growing importance of knowledge resources and sustaining progress. Outsourcing is a corporate strategic alliance between onshore and offshore firms. Therefore, the knowledge pieces which are required for offshore companies are mainly coordinated from their customers, namely outsourcers, and internal expertise. This paper reports and analyzes a case study in a software company in Hang Zhou, China, and tries to derive insight into the factors influencing knowledge integration and the effects on the success of outsourcing software development projects.

ME-04.2 [R] Strategic Outsourcing and Modularity: A Case Study in the Plastic Packaging Industry

Paulo Gomes; Universidade Nova de Lisboa, Portugal
Sonia S Dahab; Universidade Nova de Lisboa, Portugal
Conceição Santos; Instituto Superior Ciência do Trabalho e Empresa, Portugal

Major international companies in different industries such as automobile, chemical, computer industries and plastic packaging companies are redesigning their value chain while outsourcing. The context for our study is the plastic packaging industry. In an industry where products became commodities, the migration from a pure product provider toward a combination of product and services, creating tailor-made solutions to their customers, is critical in a strategy of differentiation. Our purpose is to analyze the integration across the value chain through the perspective of modularity taking into account that suppliers want to bundle product and services on a "package" while the interface with customers requires an effort to unbundle information and knowledge sharing. We use an in-depth case study of Logoplaste, a global producer of plastic packaging, and some of their partners. The focus of the paper is on how suppliers and customers are redesigning their organizational architecture to incorporate new forms of unbundling knowledge in its process and products, with the aim to achieve modularity. From this analysis we can understand strategies for dealing with modularity. We analyze requirements for new organizational-coordination skills and an ability to externalize knowledge.

ME-04.3 [R] Flexibility – Examining an Underappreciated Motivation for Outsourcing with an Optimization Model in a Small E-Product Manufacturer

Asser Fayed; Portland State University, United States
Timothy R Anderson; Portland State University, United States
Dave Fenwick; Portland State University, United States

Technology outsourcing has recently become a politically sensitive issue with proponents emphasizing long-term economic growth opportunities, and opponents pointing out immediate job losses. The underlying reason for outsourcing is often assumed to be the availability of cheaper labor outside the USA but this overlooks the possibility that companies may simply be seeking greater labor flexibility outside of US state and federal labor laws. This paper quantitatively tests a software company's motivation to secure a flexible and adaptable labor pool. Although production lines located at multiple sites provide great flexibility for scheduling and costs because each site has its own local expenses, capacities, and capabilities. This flexibility comes at the cost of added complexity of production planning, hiring and training employees, and quality assurance of finished products. A mixed integer optimization model is introduced to evaluate an outsourcing decision by placing a value on labor flexibility. This model is then used to examine the sensitivity of the outsourcing decision to various parameters.

ME-05 Technology Adoption and Diffusion-2

Monday, 8/1/2005, 15:30 - 17:00 **Room: Broadway-3**
Chair(s): Steven T Walsh; University of New Mexico

ME-05.1 [R] An Empirical Study on the Technology Innovation Spillover Paths Among OECD Countries

Dong-Jin Chung; Institute of Information Technology Assessment, Korea, South
Sang Sup Cho; ETRI, Korea, South
Sang-Tae Kim; IITA, Korea, South
Hyeoeun Lee; IITA, Korea, South

The study is to investigate the role of trade on the technology spillover among OECD countries. To this study objective, we construct data set periods over 1980-2003. These data sets include export volume, import volume and total factor productivity as well as R&D stock for 15 OECD countries. To accommodate non-stationery data characteristics, we use popular panel non-stationary methods for R&D spillover empirical tests since 1980s. Our empirical results show three important points. First, all relevant variables have unit root in using panel unit root tests during the periods. Second, even though all variables are non-stationary, they are moving together and we cannot reject the co-integration relationship among the variables. Third, we estimate the coefficient vectors using dynamic OLS in different specification forms. The estimated coefficient vectors are so significantly different. Our empirical results suggest that the previous studies based on the same specification test forms may be biased and that there may be not only the different technology innovation transmission of sources but also the different technology innovation spillover path among OECD countries.

ME-05.2 [R] Exploring the Relationship Between Information Technology Diffusion and Managerial Decision Making

Ilda Tanoglu; Bogazici University, Turkey
Nuri Basoglu; Bogazici University, Turkey

The evolving nature of Information Technology (IT) results in changes on the decision making patterns of today's managers in all functional areas and at all managerial levels. The patterns of decision making in organizations especially vary through different stages of adoption to new information technologies. This paper aims to understand the diffusion process of IT in organizations in both individual and organizational context, regarding different stages of adoption to different technologies, and to examine the role of IT diffusion on decision making processes in all functional areas and at all managerial levels of organizations. In order to achieve this purpose, the existing literature has been reviewed and a new research framework has been developed that will provide a basis for further empirical studies in the area.

ME-05.3 [R] A Theory of Diffusion for Controversial Technologies: The Case of Biotechnology

Stefano Perlusz; Singapore Management University, Singapore
Moon-ho Ho; McGill University, Canada

This work proposes a theory for the diffusion of controversial technologies. Some technologies, like human cloning and genetically modified food, face resistance from the public. We propose a theory that aims to explain and predict the diffusion of these technologies. To do so, we build and test a model that distinguishes between two levels of acceptance. The first level of acceptance consists of the tolerance towards the societal involvement with the technology. The second level of acceptance consists of the individual willingness to adopt and use the technology. In our model, perceived usefulness, perceived risk and perceived moral acceptability are used as independent variables to predict acceptance. To validate our theory, we test the model with a sample of 16000 respondents. The sample is representative of the population of 15 European countries, and biotechnology is used as case of controversial technology. The results support the theory, and the model shows high predictive power. The model advances knowledge about the definition of technology acceptance. Implications are discussed.

ME-06 E-Business-2

Monday, 8/1/2005, 15:30 - 17:00 **Room: Broadway-4**
Chair(s): Ivan P Hernandez; Portland State University

ME-06.1 [R] A Taxonomy of Business Models on Mobile Business: BM Patent Analysis

Chulhyun Kim; Seoul National University, Korea, South
Changwoo Choi; Seoul National University, Korea, South
Yongtae Park; Seoul National University, Korea, South

The development of information technology and the appearance of wireless telecommunication and internet have attracted explosive attention on business models (BMs) on mobile business (m-business). Consequently, numerous studies about the BM on m-business have been carried out not only in academic field, but also in commercial field. In the academic field, amongst others, the classification of m-business models and the establishment of business innovation models have been studied. But most classifications have focused on deductive typological approaches and relied on the intuition of researchers. The main objective of this paper, therefore, is to suggest an inductive taxonomical approach for classifying BM on m-business. The data used in this research are the BM patents of m-business registered in the USPTO, especially in the 705 class. The keywords from the claims of each patent are extracted through text-mining. With them, the frequency set of keywords in each patents are calculated. Next, we analyze this frequency set by factor analysis and the patents are clustered into seven groups by clustering. We analyze some characteristics and the similarities among patents classified to the same cluster and give proper name to each group.

Finally, we can find that BMs on m-business related to services for individual customers are more and more paid attention to. The result of this research could be used as a basic framework or starting point of the quantitative analysis of BM on m-business.

ME-06.2 [R] Examining the Drivers and Inhibitors of Business-to-Business Implementation by Engineering to Order Organisations

Keith Bell; Darhem Engineering, United Kingdom
Christos D Tsinopoulos; Durham Business School, United Kingdom

The aim of this paper is to examine the adoption of electronic business to business practises by modern engineering to order organisations. To achieve this we present and analyse the findings of interviews conducted with directors, business managers and IT specialists within seven UK engineer-to-order manufacturing organisations. These interviews examined the degree to which such practices have been implemented, how and if improved performance is measured as a result of this practice and the organisational and cultural reasons for the slow speed of adoption. The findings suggest that organisations are adopting this practice within the inertia of their marketing domains, supply chain demands and affordability. Also, benefits to the organisation such as speed of response and business process connectivity are clearly visible and essential. However, there is no defined methodology for measuring improved overall business performance as a result of this practice. It can be concluded that organisations are slow to adopt this practice but this could be a deliberate strategy based on security and IPR ownership. The paper concludes by suggesting implications for practice and some guidance for future research.

ME-06.3 [R] Network Dynamics and Developing Business Models - A Conceptual View

Mikko Pynnönen; Lappeenranta University of Technology, Finland
Päivi Kallio; VTT Electronics, Finland
Olli Kytölä; Lappeenranta University of Technology, Finland
Maria Taitokari; Lappeenranta University of Technology, Finland

A mobile Internet market is merging from the Internet and mobile communications markets. The convergence of these industries causes constant change, when the firms seek continuously new business opportunities. The change can be seen in the industry structures and the power relations of the firms, which on conceptual level means changes in the value network structures of the industry. These changes have effects on the business models of the firms in the value network. In this paper we focus on analyzing the economical effects causing the change in the value network and business models on conceptual level by using a case study approach. We demonstrate the effects of network dynamics on business models with a simple case scenario of a value network for a mobile multiplayer game. The case includes three phases of evolution and each of them has effects on the business models of the actors and the structure of the value network. The aim of this paper is to explain the role of network dynamics on development of the business models and value networks of mobile gaming industry.

ME-07 Project/Program Management-3
Monday, 8/1/2005, 15:30 - 17:00 **Room: Forum Suite**
Chair(s): Dragan Milosevic; Portland State University

ME-07.1 [A] Team Management Master Tool for Implementing Projects in Competitive Advantage Model

John R Patton; Cadence Management Corporation, United States
Donald E White; Cal Poly University, San Luis Obispo, United States

Rapid pervasive technological and business change challenges the ability of firms to create a sustainable competitive advantage. This presentation focuses on an underutilized fundamental project management (PM) graphics tool whose creative and effective use will enable improvements to a firm's strategic effectiveness. The presentation first reviews a 5-stage strategic implementation model presented at two previous PICMET conferences. It is being used by some highly successful firms. Research results show that many firms still need to improve their basic project implementation practices to attain overall effectiveness at the strategic level. Three-fourths of the presentation will be devoted to viewing application cases of the graphical master tool and its planning and control uses for the fast and effective implementation of projects. The tool is integrated with bedrock fundamentals of PM. It is often underutilized. Yet, it can be critically important from a human skills and integration standpoint. Several specific cases will clearly demonstrate how the tool can be used to remove barriers, enhance project team effectiveness, and improve project planning and decision making. Also shown will be how the tool: 1) facilitates team and organizational communication, 2) improves integration across disciplines and enterprises, 3) mitigates project risk, and 4) helps in geographically dispersed and global environments. Most importantly, the tool facilitates a high velocity, flexible, and focused strategic implementation process that is critical for sustaining competitive advantage.

ME-07.2 [R] The Impact of Effectiveness and Efficiency on Project Success

Timothy M Phelan; Stevens Institute of Technology, United States

Effectiveness is the extent of the accomplishment of the right things, the right ends, and efficiency is the economics of doing things right, the economics of the right means. These are two fundamental concepts in all human activities and work, yet rarely are these two concepts collectively tested empirically. The lack of such experiential support limits a more complete conceptualization of these two ideas and places a serious constraint on our ability to expand our understanding of organizations and management. Specifically, in the field of project management, much of the research has been devoted to efficiency, independent of effectiveness, and research conducted on effectiveness does not provide a means to predict or affect the project outcome. This research presents results that demonstrate that the quality of the effort invested in effectiveness and efficiency during the initial phase of the project reliably predicts project success at completion, as well as completing the project ahead of schedule. Yet, and in contrast to conventional thinking, only the quality of the effort in effectiveness reliably predicts the project completing under budget. This increased predictability offers organizations a powerful advantage in improving their business by focusing projects upfront on the right ends, thereby increasing the organization's competitiveness.

ME-07.3 [A] Project Management Maturity: Just a Singular Methodology Is Enough?

Ruy Bouer; University of Sao Paulo, Brazil
Marly M Carvalho; University of Sao Paulo, Brazil

The world in which organizations operate today is rapidly becoming more complex than ever before. Major shifts in technology and in the business and economic environment present many opportunities, but also many challenges, to organizations striving to manage and thrive in the midst of great change. Projects have become important instruments for change and development in organizations. The broader utilization of projects requires a new orientation in project management in order to provide a more effective approach to manage project resources and outcomes. Project management maturity models have been studied and developed to sustain and drive project management strategies. The project management maturity model literature points out that the fact of one organization possesses a singular methodology, developed and implemented to project management, it is a vital signal of the organizational maturity in terms of project management. This paper will address this issue through a review of project management maturity models and the presentation of a case study combining both, a desk research of the singular methodology practiced by a multinational company from the Lighting segment, and a field research to evaluate the organizational project management maturity according to the perception of the company's key business areas..

ME-08 Innovation Management-3
Monday, 8/1/2005, 15:30 - 17:00 **Room: Council Suite**
Chair(s): Antonie Jetter; Aachen University of Technology

ME-08.1 [R] Knowledge-Partitioning and Inter-firm Innovation: An Empirical Case Analysis

Jaegul Lee; Carnegie Mellon University, United States

Francisco Veloso; Carnegie Mellon University, United States

Building on emerging research on knowledge partitioning and an information processing view of product development, this study examines the impact of task uncertainty on the knowledge boundary between manufacturers and suppliers in automobile industry. Using successfully applied patents in automobile emission control technologies from 1970 to 1998, this research shows that manufacturers expand their in-house R&D capabilities beyond architectural knowledge and into component innovation whenever they encountered task uncertainties. Moreover, and unlike what was anticipated, manufacturers' endeavor in building up in-house component innovation was shown to increase over time, indicating a growing importance of component knowledge for manufacturers in times of task uncertainties, even after the establishment of dominant designs. This study also provides a large scale empirical test for the theoretical claims that effective knowledge management for both architectural and component knowledge is a key factor influencing firms' competitiveness in the inter-firm product developments.

ME-08.2 [A] Acceleration of Global Innovation Through Tacit Knowledge-based Small Network

Yutaka Kuwahara; GVIN Limited, Japan

This paper describes a novel scheme of acceleration of global innovation, through the unique concept and structure named "GVIN" that has a value chain forming a small network of "tacit knowledge" at both seeds and needs sides. Since global industrial companies have experienced unprecedented long business recess during 1989-2003, they are now quite aggressive to acquire any outside innovation seeds. GVIN structure will satisfy this requirement.

ME-08.3 [A] Social Capital and Knowledge Acquisition in Chinese Knowledge-based Firms: An Empirical Study Based on BP Neural Network

Fanghua Zhang; Soochow university, China
Jin Chen; Zhejiang university, China

With the development of the globalization of knowledge, how to improve a firm's innovation capability through knowledge acquisition has been catching people's eyes. By studying the relationship between a firm's social capital and knowledge acquisition, this paper probes into their relation on the basis of BP neural network. Furthermore, it puts forward some suggestions for Chinese firms to improve their innovation capability through knowledge acquisition from external organizations.

ME-09 Information/Knowledge Management-1

Monday, 8/1/2005, 15:30 - 17:00 **Room: Directors Suite**
Chair(s): Nathasit Gerdsri; Portland State University

ME-09.1 [R] Evaluating Information and Communication Technologies (ICTs) for Banking Industry in Thailand

Nutthapong Mitranond; Portland State University, United States

This study proposes a decision model that helps banks evaluate the impact of ICTs on a bank's objective. The concept of Hierarchical Decision Modeling (HDM) is applied in this study. This project focuses on banking industry through the case study of a leading bank in Thailand. The result is the assessment of relative importance of ICTs to the goal of enhancing competitiveness. The result shows that "Database system" is the most important technology for enhancing competitiveness because it contributes to many competitiveness factors. "Internet banking" and "ATM cards/machines" have the second highest score. They also have many similarities in their contributions to each competitiveness factor. "Digital check processing" ranks third with remarkable contribution to "Improving data transfer capability and continuity" factor. Also included are the brief guidelines for banks to gain a competitive advantage over competitors, such as building and leveraging their own ICT assets, and developing an action plan to enhance competitiveness.

ME-09.2 [A] Evaluating Information Quality for Effecting Business Performance

Chun-Yen Chang; National Chiao-Tung University, Taiwan
Gwo-Hshiung Tzeng; National Chiao-Tung University, Taiwan
Mei-Chen Lo; National Chiao-Tung University, Taiwan

The complexity of fab operation has increased along with advance in technology and increases in wafer size. Automation in both material transportation and information collection for operation feedback are the keys to running an efficient semiconductor manufacturing company. Therefore, this paper uses upon information quality and knowledge management theory to propose a model from four different aspects (by unit, by group, by function and by management) to view an entrepreneur's communication network features. This is done by aggregating the synthetic performance value of all possible alternatives and strategies in multiple attribute decision-making (MADM) problems. This process is based on the results of an empirical study where the Analytical Hierarchy Process (AHP) technique was employed to survey the performance of an information quality (IQ) system upon knowledge management enquiry. This study aims at quantifying relative priorities for a given set of alternatives, based on the intuitive judgments of the decision-maker in seeking consistency within the comparison of alternatives in the decision-making process. From the overall synthesis performance value, the results demonstrate a consistent results of the top five alternatives, indicating that accuracy, consistency, convenience of access, believability and ease of understanding are the items needing the most improvement.

ME-09.3 [A] Implementation of Management Accounting Information System (MAIS) in Chinese Banking Industries

Dehong Jiang; China Construction Bank ShenZhen Branch, China
Ruisheng Huang; China Construction Bank ShenZhen Branch, China

Based on thorough decomposition of typical business processes and utilization of datawarehousing technique, this paper puts forward a kind of novel data mart model, which organizes the data from miscellaneous channels. The model enables us to analyze and calculate the operation cost and in-depth potential profitability according to respective products/services, customers and organizational units (such as departments, subsidiary banks and client managers). Therefore, the EVA of each of the products/services, customers and organizational units would be clear at a glance. The decision-maker could avoid the risk of making mistakes and concentrate resources on services and productions that have great potential benefits.

ME-10 Productivity Management-1

Monday, 8/1/2005, 15:30 - 17:00 **Room: Studio Suite**
Chair(s): Scott Leavengood; Oregon State University

ME-10.1 [R] Measuring the Efficiency of Warehouse Logistics Operations Using DEA and Weight Restrictions

Amer Hamdan; University of Texas at Arlington, United States
Man Chen; University of Texas at Arlington, United States
Jamie Rogers; University of Texas at Arlington, United States

This paper introduces Data Envelopment Analysis (DEA) as a tool to evaluate the efficiency of a group of warehouse logistics operations. DEA is a linear programming technique used to evaluate the efficiency of Decision Making Units (DMUs) where multiple inputs and outputs are involved. The paper starts with a general review of the DEA models and basic definitions, then, provides a review warehousing functions and performance measures. First, the basic (unrestricted) DEA model is applied to a group of homogenous warehouses that have similar inputs and outputs, then, a revised (restricted) DEA model with additional constraints is presented; the revised model incorporates weight restrictions and value judgment. The relative efficiency scores for the warehouses used in the study were analyzed before and after the use of weight restrictions. As a result, we were able to determine the impact of each input and output on the efficiency of each warehouse, and also, we were able to examine specific warehouse characteristics and develop a set of recommendations for assisting managers and engineers in the improvement and design of more efficient operations.

ME-10.2 [R] Labor Productivity and Management of Technology in the Brazilian Industry

Kazuo Hatakeyama; Federal Center of Technological Education, Brazil
Marcelo Antonio Percicotti da Silva; Federal Center of Technological Education-Parana, Brazil

This paper examines the levels of labor productivity of groups of economic activities of the Brazilian manufacturing industry, classified in accordance with the technological intensity, and considers the implementation towards the improvement of technology, making possible the increase of the labor productivity in those activities that contributes to the generation of jobs and/or participation in the value aggregation of the industrial transformation. For the assessment procedure, one uses the data elaborated for the Brazilian Institute for Quality and Productivity - IBQP/PR - on the labor productivity, the level of the staff employed, and the average schooling level of the groups of economic activities of the Brazilian manufacturing industries, in the period of 1996 to 2001. By this way, it is possible to identify the presence of traditional economic activities that present low productivity, and the participation in the generation of jobs, that demand the implementation of programs for the improvement of productivity, whereby would results positively for the Brazilian society as a whole. It also has noticed that, a series of activities with gradual participation in the value aggregation of the industrial transformation is demanding the incorporation of technical progress aiming the increase of labor productivity.

ME-10.3 [R] IBM, from Products to Professional Services Provider: The Role of Functional Groups for Cohesion in Optimizing Value Delivered to Customers

Jozee Lapierre; Ecole Polytechnique, Canada
Bruno Cappella; Polytechnique University in Montreal, Canada

Defining roles, responsibilities and power for the functional business units of a company that plans to offer professional services rather than strictly products and support services is not the only factor entering into the transformation of that company. Our objective is to show that mechanisms for interaction and collaboration between those units are essential for developing, promoting and delivering value to customers. With this in mind, we examine the case of IBM.

ME-11 TUTORIAL: Collaborating Across Boundaries to Generate Intangible Forms of Capital

Monday, 8/1/2005, 15:30 - 17:00 **Executive Suite**
Speaker(s): Michael M Beyerlein; University of North Texas

Capital represents resources – either tangible or intangible. Organizations rely on both but traditionally and formally have focused on the tangible – financial and physical assets. Although intangible resources have clearly been recognized and manipulated informally throughout history, deliberate attention to their role in the organization has only emerged in the past decade. Intellectual capital has been the primary focus, perhaps because of the transformation of the economy to a knowledge-based system. However, a large number of other types of intangible capital have been described in research journals, including: social, relationship, political, customer, organizational, human, structural, process, knowledge, market, innovation, and collaborative. Intangible forms can be converted into tangible forms and into other intangible forms. The production of capital in any of its forms depends on competencies at the individual, group, organizational, and inter-organizational levels. In this tutorial, we will focus on the design of organizations where collaboration is a core competency and how that enables the generation of capital in a number of forms, including intellectual, social, and financial, by leveraging existing resources across boundaries. The principles of collaborative organization will be illustrated through an exercise that enables participants to identify ways collaboration generates various forms of capital in their organizations.

ME-13 Supply Chain Management-2

Monday, 8/1/2005, 15:30 - 17:00 **Room: Galleria-1**
Chair(s): Stella Hua; Western Washington University

ME-13.1 [R] A New Supply Chain – Reverse Logistics: A New Form of Capturing Value, Focusing on Sustainable Development and Customer Care

Joao M Simoes; Portland State University, United States
Evan E Hall; Portland State University, United States

Rogers and Tibben-Lembke from Alysida Solutions Inc [1] gave a good definition for a new and growing field in Supply Chain Management: "Reverse Logistics includes the processes of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finish goods and related information from the Point-of-Consumption to the Point-of-Origin for the purpose of recapturing value or proper disposal." This is not just a reversed supply chain, it's a new array of issues and variables to consider and manage properly. It includes the process of moving goods from their typical final destination in order to capture value, or proper disposal. How you deal with returns, how you are aware of and manage it, might be the difference between reducing costs and increasing value, or live with a problem on your back. Reverse logistics is also processing returned merchandise due to damage, seasonal inventory, restock, salvage, recalls, and excess inventory. It includes recycling programs, hazardous material programs, obsolete equipment disposition, and asset recovery. Reverse Logistics, or the Reverse Supply Chain as many call it, can deal with low numbers of single items scattered across large regions, or it can deal with recycling, demanded by strict environmental laws, or the realization of the social and economic value of planning for reusability. There is a new paradigm being developed around Reverse Supply Chain Management. [1] "The Alysida Reverse Logistics Solution", Alysida Solutions Inc, 2004. http://www.alysida.com

ME-13.2 [R] The Coexistence in the Supply Chain

Yuying Wu; Beijing University of Technology, China
Feng Yan; Beijing University of Technology, China

The different groups in the supply chain are similar to related species in an ecology system. The organizational environments are increasingly turbulent, organizations are increasingly less autonomous and formal organizations are increasingly important components of organizational environments. The different groups in the supply chain are depending upon each other more and more. A coexistence model of Lotka-Volterra system is proposed in this paper and applied in the analysis of the market alliance organizations.

ME-13.3 [R] The Co-evolution in the Value Chain

Yuying Wu; Beijing University of Technology, China
Feng Yan; Beijing University of Technology, China

The different groups in the value chain are similar to related species in an ecology system. The business environments are increasingly turbulent, corporations are increasingly less autonomous and formal organizations are increasingly important components of the value chain. The different groups in the value chain are depending upon each other more and more. A co-evolution model of Lotka-Volterra System in the value chain is proposed in this paper and applied in the analysis of the value chain.

ME-14 Semiconductor Industry-2

Monday, 8/1/2005, 15:30 - 17:00 **Room: Galleria-2**
Chair(s): Jonathan C Ho; Yuan Ze University

ME-14.1 [R] Inter-firm Collaboration Mechanism for Process-Product Innovation Between Foundry and Fabless Design House

Yea-Huey Su; National Central University, Taiwan
Ruey-Shan Guo; National Taiwan University, Taiwan
Shi-Chung Chang; National Taiwan University, Taiwan

As IC design and manufacturing complexities continue to increase exponentially, new collaboration mechanisms are required between foundry and fabless IC design house in the semiconductor industry. By exploring a typical case of the leading foundry A and fabless B (we disguise the case provider for confidential reason) via conducting field interviews and empirical study, this research summarizes different engineering collaboration mechanisms under different stages of process technology. There are several findings: 1) The collaboration is mostly required when the design house develops advanced products and the foundry needs driving product to develop advanced processes; 2) The major effort of collaboration in advanced and developing processes is to find the critical failure modes in order to dra-

matically improve the yield of new process technology; 3) It is critical to have right experts from both parties; 4) The migration from low yield toward high yield requires improvement through both product design tuning and process tuning. Partnership and close interactions are required for quick problem solving. Insight resulting from this exploratory study is offered to help researchers and managers have foresight in response to the trend of new foundry-fabless business model, re-integration of vertical dis-integration for process-product innovation, according to the continuous deep sub-micron process development.

ME-14.2 [A] Using Run-to-Run Controllers to Increase Process/Product Quality in a High-Mix Manufacturing Environment

Nima Behkami; LSI Logic Corp, United States
Paul Rudolph; LSI Logic Corp, United States

This presentation reports the results of successfully implementing an APC (Advanced Process Control) Controller at LSI Logic's ASIC's fabrication planet, to regulate Etch Time at Block Etch Step. Due to incredibly tight process tolerances and the fact that many Fab tools have not kept up, Advanced Process Controllers (APC) have become essential in semiconductor manufacturing. Using a mathematical model and historical data, a Controller can make real-time adjustments to the manufacturing process without human intervention. These corrections result in improved product quality by allowing a well-controlled and tightly monitored Fab, reducing test wafers and necessary inspection time, reducing scraps and rework, and minimizing engineering sustaining efforts. This presentation will explain why the Block Etch Step was chosen as a candidate for APC implementation. It will show capacity improvement and yield improvement numbers for before and after implementing the Block Etch Controller. It will also explain the project and business objectives that were set to meet goals.

ME-14.3 [A] Modeling and Optimizing Wafer Layouts Using WOM to Improve Yield and Product Quality

Paul Rudolph; LSI Logic Corp, United States
Nima Behkami; LSI Logic Corp, United States
David Sturtevant; LSI Logic Corp., United States

This presentation shows how WOM (Wafer Object Model) was used to optimize wafer layouts at LSI Logics ASIC's fabrication plant. WOM is a virtual representation of all the parts on a wafer. Wafer layouts can be optimized based on many parameters including historical yields and photo-stepper throughputs. A wafer layout refers to the way that the die and photo-stepper shot combinations are placed on a wafer. Depending on the die size and stepping distance, the permutations of layouts can range from hundreds to hundreds of thousands. However, not all layouts are desirable. The most desirable layouts are ones with the highest net yields. This presentation will explain how WOM can be utilized to reduce the set of permutations into a more manageable number. It will also show how WOM can be used by engineers to experiment with what-if scenarios.

ME-15 Entrepreneurship/Intrapreneurship-3
Monday, 8/1/2005, 15:30 - 17:00 **Room: Galleria-3**
Chair(s): Burton Dean; San Jose State University

ME-15.1 [R] Technical Entrepreneurship in Developing Countries

Albert H Rubenstein; Internat'l Applied Science & Technology Associates, United States

The central focus of this project is on identifying, supporting, and assessing entrepreneurial projects of a technical nature in selected developing countries. The methodology is based on the research and consulting experience of the author and his colleagues in this field over several decades. This includes: (a) performing basic research on technical entrepreneurship, (b) consulting with large firms and high-tech start-ups, and (c) serving as a member of the board of directors of a venture capital company. The author has also had extensive experience in the field of science and technology in developing countries. The objectives of this project are to: (a) encourage promising young entrepreneurs to look beyond traditional products and services for business opportunities, incorporating "mid-tech" materials, production processes, products, and applications; (b) provide linkages to firms inside and outside their country which have technology-based products and services that can be adapted to be "appropriate" in the developing country context; (c) help attract both internal and external start-up funds and, eventually, steady-state financing; and (d) encourage the emergence of a cadre of "technical entrepreneurs" to enhance their countries' economies.

ME-15.2 [R] The Educational Profile in Entrepreneurship of Post-graduate Students: A South African Perspective

Frans J Lotz; University of Pretoria, South Africa
Andre J Buys; University of Pretoria, South Africa

New venture creation in the technological business domain is a cornerstone for growth and job creation in developing nations. Despite this internationally accepted notion, the present body of knowledge on technological entrepreneurship in emerging countries is fairly limited. Research is being conducted in South Africa by the University of Pretoria on the status of technological entrepreneurship and focuses on the: - Profile of the practicing technological entrepreneur (person); - New venture creation process of the technological enterprise; - Further development of the new venture into a mature business; and - Environmental influences on the above. This paper presents findings on part of the research project, in particular the educational profile in entrepreneurship of students participating in the MOT and other Masters of Engineering Management programs at the University of Pretoria. Data was collected through questionnaires, analyzed statistically and several inter-relationships between the key entities of technological entrepreneurship development were identified. The findings could act as indicators to policy makers in emerging societies where the traditional so-called 'first-world' knowledge and views are not necessarily applicable.

ME-15.3 [R] Entrepreneurial Learning and the Process of Firm's Growth: Evidence from SMEs in the PRC

Hui Qin; Zhejiang University of Technology, China
Gongmin Bao; Zhejiang University, China

It is recognized that the growth of small and medium-sized enterprises (SMEs) is very important for developing countries. Further, many scholars have argued that entrepreneurial learning is critical to the growth of SMEs. However, little attention has been paid to the co-evolution of entrepreneurial learning and the growth process of SMEs. This study explored the dynamic nature of entrepreneurial learning during the growth process of four different SMEs in the largest developing countries in the world, i.e., the PRC. The results demonstrated that the relationship between entrepreneurial learning and the process of firm's growth is essentially non-linear and discontinuous. In fact, a large part of entrepreneurial learning is experiential, and the pre-start courses in entrepreneurship training are less useful for firm's growth than expected. Entrepreneurs' own experience is critical to the formation of their firms, but not enough for firm's growth. They have to develop different abilities to capture opportunities and to access resources through their social network during different stages of the growth process of their firms. For the healthful growth of their firms, entrepreneurs need mentors who can show them how to reflect from experience and to absorb the knowledge.

ME-16 Technology Management Framework-3
Monday, 8/1/2005, 15:30 - 17:00 **Room: Parlor-A**
Chair(s): Alan Pilkington; University of London

ME-16.1 [R] Toward a Fundamental Entity of Technology

Aaron J Shenhar; Stevens Institute of Technology, United States
Rias van Wyk; Technoscan Centre, United States
Joca Stefanovic; Stevens Institute of Technoligy, United States
Gerard Gaynor; Stevens Institute of Technology, United States

While technology is clearly playing a major role in modern life, there is surprisingly no common agreement on its definition. A new academic discipline, Management of Technology (MOT), has recently emerged, but many of its concepts have not been organized yet into a unified field - let alone a theory. Whereas the term organism serves as the fundamental entity in biology, there was so far no equivalent entity of technology, thus posing a serious constraint for theory building of technology. To overcome this barrier we suggest a possible fundamental entity, which can serve as the basic building block for the definition and con-

ceptualization of technology.

ME-16.2 [R] Recent Developments in Systems Thinking, and Engineering and Technology Management

Murat K Yurtseven; Yeditepe University, Turkey
Walter W Buchanan; Nothestern University, United States

The objective in this paper is to explore the inter-relationship between some of the recent developments in Systems Thinking, and Engineering and Technology Management. It is argued that these developments (such as critical systems thinking, soft systems methodology, and soft versions of cybernetics, operations research, and system dynamics) may make significant contributions into the way engineering and technology managers deal with the complexities involved in their interdisciplinary problematic situations. In particular, the discussion given in the paper is focused on the applicability of these new approaches to technology deployment.

ME-16.3 [R] Implementation of New Technology - Factors for Success

William R Peterson; Old Dominion University, United States
Leonardo Bedoya-Valencia; Old Dominion University, United States
Yaneth Correa-Martinez; Old Dominion University, United States
Kawintorn Pothanun; Old Dominion University, United States

The successful introduction of any new technology into an organization is a challenging proposition. This paper looks at a series of situational elements, their states, and their impact on the project. While several of the elements cannot be easily manipulated, understanding these elements, the state of the element, and allowing for this state in the planning and execution of the project can improve the likelihood of a successful implementation. Understanding of these elements also allows an organization to better design the organizational culture to accommodate change.

ME-17 Collaborations in Technology Management-2
Monday, 8/1/2005, 15:30 - 17:00 Room: Parlor-B
Chair(s): Al Herman; Quantric Corp.

ME-17.1 [R] Management Instruments in Innovation Networks from an Operational Perspective

Jan E Borchert; University of Goettingen, Germany
Svenja Hagenhoff; University of Goettingen, Germany

In this article we will analyze the requirements for operational management instruments used in technology and innovation management in network organizations and apply these exemplary to an existing instrument. For this analysis the case study "Toll Collect", a Network of DaimlerChrysler, the German Telecom and Cofiroute will be used. Due to the increasing complexity of products, companies are increasingly forced to implement their innovation process in networks. But high failure rates of innovations and also a large number of unscheduled break-ups of networks indicate that the established instruments like the value benefit analysis or the project management and processes don't meet the requirements of networks. The existing instruments have to be modified or new ones have to be created. The actual requirements for the instruments will be derived using different sources. First the goals, tasks and characteristics of innovation management in networks will be considered. To illustrate the tasks comprehensively, an integrated process model will be developed that depicts both the innovation management and the network management tasks. In addition, shortfalls of the existing instruments are derived from empirical studies. This paper tries to fill a gap in the literature by deriving requirements for management instruments. The requirements will afterwards be faced to the properties of the value benefit analysis. This instrument is used to demonstrate how it could have supported the innovation process at the "Toll Collect" project more effectively.

ME-17.2 [R] A Network of Regional Software Companies: Management Viewpoints

Jari Soini; Tampere University of technology, Finland
Jari Leppäniemi; Tampere University of Technology, Finland
Timo Varkoi; Tampere University of Technology, Finland
Hannu Jaakkola; Tampere University of Technology, Finland

The aim of an ongoing research project is to clarify the views and experiences of small and medium sized (SME) software companies concerning networking in a region. Also, the possible obstacles and problems of networking are to be recognized. This paper presents the views of the SME software companies' management in the importance of networks in their business. The research included questionnaires and interviews, and the information received was analyzed. According to the results of this analysis, the current situation of networks in the software SME-sector is evaluated in order to give recommendations to the management of the companies to develop and make their business more effective.

ME-17.3 [R] Ten Years of Technology Management Research at Cambridge: What Has Been Done and What Does the Future Hold?

David R Probert; University of Cambridge, United Kingdom
Rob Phaal; University of Cambridge, United Kingdom

Technology management research at Cambridge goes back over more than ten years and the Centre for Technology Management was set up within the Engineering Department eight years ago. During that period it has grown to be the largest research centre within the Institute for Manufacturing and has developed many active lines of research and collaborative projects with industry. This paper reviews the research agenda as it has developed over the life of the Centre, reflecting the evolving international interest in the field and the concerns of industrial partners. An assessment is made of what contribution to research, practice and teaching may have been achieved, and the results of a recent poll of future research priorities is discussed. Key emerging themes include technology convergence, determining the future worth of emerging technologies and new business models for the 21st century.

ME-17.4 [A] Manufacturing Technology Management for Product Design and Manufacturing Cooperation

Takehisa Seino; Toshiba Corporation / The University of Tokyo, Japan
Kiyoshi Niwa; The University of Tokyo, Japan

One of the most important issues in technology management in Japanese manufacturing companies is establishing methodologies for efficient cooperation between product design and manufacturing sections, thereby realizing competitive product development with a high performance, a high quality, a low cost and a short lead time simultaneously. In this paper, efficient information transfers and flexible activities between these two sections are discussed by analyzing actual successful activities in Japanese manufacturing companies. Then, as management tools, unit and chain models of the cooperation are proposed to analyze processes for successful cooperation.

ME-18 Environmental Issues in Technology Management-2
Monday, 8/1/2005, 15:30 - 17:00 Room: Parlor-C
Chair(s): Robert Harmon, Portland State University

ME-18.1 [R] Sustainable Life Cycle Management: Development of Social Indicators for Technology Management in the Process Industry of South Africa

Alan C Brent; University of Pretoria, South Africa
Carin Labuschagne; University of Pretoria, South Africa

Corporations are increasingly pressurised to commit to and report on the overall sustainability performances of operational initiatives, i.e. undertaken projects or technological innovations. A prerequisite for aligning these operational initiatives with the principles of sustainable development is a clear understanding of the various life cycles that are involved and the interactions between these life cycles. Such a holistic Life Cycle Management (LCM) approach therefore requires an effective integration of different life cycles that are fundamental to the manufacturing sector, i.e. projects that drive internal change, assets (or technologies) that are required to manufacture products or supply services, and products (or services) from which income is derived. From a technology management perspective, tools are necessary

to evaluate the sustainability of these integrated life cycles. Social indicators are subsequently introduced to evaluate the sustainability of operational initiatives in the process industry through an integrated Life Cycle Management (LCM) approach. The indicators consider the social footprint in a specific region where a process technology will be deployed in order to evaluate its potential social impacts. However, the practicability of these indicators is highly dependent on the availability of information where a technology is assessed. A case study in the South African process industry is used to demonstrate the calculation procedure. Further case studies are required in order to refine social indicators that are practical for technology management purposes in the process industry.

ME-18.2 [A] Ecologically Sustainable Product Innovation

Dawood Abugharbieh; Portland State University, United States
Robert Harmon; Portland State University, United States

Ecologically Sustainable Development (ESD) is emerging as a critical business issue with the potential to impact a firm's product innovation process. This corporate social responsibility driven trend is the culmination of market forces that include changing consumer expectations, evolving community standards, government regulation, and pressure from non-governmental organizations. Firms are beginning to approach ESD from a risk management perspective, since the emerging ESD paradigm has the potential to cause discontinuities in markets, industries, and technologies with corresponding impacts on operations and financial results. The need is apparent for new strategies that will reduce the ecological footprint of new products throughout the development and consumption cycles. Existing research provides little insight for how to proceed. The primary focus of ESD research has been on the corporate policy and operational dimensions of environmental management with little attention given to new approaches for the development of ecologically and economically sustainable products. This paper posits a model for sustainable product development that leverages the "fuzzy front end" of product (and process) design to favorably impact sustainable market outcomes.

ME-18.3 [A] Cluster: Alternative of Sustainable Regional Development

Sieglinde K Cunha; IPARDES/FACIPAL, Brazil
Joao C Cunha; UFPR, Brazil
Michitoshi Oishi; AIEC, Brazil

This paper is based on the concept of clusters or productive arrangements as an alternative of sustainable regional development, more specifically of the Ponta Grossa Region/Castro (Paraná – Brazil). With the changes in the recent years in the economy and the installation of new industries, the companies and institutions need to search alternatives to continue competitive. Through the analysis of cluster potential of the industry of the cited region, it is looked for identify the region function and emphasize the importance of companies agglomeration and institutions geographically concentrated that increase the competitiveness when they establish relations of complementation and interdependence.

TA-01 PLENARY-2

DATE: TUESDAY, AUGUST 2
TIME: 08:00 – 9:30
ROOM: PAVILION

KEYNOTE

Youngrak Choi; Korea Research Council of Public Science & Technology (KORP), South Korea

"The Role of Government in Technological Innovation: East Asian Perspectives"

The role of government in technological innovation is considered crucial in general. Is it? Aren't there any other critical factors? This paper explores this fundamental question by examining the innovation policies in three East Asian countries with particular emphasis on government-business relation. The paper explains the patterns and processes of industrial development in Korea, Taiwan and Singapore, which have managed the shift from light industries to high-technology reasonably well. Korea's approach to technological innovation through large enterprises (so-called Chaebol), Taiwan's emphasis on small- and medium-sized enterprises (SMEs) and Singapore's success with multinational enterprises (MNEs) are described. The role of government policies in technological innovation such as the cultivation of key R&D players, mobilization of resources, development of the R&D infrastructure, etc. is discussed. In particular, similarities and differences in government policies are emphasized, and the change of government policies after the 90s, when self-growing S&T capability was the key issue, is explored. The paper focuses on the crucial role of government policy in technological innovation, but it also articulates that the role of private enterprises is equally essential. Examples of private firms are given which have made massive in-house R&D efforts and succeeded in establishing strong R&D capability in response to government initiatives. The paper concludes with lessons learned from these East Asian perspectives.

KEYNOTE

Rosalie Zobel; European Commission, Belgium

"The Lisbon Agenda Revisited: The Key Role of the 7th Framework Programme for Research"

Five years ago the European Union launched an ambitious agenda, aiming at Europe to become the largest knowledge-based economy in the world by 2010. At half-time, the Commission is reviewing the progress made. This process has led to a vigorous debate at the European and national level amongst all those with an interest in Lisbon's success. The Commission has benefited from the work of a High Level Group, chaired by the former Dutch Prime Minister Wim Kok, that reported last November. The result of this assessment is that Europe is still far from achieving its potential for change that the Lisbon strategy offers. While the diagnosis and the remedies are not contested, the reality is that not enough progress has been made. At their Spring Council meeting, 22-23 March 2005, in Brussels, Europe's Heads of State and Government reaffirmed their commitment to the principles of the Lisbon Agenda, and reinvigorated measures around two principal tasks – delivering stronger, lasting growth and creating more and better jobs. The renewed Lisbon Action Programme identifies new action at the European and national level which will help to see the Lisbon vision achieved. One of the key elements of this action plan is an increased commitment to R&D and innovation. A doubling of the resources for the next European Framework Programme for Research (2007-2013) has been proposed by the European Commission. The presentation will highlight the novelties in terms of research content as well as in terms of a new management approach to R&D that the Commission has proposed in order to strengthen the European R&D base and to move research into innovation more effectively.

TB-01 Technology change management in the automotive industry

Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Pavilion East**
Chair(s): Leslie Monplaisir; Wayne State University

TB-01.1 [A] Creating Structured Innovation Management: The Visteon Experience

Kenneth Chelst; Wayne State University, United States
Yavuz B Canbolat ; Wayne State University, United States

Visteon is an $18 billion global supplier of automotive interiors, climate and electronics systems. It was recently split off from Ford as an independent company that must now aggressively, efficiently, and effectively compete for new business. The keys to success will be technology and innovation and processes to efficiently and effectively drive product innovation & development. In this paper we describe two projects. One is called IDEATION and dramatically increased the rate of flow of new ideas. The second project, SMART IDEAS, was focused on structuring and providing discipline for the initial gate zero review of new ideas. Both projects were outstanding examples of final team projects in the Engineering Management Masters Program that Wayne State University offers at Visteon.

TB-01.2 [A] Accelerated Design Cost Reduction

Ken Riopelle; Wayne State University, United States
Gary Callies; Visteon Corp, United States
Kenneth Chelst; Wayne State University, United States

The role of technology management in melting the boundaries among disciplines to guide technology toward the betterment of humanity has become a reality at Visteon Corporation through a unique educational partnership with Wayne State University (WSU). WSU's Department of Industrial Manufacturing Engineering, the School of Business Administration and the Department of Anthropology have combined their disciplinary boundaries to offer a unique Engineering Management Master Degree for high potential engineers. The Engineering Management Master's Program (EMMP) is a unique three-year lock step program which is a blend of engineering and business courses focused on the application of theory to real-world product development and manufacturing problems. This paper is a case study of how an EMMP Leadership Project team benchmarked design cost reduction processes and crafted over ten organizational change innovations to reduce the process time required from idea concept to customer approval by 46 percent. This case illustrates how a cluster of organizational innovations which spanned departments, committees, functional roles and responsibilities was able to achieve bottom-line performance results by managing the boundary relationships. This project illustrates the importance of managing technology change across internal organizational boundaries and external client relationships.

TB-01.3 [A] Managing Technology Change Through Organizational Communication Networks

Ken Riopelle; Wayne State University, United States
Fred Hallway; Ford Motor Company, United States
James Danowski; University of Illinois at Chicago, United States
Julia Gluesing; Wayne State University, United States

The role of technology management in melting the boundaries among disciplines to guide technology toward the betterment of humanity has become a reality at Ford Motor Company through a unique educational partnership with Wayne State University (WSU). WSU's Department of Industrial Manufacturing Engineering, the School of Business Administration and the Department of Anthropology have combined their disciplinary boundaries to offer a unique Engineering Management Master Degree for high potential engineers. The Engineering Management Master's Program (EMMP) is a unique three-year lock step program which is a blend of engineering and business courses focused on the application of theory to real-world product development and manufacturing problems. This paper is a case study of how an EMMP Leadership Project team composed of different disciplines from information technology to product development along with faculty support from Engineering, Anthropology and Communication used social network analysis to analyze organizational communication networks among five manufacturing plants and a headquarters team to accelerate the diffusion of new technologies from plant-to-plant and improve productivity and profits. Based on this analysis, the team was able to make concrete recommendations to improve the use of industrial materials with a potential savings estimated at 40 million dollars.

TB-02 TUTORIAL: Program Management at Intel and Tektronix: Linking Execution to Strategy

Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Pavilion West**
Speaker(s): Russ Martinelli; Intel Corporation
Jim Waddell; Tektronix, Inc.

It is quite common for the terms 'program management' and 'project management' to be used interchangeably. Unfortunately, this serves to reinforce the confusion between the two disciplines. At Intel Corporation and Tektronix, Inc., program management is a critical business and operational function that provides the means by which new products are conceived, developed and brought to market. This tutorial by Russ Martinelli and Jim Waddell describes how the program management model is utilized to link business and technology strategy to product development execution. Key topics include: • The definition of program management as it pertains to product development • How program managements serves as the link between strategy and execution • Key distinctions between program and project management • Why Intel and Tektronix utilize the program management model to develop products • Managing the program • Program level risk management

TB-03 Government Sector-1

Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Broadway-1**
Chair(s): Deok Soon Yim; STEPI

TB-03.1 [A] Using Simulation Technology to Improve Criminal Justice System Operations

Wayne Wakeland; Portland State University, United States
Olgay Cangur; Portland State University, United States

We apply discrete system simulation to analyze the Lane County, Oregon criminal justice system. Research questions include how to improve the allocation of district attorney resources and the utilization of jail space without adversely impacting community safety. Another research area is the "matrix release" process used to alleviate jail overcrowding, a process that has the potential to prematurely release dangerous offenders. The model depicts the flow of offenders and their associated case file, from the point of arrest to their eventual release from the system, having either served their time, participated in a diversion program, been found not guilty, or any number of other possible resolutions. Offenses are broken down into a variety of categories with different levels of risk, sentence severity, and other characteristics. Outcome variables include processing time, time served, matrix releases by risk category, jail occupancy by category, and several resource utilization measures. The model is validated by reproducing the actual system performance during a historical period, and by subjecting the model to several tests, including parameter sensitivity, extreme values and specific test scenarios.

TB-03.2 [R] Overall Coordination of National Research and Development Programs in Korea

Donghoon Oh; Korea Institute of S&T Evaluation and Planning, Korea, South
YoungJun Kim; The George Washington University, United States

With the growing amount of government-sponsored national R&D programs in terms of budget size as well as total numbers of programs and related government departments, the importance of an efficient and an effective overall coordination of those programs seems certain to increase. The 'overall coordination' refers to the overall efforts to derive an optimum solution in terms of allocating limited research funds through the process of investigation, adjustment and compromise of conflicting interests arising from all interested parties. This paper introduces the overall coordination system of national R&D programs in Korea. We also address current issues and problems raised by stakeholders, and finally propose a reform measure for the improvement of an overall coordination system.

TB-03.3 [A] The Competitive Behavior of Governments: A Study of Successful IT in Great Britain

Ikenna S Uzuegbunam; Rensselaer Polytechnic Institute, United States

Information Technology innovation has presented an unprecedented challenge to both private and public sector organizations. Between early 1980s and the 1990s, software system failure was quite rampant across countries and across sectors. Complex Product software systems (CoPS) failed to meet deadlines, costs and systemic requirements. Whereas Fredrick Brooks had attributed software development failure as a 'mythical man-month syndrome', it became evident through subsequent research that the prevalent failure of software systems were based on a complex variety of reasons mostly associated with (mis)management of technological innovation. As a result, most firms (and governments) are seeking to master the 'art' of managing software development, as this 'art' has become a pre-requisite for survival in this technologically driven era. Thus, this paper attempts a critical review of the evolution of government policy reforms in IT procurement within the British public sector. These reforms are based on a series of recommendations made by the cabinet office after investigating the causes of IT failure in the public domain. It is widely believed that the reforms would improve managing information technology (software-based) projects in Great Britain. Nevertheless, it is important to look at these reforms within a wider context of innovation management in the public institution.

TB-04 Technology Based Organizations-2
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Broadway-2**
Chair(s): Robert J Watts; TACOM

TB-04.1 [A] Driving Change from the Middle in High-Tech Organizations: An Approach and Lessons Learned from a Military Science & Technology Development Organization

Grace M Bochenek; U.S. Army, United States
Timothy Kotnour; Univeristy of Central Florida, United States
James Ragusa; Booz Allen Hamilton Inc., United States

The U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC) recognized a need for strategic organizational renewal and transformation to become more responsive and relevant to its operational military and funding customers, ongoing war effort support, and anticipated future combat and support system requirements. In an effort to identify and solve significant problems without a major disruption to the organization, a "grass-roots" approach, which balanced middle management sponsorship and leadership with bottoms-up involvement, was taken to identify and implement several strategic "quick wins." During the process a middle management steering group and champion were identified, and working-level action teams formed to identify several significant contemporary problems considered critical to near- and longer-term organizational success. This planned approach was an alternative to the more traditional and protracted strategic organization analysis and renewal process (developing or reviewing mission, vision, goals, objectives, etc.). Identified and reported in this paper are: a research approach and methodology, a case description, some improvement initiative results, and implications for managers of technology. A central research question asked and partially answered was: Is this "grass-roots" engineering and technology management approach effective and efficient for identifying and driving organizational performance improvements. The preliminary answer is: Yes, it was.

TB-04.2 [R] In-house Technology Center: A New Emerging R&D Organization Within Chinese Manufacturing Firms

Nan Ma; Beijing University of Aeronautics and Astronautics, China
Jiancheng Guan; Beijing University of Aeronautics and Astronautics, China

As a new emerging form of R&D organization, in-house technology centers of huge firms in China could improve their original indigenous innovative capabilities, and furthermore, help increasing their absorptive capacity for technological efforts being done outside the firm. In this paper, the authors give a profile on the development trends of the in-house technology centers in China. The criteria for selection of the in-house technology centers are discussed and described. The evaluation procedures include the agency evaluation and the experts' evaluation, which are independently performed by Evaluation Research Center of Chinese Academy of Sciences and some active experts in the field of technology management in China. The detailed indicators for evaluation are graphed in this paper to make clear the hierarchical structure in the indicator system. Then, the development achievements have been concluded that, there are altogether 332 in-house technology centers selected and authorized during 1993-2004. The 18 industrial sectors and 31 provinces, autonomous regions and municipalities which the technology centers have covered are in detail delineated. Unbalanced distributions of the in-house technology centers amongst different regions and industries are exposed and then their weaknesses are revealed through analysis. Finally, some policy implications for tackling these weaknesses are proposed.

TB-04.3 [R] Constraints to Technology-Based Firms in Developing Countries: An Assessment from the Brazilian Experience

Marcelo Pinho; Federal University of Sao Carlos, Brazil
Ana Cristina Fernandes; Federal University of Pernambuco, Brazil
Mauro Côrtes; Federal University of Sao Carlos, Brazil

The paper is focused on the restraints to the creation, maturation and growth of technology-based firms (TBF) in developing economies, based on empirical evidence from the Brazilian experience. The argument has been developed from a database drawn from a survey which includes information about 117 firms. The paper is organized in three sections, besides the introduction. In the first one, we discuss briefly the methodology of the field work and present a definition of developing economies' TBF. We intend to distinguish technologically dynamic firms from those that operate in activities where the technological frontier moves more slowly even though their technology may be dense and complex. Section 2 is focused on results from the database analysis in relation to the difficulties that developing countries' TBFs face. Our argument highlights the restraints on these firms' competitive strategies and very limits for their accumulation prospects imposed by market dynamics and competitive effects of structural characteristics of TBF's in lagging economies. Section three of the paper argues for a discussion about some implications of industrial policy drawing from the arguments presented.

TB-05 Technology Adoption and Diffusion-3
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Broadway-3**
Chair(s) Nuri Basoglu; Bogazici University

TB-05.1 [A] Planning for the Adoption of a New Technology at the Mexican Retail Industry

Victoria E Erosa; Desarrollo Academico, Universidad Olmeca, Mexico
Pilar E Arroyo; ITESM Campus Toluca, Mexico

Retailing chains face severe competition due to increasing customer demands related to product variety and low prices. To assure a proper assortment of products, a reliable supplier base is required, along with a cost-efficient manner to identify new suppliers, track good prices, place orders and make payments. Electronic catalogs are recognized as one of the technology solutions to reduce transaction costs and processing times, and at the end, for supply chain integration of retailers and suppliers. One of the main retailing chains in Mexico decided to adopt an electronic catalog as part of its strategy for an efficient supplier management. The retailer exercised power over its supplier's base to complete the adoption as soon as possible, but decided to provide training to induce the suppliers to accept the application. In order to define the training requirements, the suppliers' readiness to operate the electronic catalog was assessed. The evaluation considered four critical readiness dimensions: technological, database alignment, human resource and development of supply chain links. The diagnostic revealed the need to support suppliers in the development of relationship management activities to align databases and processes with their trading partners, and redefinition of tasks for the sales employees.

TB-05.2 [R] Consumer Adoption of e-Service: Integrating Technology Readiness with the Technology Acceptance Model

Chien-hsin Lin; National Chi Nan University, Taiwan
Hsin-Yu Shih; National Chi Nan University, Taiwan
Peter J Sher; National Chung Hsing University, Taiwan
Yen-Li Wang; National Chi Nan University, Taiwan

The technology acceptance model and the construct of technology readiness were reviewed in this article. The study proposed an integrated model for explaining consumers' intention to use online stock trading system. Based on related theoretical backgrounds, the study integrated technology readiness with the technology acceptance model, and theorized that the impact of technology readiness on use intention is completely mediated by both perceptions of usefulness and ease of use. The research hypotheses and the integrated framework were tested and confirmed by Web-based survey data. Theoretical and practical implications and future research directions were discussed.

TB-05.3 [R] A Study on the Business Strategy to Enlarge Wireless Lan Market in Korea

Moon-Koo Kim; ETRI, Korea, South
Kyoung-yong Jee; ETRI, Korea, South
Jong-Hyun Park; ETRI, Korea, South
Dong-sup Oh; ETRI, Korea, South

The Wireless Local Area Network (WLAN) service, which once drew expectation to become a new core business in the mature Korean communication service market, is now at a crit-

ical situation of chasm in which subscribers are stagnated and fearful of losing its potential market by emerging competitive services. This paper has taken a closer look on the status of WLAN service's utilization based on a questionnaire result subjected to the city areas and analyzed the special characters of non-users in order to expand WLAN service market. Especially, this paper tried to analyze the reason for WLAN non-proliferation based on an innovative theory and come up with strategic tasks and suggested an idea to overcome the chasm. In addition, this paper has presented strategies to do repositioning work and offer a new business model service through analyzing the possibility of connecting with portable internet.

TB-06 Management of Technical Workforce-1
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Broadway-4**
Chair(s): Peter Flynn; University of Alberta

TB-06.1 [A] White-Collar Job Migration: The Strategies to Survive

C. M Chang; University of Buffalo, United States

By 2015, several millions of white-collar jobs are projected to migrate from the United States to low-wage nations. It will affect many engineering jobs which may be performed digitally and/or remotely. This paper discusses the nature of the white-collar job migration problem, which is induced by the supply and demand of engineering graduates in affected countries, the salary disparities between US engineers and their overseas' counterparts, and the driving forces behind many US companies to outsource white-collar jobs. It then discusses the known cases of white-collar job offshoring and the types of engineering jobs which may likely be targeted for outsourcing. To effectively survive this adverse trend, engineers may find it insufficient to simply master the eleven attributes as defined in "The Engineer of 2020," published by National Academy of Engineering. Instead, engineers are advised to pursue broad-based advanced training and to be selective of the industries, companies and types of engineering activities and functions they get themselves involved with. In addition, they should acquire the right type of knowledge and practice a "Steady Ascent" strategy, which guides them to constantly strive to add new value to their organizations. Specific examples of applying the "Steady Ascent" strategy are elaborated.

TB-06.2 [R] Analysis of Behavior Change of Chinese Local Workers Under Influence of Japanese Teamwork

Jiawei Huang; Waseda University, Japan
Takayuki Kawaura; IICLO, Japan
Junzo Watada; Waseda University, Japan

This research for three years traced and recorded changes of consciousness and behavior that Chinese workers showed when a local factory in China adopted a teamwork style and the analysis of the data explained the influence of the teamwork on their consciousness and behavior and their work performance. It is shown clearly that they resisted against the acceptance of the teamwork style and a new conduct code. But they resulted in accepting the teamwork style and changed into positive participation in a team work. In the paper, the change of the consciousness and behaviors is measured that they come to accept a work style with a more positive attitude from the initial resistance against the teamwork instruction. The paper shows that the behaviors of workers according to a team can be classified into a team-work oriented group, a partly team work oriented group, and an individual behavior group, and the feature of groups can be analyzed based on the difference of their consciousness and behavior, that the scatter charts of sample scores of Dual Scaling explain the difference among the groups in Chinese local workers' consciousness and behavior by Dual Scaling.

TB-06.3 [A] Concurrent Engineering Teams: An Overview

Ozalp Vayvay; Marmara University, Turkey
Gulgun Kayakutlu; Istanbul Commerce University, Turkey
Neslihan Sener; Yildiz Technical University, Turkey

Rapid changes in technologies and markets and short product cycles force companies to consider how to cope with these changes and improve their competitive capabilities. Some methodologies try to improve an organization's competitive capabilities by reducing time to market, integrating different departments such as R&D, marketing and production for sharing knowledge and collaboration, increasing customer satisfaction and market share. One of the most important methodologies is "Concurrent Engineering". Concurrent Engineering is a systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support. Typically, concurrent engineering involves the formation of cross-functional teams, which allows engineers and managers of different disciplines to work together simultaneously in developing product and process design. We will focus on the human side of Concurrent Engineering and the importance of teams for organizational integration. At this point characteristics of team members are vitally important. This paper indicates the role and the formation of the teams in successful Concurrent Engineering implementations.

TB-07 Project/Program Management-4
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Forum Suite**
Chair(s): Boonkiart Iewwongcharoen; Portland State University

TB-07.1 [A] Outsourcing of IT Application Development: Project Management Perspective for Customers

Ying K Kwong; Oregon Department of Human Services, United States
Matt A Taylor; PMI Group, Inc., United States
Maris G Martinsons; City Univeristy of Hong Kong, China

Public and private-sector organizations routinely outsource large information technology (IT) projects to independent contractors. This trend means a small internal staff is frequently employed to oversee large initiatives; a situation that presents a special set of project management challenges. This paper reviews project management best practices from the customer vantage point for applications development outsourcing. Management considerations that augment software development life cycle (SDLC) management and formal project management are discussed, emphasizing improved planning for such projects. We conclude with a discussion on key challenges to successful outsourcing of major application development projects.

TB-07.2 [A] Beginning Maturity-based Models Software Process Improvement: A Software Developer Company's Experience

Antonio Carlos C Tonini; University Sao Paulo, Brazil
Marly M Carvalho; Univers.Sao Paulo, Brazil

The demand of software has generated a great attractiveness for this business, expressed in the software developer company's increase, turning the products practically similar. At the same time, this scenery restricts the competitiveness just in the manner by which product's functionalities increase, and stimulates the companies to look for their own innovating way, through the added services improvement as well as in the operational inefficiency focuses elimination. One of the great software enterprise challenges is to combat the informality. A pragmatic approach only could ensure the quality guarantee of the processes, without an alignment with the business objectives and without the organizational culture evaluation, it is a little effective effort, generating additional work for the organization and, mainly, it doesn't translate itself a return of the investment. This paper aims to discuss a software developer company's experience in maturity-based models process improvement. Thus, the first section of this paper reviews the conceptual frameworks of the most widely used maturity models in the IT area. Based on this theoretical framework, the paper analyzes three practical experiences performed in Brazilian software developer companies.

TB-08 Innovation Management-4
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Council Suite**
Chair(s): Kal Toth; Portland State University

TB-08.1 [R] The Impact of Innovation System on R&D Integration in Finland

Jari Hyvarinen; Tekes, the National Technology Agency, Finland

This paper presents key elements of the innovation environment that activate technology integration both at the intra- and inter-firm level. Same methodology can be easily broadened to the university-firm relationships. We use an analysis of the Finnish innovation environment

as an example by stressing that the commercial success of R&D firms is improved when the well-functioning contracting environment is assured. Such contracting environment can be improved by the effort of innovation system. Hence, it needs more straightforward analysis to show the relationship between the institutional framework in order to connect the role of skilled human capital and success in R&D innovations, and the organizational framework inside the R&D firms in order to form high-powered managerial incentives. These incentives should lead to those decisions that utilize the high-quality and specialized inputs, and pick up the most competitive production processes. Such decisions raise the question about the awareness of hidden transaction costs, such as searching and customization costs, in the R&D integration process. Managing those costs are indeed crucial when ongoing globalization process push the firms increasingly to look for partners abroad. We use Grossman-Helpman models and Porter's strategy diamond to describe the logic behind these factors.

TB-08.2[R] Integration of Strategic Level and Operative Level Front-end Innovation Activities

Jarno J Poskela; Helsinki University of Technology, Finland
Perttu Dietrich; Helsinki University of Technology, Finland
Pekka Berg; Helsinki University of Technology, Finland
Karlos Artto; Helsinki University of Technology, Finland
Tommi Lehtonen; Helsinki University of Technology, Finland

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 and radical product concepts. This article makes a distinction between strategic and operative level front-end activities, which are often confused and unclearly articulated in literature. Strategic level front-end activities form a basis for the success of operative level operations and necessitate top management involvement. Effective integration of strategic level and operative level front-end activities both in top-down and bottom-up processing is a cornerstone for creating an efficient innovation process. The objective of this article is to empirically examine how the integration of strategic and operative level front-end activities is perceived by top managers in the product innovation context. The research design is a multiple case study. The data has been collected from 20 large and medium-sized innovation-intensive Finnish companies with semi-structured interviews. The empirical data analysis focuses on clarifying the integration mechanisms and perceived integration challenges of strategic and operative level front-end activities. The findings indicate that companies exploit different strategy-making processes, and that each strategy-making mode is prone to particular challenges. The relationship between the integration challenges and employed strategy-making modes is partly moderated by the company size. The results also indicate that the efficiency of integration of strategic and operative level front-end activities is dependent on the level of concreteness of the defined business strategies, the amount of business-minded decision making, and the balance between control and creativity. Based on the empirical findings, this paper draws implications for effective front-end management and ends up with discussing contextual factors affecting effective integration, and creating propositions for effective front-end management.

TB-08.3 [A] Introducing 'Application Development Process Chart (ADPC)' for Assistance to Across Over the Death Valley

Hiroshi Yoshino; Nomura Research Institute, Japan
Shigeyuki Sekine; AIST, Japan

Recently, many of Japan's basic research institutes, either nationally or privately owned, had been urged to develop good commercial applications or products. Because the basic research is at the farthest end from such applications or products, it's tough to develop them, even from a very good finding of the basic research. The reasons are summarized below. - Hard to find a good application or products, which can be developed from the finding or invention of the basic research. - Hard to construct a good fabrication process for a target application. - Hard to find a good market or client of the application. We developed "Application Development Process Chart (ADPC)" in order to assess a target application and its fabrication process for an invention of the basic research. To draw ADPC, elemental processes, which are necessary for the whole fabrication process, are clarified. ADPC eases to examine a bottleneck of total fabrication process of the application, and enables one to assess implementability of the target application. We applied ADPC for the molecular device research to understand the feature for their application. We will demonstrate the best strategy to develop good commercial applications or products from basic research by using ADPC.

TB-09 Technology Marketing-1
Tuesday, 8/2/2005, 10:00 - 11:30 Room: Directors Suite
Chair(s): Fred Phillips; Maastricht School of Management

TB-09.1 [R] Economic Effects of CPS in the Mobile Telecommunication Market

Byung-Woon Kim; Electronics & Telecommunications Research Inst., Korea, South
Sung Uk Park; Electronics & Telecommunications Research Inst., Korea, South
Jong Soo Kyung; Electronics & Telecommunications Research Inst., Korea, South

Voices asserting the need to introduce CPS have become louder in the Korean telecommunication market owing to the leaning of Ministry of Information & Communication (MIC) towards service-based competition, fair competition between carriers and increase of consumer benefits. Since the year 2000, major advanced nations have been expanding CPS to the long distance, international, local, LM and mobile market in order to conform basket regulator's policy, registration method, compulsory service carrier, cost distribution regulator's policy to the local market environment (OVUM, 2003). In the case of Korea, CPS was introduced to the long distance market on November 1, 1997 and CPS is to be proliferated to the local, LM and mobile markets as well in following the trend of advanced nations. There is considerable interest towards the estimation of economic benefits relating to anticipated change in consumer benefits and revenue of mobile carriers in the case CPS is introduced to the mobile telephony market. There are very few research reports on consumer benefits in the mobile telephony market as statistical information is limited. Research papers, which estimate consumer benefits by deriving general demand equations based on traffic data and revenue by carrier using estimated virtual traffic data is almost non-existent. In particular, estimating economic benefits based on revenue of carriers requires a solid understanding of very technical aspects. Currently, there are 3 mobile carriers in Korea, SKT, KTF and LGT. Access charges, market share and standard call rates are different between the carriers. Incoming traffic is categorized into own network traffic, external network traffic and fixed line traffic. Moreover, if CPS is introduced to the mobile telephony market, the call rate structure, market structure and connection relationship between the 3 existing mobile carriers and expected CPS providers such as KT, Hanaro Telecom, Dacom and Onse Telecom will become even more complex. This research paper will first estimate the price elasticity of mobile and LM telephony together with substitution elasticity using rate and traffic data from 2000 to 2003. To add, the level of change of consumer benefits will be estimated taking into account change in mobile call rate structure and market structure following the introduction of CPS. On one hand, as the introduction of CPS to the mobile telephony market decreases consumer benefits in the LM market, which has a close substitution relationship with CPS, LM service providers would decrease LM rates in order to maintain profitability. Because of the substitution relationship, the reduction of LM rates is reflected, as it would affect the mobile telephony market through the decrease in consumer benefits (Song et al., 2002). Revenue of existing mobile network providers and pre-selection carriers will be estimated based on elasticity using virtual traffic data of carriers. Revenue estimations by carrier will include mobile network fees, fixed line network fees and marketing costs. Following the introduction, Chapter 2 will provide a general outline of CPS, Chapter 3 will explain the analysis methodology in deriving economic benefits and Chapter 4 will describe the results and Chapter 5 is the conclusion.

TB-09.2 [R] Consumer Choice Behavior Toward On-board Machine in Telematics Products

Chin-Yi Chen; National Chiao Tung University, Taiwan
Yu-Jing Chiu; National Chiao Tung University, Taiwan
Gwo-Hshiung Tzeng; Kainan University, Taiwan

To think highly of e-functions of the car will be the mainstream of the automobile industry in the future. The wireless communications and internet create the Telematics industry. It provides new service functions and convenience of information transmission, and is the real-time system that can navigate automatically and combine the safety, convenience, and information technology at the same time. Since the foreign market is still unripe, the product sold by relative domestic companies may not meet the customers' needs. Therefore, to find out the important attributes which customers will take into consideration when they purchase those products and analyze the customers' preference with the utility function is a matter of concern. This study uses stated preference method and discrete choice behavior model to analyze the preference allocation of the drivers in Taiwan. The result shows that sex, location and car-having are statistically significant in marketing segmentation, and each group has different taste of the product portfolios. The market share analysis shows that the real-functioned Telematics product (No.3), with the highest market share, represents that customers pay much attention to safety and entertainment functions. The result of this research provides the segmentation, and marketing strategy planning for the firms in automobile industry to satisfy customers' needs and gives good direction to research and development in the future.

TB-09.3 [R] Customer-Centric Order Management System – A Basic Framework

Suraj Mohandas; Arizona State University, United States
Mark Henderson; Arizona State University, United States
Dan Shunk; Arizona State University, United States
Rajiv Sinha; Arizona State University, United States
Ahmet Keha; Arizona State University, United States

"Look after the customer and the business will take care of itself" – Ray Kroc Over the last few decades, businesses world-wide have come to realize this quote to be true. The business may not be capable of taking care of itself entirely, but the most important message that can be inferred from the above statement is that customers are the backbone of any industry and meeting their interests and preferences is what drives the margins and guarantees survival in the world of cut throat competition. This paper explains the framework of a model that is designed to utilize the customer related information to provide better products and solutions to their customers. The model also includes aspects of Utility Theory, Bundle/Product pricing and pricing under inventory considerations. The paper explains the various components in the customer-centric order management system (CCOMS) in detail. It concludes with a discussion on the benefits of the model and the future work related to the development of the optimization core (Optimizer).

TB-10 New Venture Management-1
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Studio Suite**
Chair(s): Melissa Appleyard; Portland State University

TB-10.1 [R] Resource-based View of Partnerships Between Technology-based Start-ups and Established Firms: A Case Study of Cambridge Display Technology (CDT)

Tim Minshall; University of Cambridge, United Kingdom
Pete Fraser; University of Cambridge, United Kingdom
Robert Valli; University of Cambridge, United Kingdom
David Probert; University of Cambridge, United Kingdom

This paper aims to provide a structure for examining the role of partnerships between technology-based start-ups and established firms from a resource based perspective, using case study evidence. The paper first seeks to place this topic within the wider literature on the use of partnerships. From this review of existing research, the resource based view on partnerships is identified as a useful tool to help us understand the motives and operations of the partnerships between technology start-ups and established firms. Analysis of issues emerging from 10 mini-case studies can be grouped around five themes of: (1) strategies and business models; (2) industry and organisational 'clockspeed'; (3) relative size and proximity of partners; (4) resources and funding; and (5) partnering competence. We then use the resource based view to examine these five themes as they apply to a spin-out from the University of Cambridge – Cambridge Display Technology – that has recently completed the Initial Public Offering of its shares on NASDAQ. The paper concludes by identifying a target for the next stage of research in this area. This will focus on the interplay between the ability of start-ups to access the resources they need to grow; the role of early-stage technology investors in supporting this growth; and the implementation of different types of partnerships at different stages of the evolution of a start-up's business model during the phases of resource access, mobilisation and generation.

TB-10.2 [R] Dual Strategy Management in Early Stage of High-tech Start-up Companies

Miho Moritake; Waseda University, Japan

There is a high risk of failure for high-tech start-up companies during Early Stage, due to the Death Valley. The paper examines the strategic choice of start-ups, especially among High-tech Start-up companies, via questionnaire survey result and growth path analysis of case review. In the end, it indicates the importance of dual strategy management to overcome the Death Valley. Specifically, the flexible correspondence between strategies for competitiveness and that for living shall be vital capability during this particular phase.

TB-10.3 [R] Japanese Bio-venture Evaluation by the Real Options Analysis

Kazumasa Shindo; Tama Graduate School of Management and Information, Japan

The real options analysis method is often used for evaluating a Bio-venture with its business uncertainty. It also can be used for the continuous corporate evaluation of the Bio-venture during conducting research and development, and provides the proper information for its corporate decision making. This paper examines how a Bio-venture is evaluated at its establishment and at the completion of the research using two methods, the Black-Scholes model, and the binomial model, respectively, and the effectiveness of the real options analysis method and the influence over the corporate decision making is discussed.

TB-13 Supply Chain Management-3
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Galleria-1**
Chair(s): David Moore; Colorado School of Mines

TB-13.1 [R] An Effective Supplier Evaluation Process for Textile/Apparel Supply Chains

S. Gary Teng; University of North Carolina at Charlotte, United States
Hector Jaramillo; Jacobsen A Textron Company, United States

Due to steep competition in the global market, textile/apparel companies have to make right decisions at different stages of supply chain operations. In this research, logistics issues involving supplier evaluation are the center of the study given that the U.S. textile/apparel industry is currently facing the need to establish effective relationships with global suppliers. This study intends to provide a supplier evaluation process to help textile/apparel companies in managing their supplier related supply chain activities. It develops a simple, flexible, and easy to use evaluation process that includes the consideration of five main clusters to reflect the performance of a global supplier in a textile/apparel supply chain. This process is comprehensive and flexible enough to resolve one of the major strategic decision issues, to have an effective sourcing operation. With the use of this process, sourcing and supplier evaluation will be much easier and effective for textile and apparel companies. A case presented in this paper shows that this process provides textile/apparel companies an easy way to evaluate their suppliers and make their selection of suppliers more efficient and effective. The results obtained from a decision matrix table demonstrated why suppliers in Asian countries and suppliers in South America are increasing their participation in the U.S. supply chain.

TB-13.2 [R] A Two-way Approach to Analyzing Factors for Retail Location Decisions

Charnwit Somprakij; Assumption University, Thailand
Chamnong Jungthirapanich; Assumption University, Thailand

Effective search for the best location relies on completeness of location factors, accuracy and

availability of location data. Much research to date has concentrated on comprehensive compilation of location factors. Although numerous lists of factors resulted, problems with inaccurate and lack of data oftentimes arose. This paper proposes a two-way, i.e. bottom-up and top-down, approach to location decisions. Location information was exhaustively collected from websites of all ministries in Thailand, resulting in a list of 228 factors. Completeness of location factors for a thorough site investigation was assured by supplementing the obtained web data with published information from research and business literature. Among these, 93 factors applicable to retail location analysis were identified and evaluated for relevancy through expert opinions. Factors were ranked in order of importance by means. They were subsequently extracted into homogeneous groups via principal component analysis. The obtained taxonomy of factors facilitates effective and efficient location search by gathering all publicly available governmental information and eliminating redundant data collection. Apart from the retail industry, the research findings may serve as a standard procedural framework for location factor analysis, which can be readily applied to other industries as well.

TB-13.3 [R] PLM and the Extent of Its Application

Kamy Farahbod; California State University, United States
Jay Varzandeh; California State University, United States

Examples of manufacturing companies designing perfect products, only to see then being produced better by other companies that have superior production processes, are abundant. While Product Data Management (PDM) systems have proved to be useful in managing product design, a more innovative approach is needed to facilitate the production, and later on, the service processes. Product Lifecyle Management (PLM) is defined as "the process of managing the entire lifecycle of a product from the concept and design phase, through production planning, visualization and marketing, to the point where the product is trashed by the user." A successful PLM effort does not occur within one company. It requires a wide range of partnerships and collaboration that facilitate common access and easy exchange of product and process information among partner companies and their vendors and customers. Many software have been developed recently to deal with and integrate the different phases in this type of management. The purpose of this paper is to explore the importance of PLM in today's manufacturing environment and its contribution to the product – process integration. In addition, a survey instrument is used to measure the familiarity of the manufacturing managers in Southern California with PLM and the extent of its use in this area.

TB-14 Technology Transfer-2
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Galleria-2**
Chair(s): Larry G van den Berghe; University of Waterloo

TB-14.1 [A] Space Coast Innovation and Technology Commercialization Partnership

Carmo A D'Cruz; Florida Tech, United States
William Arrasmith; Florida Tech, United States
Syed Murshid; Florida Tech, United States
Ken A Ports; Florida Tech, United States

This paper discusses the activities and initial impacts of the Space Coast Innovation and Technology Commercialization (SCITC) Partnership. This is a synergistic partnership between Florida Tech, the Technological Research and Development Authority (TRDA) of the state of Florida, the NASA Office of Technology Commercialization at KSC, the Space Applications Technology Outreach Program (SATOP), The Florida/NASA Business Incubation Center (FNBIC) and other local partners (EDOs, SBDCs, incubators, other universities/colleges, private and public organizations, local high tech companies, etc). Its purpose is to facilitate space technology transfer/commercialization and technical entrepreneurship and to create high-tech start-ups to build a strong innovation-based local economy on the Space Coast. This multi-disciplinary, multi-college, industry/government research partnership provides innovative, multi-faceted education programming and networking / support activities to stimulate engineering entrepreneurship and technology transfer. The anticipated broader impacts of this partnership are transferable initiatives to develop sustainable core infrastructure in the areas of entrepreneurship education and technology transfer, catalyzing and improving innovation, technology commercialization and entrepreneurial processes.

TB-14.2 [A] A Cultural Challenge for NASA: Developing Technology and Leveraging Its Value Through Technology Transfer

Nan Muir Bodensteiner; University of Houston at Clear Lake, United States
Robert W Bobst; Holland & Davis, Inc., United States

For over 40 years NASA scientists and engineers have created one-of-a-kind, mission driven technologies designed to operate in space. As the world changed, NASA maintained a firm focus on the unique environment of outer space and a constant dedication to the task of creating technologies matched to the objective of delivering people and systems beyond earth's grasp and maintaining them in that environment. It is becoming increasingly clear that NASA does not need to do this alone. The growth of diversity in the pertinent technical fields, the struggle for ever more scarce funding, coupled with new firms joining the race to develop applications in space combine to force more attention to collaborations with other entities. Licensing NASA-developed technologies for application to non-NASA problems creates supplemental funding and builds support for NASA in Congress and among taxpayers. Developing the needed technologies in synergistic collaborations with other entities reduces its cost and speeds its development. But NASA needs to rearrange its mental wiring to make this "open innovation" approach work effectively. This presentation proposes key cultural challenges in creating enthusiasm for this approach and explores ways for NASA to engage these issues as they embark on the voyage of their changing future.

TB-14.3 [R] Critical Success and Failure Factors in Planning and Implementing International Technology Transfer: A Case Study from Sri Lanka

Kalinga Jagoda; University of Western Sydney, Australia
Krishnamurthy Ramanathan; University of Western Sydney, Australia

Technology transfer has become an essential feature of today's business setting. With the globalization of business, liberalization of many developing economies, and greater emphasis on the protection of intellectual property after the formation of the World Trade Organization (WTO), the transfer of manufacturing technology has become an important part of the international business strategy of firms. Firms from developing industrializing countries tend to regard technology transfer as a quick means of achieving manufacturing excellence so that they can rapidly enhance their sales in global markets. However, it appears that unless this technology transfer exercise is planned and managed carefully it may not lead to the achievement of these objectives. This paper examines a case of international technology transfer from the textile industry in Sri Lanka. The stage-gate model for planning and implementing international technology transfer is used to analyze the case and the authors identify critical success and failure factors with respect to technology transfer. The value of the stage-gate model for planning and implementing technology transfer is also highlighted.

TB-15 Decision Making in Technology Management-1
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Galleria-3**
Chair(s): John Whittaker; University of Alberta

TB-15.1 [R] Evaluating the Technological Competencies and Determining Key Capabilities in Technology Management Using Fuzzy Analytic Hierarchy Process

Yasemin Claire Erensal; Dogus University, Turkey
Esra Albayrak; Galatasaray University, Turkey

In this paper, a fuzzy analytic hierarchy (FAHP) methodology is proposed to select the most appropriate technology alternative in respect to micro- and macroergonomics. Both microergonomics criteria and macroergonomics evaluation criteria such as cultural variables, managerial and organizational methods transfer, which are not quantitative in nature, are considered for selection. From the analytical point of view, decision-makers are asked to express their opinions on the comparative importance of various factors in linguistic terms rather than exact numerical values. These linguistic variable scales, such as "very high", "high", "medium", "low" and "very low", are then converted into fuzzy numbers, since it becomes more meaningful to quantify a subjective measurement into a range rather than in

an exact value. The fuzzy appropriate indices of different technologies are then ranked, and preferential ranking orders of technologies are found. To deal quantitatively with imprecision or uncertainty, triangular fuzzy numbers are used throughout the analysis. A comprehensive numerical example consisting of two alternatives is provided to illustrate the effectiveness of the proposed approach.

TB-15.2 [R] Applying Technology Value (TV) Model to Replicate NASA's Decision on Selecting the 2nd Generation of Reusable Launch Vehicle (RLV) Technology

Nathasit Gerdsri; Portland State University, United States
Voraphol Attavavuthichai; Portland State University, United States
Gary Ficek; Portland State University, United States
Wararat Leesirikun; Portland State University, United States
Sarabjeet Waraich; Portland State University, United States
Natchanan Wathanachinda; Portland State University, United States

This paper illustrates the applicability of Technology Value (TV) model to replicate the decision making process at NASA in selecting the 2nd generation of Reusable Launch Vehicle (RLV) technology known as the Orbital Space Plane (OSP) concept. The TV model was conceptually built with hierarchical decision structure for evaluating the impact of technologies on an organization's objective. The study is a hypothetical case based on the current events and the actual concept designs of aircrafts provided to the public by NASA.

TB-15.3 [R] AHP Evaluation of Technical Barriers to Trade on the Export of China

Yuying Wu; Beijing University of Technology, China
Feng Yan; Beijing University of Technology, China

In recent years, the export of China is hindered, to a large extent, by the technical barriers to trade (TBT) and the sanitary and phytosanitary (SPS) from many foreign countries and regions such as USA, Japan, and European Union (EU) etc. The most severely threatened industries by TBT are agriculture, fishery, animal and animal product, food service industry, light industry, appliance industry, pharmaceuticals, textiles and clothing, chemicals, etc. We give the systematic indexes of evaluation of TBT on China trade, and we analyze the main factors by AHP. We put forward some suggestions to reduce the influence of the technical barriers.

TB-16 R&D Management-1
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Parlor-A**
Chair(s): Al Herman; Quantric Corp.

TB-16.1 [R] The Strategies of Japanese Firms in Fuel Cell Development: An Analysis of Patent Data for the Polymer Electrolyte Fuel Cell Technology

Yoko Furusawa; Keio University, Japan

Using Japanese patent data for the Polymer Electrolyte Fuel Cell (PEFC) technology, I analyze the technology strategies of Japanese firms. The aim of the study is to clarify how the PEFC technology has been developed. The results of the patent data analysis show the three points. (1) All the top-level patent-holding firms are the established firms whose businesses are highly diversified; (2) While firms adopt the comprehensive strategy as a corporate-wide technology strategy, there is a diversity of PEFC technology strategies among firms. Some firms take comprehensive approaches, while others take more focused approaches. There is no consistency between corporate-wide and PEFC technology strategies; (3) There is a difference in the degree of dependence on the R&D capability of each firm and the scope of R&D among them. These findings suggest a diversity of strategies in the PEFC technology development, although the stereotypical view sometimes supposes the homogeneous behavior of Japanese firms.

TB-16.2 [A] RIKEN Venture Businesses Before World War II

Eiichi Maruyama; RIKEN, Japan

RIKEN was established in 1917 as a private research institute partially supported by Imperial Household of Japan. A few years after its start, it experienced a serious financial difficulty. The 3rd director of RIKEN, a young viscount Dr. Masatoshi Okouchi, decided to establish a number of venture businesses based on its technological outputs. This decision was so successful it resulted in more than 60 companies of so-called "RIKEN Combine" that sustained RIKEN's financial basis thereafter. This industry-cluster model of venture businesses around a research institute was historically very early compared with Western examples. This paper investigates the motivation and preceding model for Dr. Okouchi, and the important human relationship that had sustained his venture-mind.

TB-16.3 [A] Stage Gate Analysis in Business-Academia Collaborative Project

Naoshi Uchihira; JAIST, Japan

This paper analyzes an actual business-academia collaborative project from the viewpoint of stage gate approach (we call this approach "stage gate analysis"). Stage gate analysis is a method of reviewing a finished project and summarizing it, whereas conventional stage gate management is used to control an on-going project. The case study analyzed is a project undertaken over a period of 6 years by Tokyo Institute of Technology, Toshiba Corporation and other companies to construct credit information infrastructure. The stage gate analysis clarifies success and failure factors of the project with a cause-and-effect relation map, which can be utilized by other business-academia collaborative projects.

TB-17 Collaborations in Technology Management-3
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Parlor-B**
Chair(s): Steven Walsh; University of New Mexico

TB-17.1 [A] Systems Biology: Melting the Boundaries in Drug Discovery Research

Minna Allarakhia; University of Waterloo, Canada
Anthony Wensley; University of Toronto, Canada

The pharmaceutical industry has gradually evolved from a purely chemistry-based paradigm to an information-based paradigm. With the completion of the Human Genome Project, drug discovery knowledge is increasingly being viewed as part of Systems Biology. Systems Biology does not focus on individual information bits one at a time, but considers the behavior and relationships of all units of information, in a particular biological system, from a functional perspective. Collective effort is required from multiple research arenas including molecular biology, physiology, computer science, mathematics, electrical, mechanical and biological engineering to mine data, develop models, conduct experiments and measure biological processes. Managing these multi-disciplinary interactions has become the focus of emerging networks of collaboration in systems biology. This paper explores and evaluates these networks of collaboration from the perspectives of organizational structure and knowledge management activities, including knowledge assimilation, generation and dissemination. Case examples include the Institute for Systems Biology, the Alliance for Cellular Signaling, the Massachusetts Institute of Technology Computational and Systems Biology Initiative and the Bio-X program at Stanford University. Developing a common language and set of priorities to bridge together the participating disciplines is necessary to efficiently and successfully exploit new technological opportunities from systems biology research.

TB-17.2 [A] A Multi-level Analysis for the Motivations of Forming International Alliances: The Case of Taiwanese Semiconductor Industry

Yi-Yu Chen; Rutgers, the State University of NJ, United States

With globalization as an environmental discontinuity to selectively diminish or enhance current capabilities and as technological innovation constantly accelerates, diversified capabilities are required for firms to compete globally. However, since the sources of organizational resources/capabilities could be found and rooted in a firm, industry, or a country, the considerations to form strategic linkages with potential partners based solely on the required resources and capabilities without the constraints of national boundaries become incredibly critical for firms to constantly development and redeployment their technical knowledge bases to cope effectively with the complexity and turbulence of such environments or at least to ensure their stake on betting on new cutting-edge technologies. However, diversified maturity levels on technology, products, markets across industries and national boundaries

have complicated the difficulty of searching promising partners. Thus, a variety of motivations to form diversified strategic linkages (Contractor & Lorange, 1988) would be crucial in determining the subsequent alliance modes of entering into a foreign market, a frontier issue with crucial implications for sustaining competitive advantages. By adopting a multi-level analysis at industry and country levels, this study aims to construct a framework of major motivations for strategic linkages among firms across national boundaries. Such multi-level analysis would be beneficial in drawing practical macro-policy implications for international enterprises. Lastly, firms in the semiconductor industry in Taiwan will be used as a case study to verify diversified motivations for engaging in selecting international partners.

TB-18 Cultural Issues in Technology Management-1
Tuesday, 8/2/2005, 10:00 - 11:30 **Room: Parlor-C**
Chair(s): Ian McCarthy; Simon Fraser University

TB-18.1 [A] Measuring Culture to Support Organizational System Integration

Larry Mallak; Western Michigan University, United States
David M Lyth; Western Michigan University, United States

This case study reports the role of culture measurement and resultant action planning in a regional hospital system in the midwest U.S. The system has a flagship medical center with 360 beds and 3,300 employees. Six other hospitals are owned or managed within the system. The flagship medical center is an acute-care, nonprofit community hospital. Two of the managed hospitals are Catholic hospitals. The system also includes a large, 32-county home health organization and several smaller entities such as helicopter ambulance transport services. The system's vision is to provide a seamless patient experience everywhere in the system. Toward that vision, leadership embarked on a set of strategic priorities, one of which concerned the measurement of organizational culture at each major system entity. The study had the following objectives: 1. Conduct a top-down definition of the culture, encompassing all major entities. 2. Facilitate leadership to a consensus set of cultural values common to the system as a whole. 3. Design and analyze a culture survey encompassing seven hospitals and home health. 4. Share results with leadership and develop a workplan based on those results and integrated with existing actions and plans. The final paper will report the results of this case study, including the application of the culture measurement tools, and integrate case study results and lessons learned with studies completed at other healthcare sites.

TB-18.2 [R] Using Perceptions to Understand the Boundaries in Government, Industry and Academia

Loretta Evans; The George Washington University/Loop Technology, China

Boundaries clearly exist in many aspects between sectors in academia, industry and government. The boundaries exist and are perpetuated largely by perceptions of leaders in the three sectors. In order to begin to melt the boundaries, an assessment of how leaders perceive their performance as well as their counterparts' performance in management is necessary. Examining their perceptions will provide a basis for determining the state of management. Thirty management attributes were used to survey leaders on their perceptions in academia, industry and government. The thirty management attributes were: (1) planning, (2) problem solving, (3) managing,(4) measuring, (5) developing people, (6) innovating, (7) contributing, (8) synthesizing, (9) operating effectively, (10) synergizing, (11) mobilizing, (12) accomplishing, (13) leading, (14) organizing, (15) implementing, (16) motivating, (17) experimenting,(18) continuously improving, (19) communicating, (20) building/using teams, (21) cooperating, (22) operating efficiently, (23) growing the enterprise, (24) responding to customers, (25) initiating, (26) making decisions, (27) moving quickly, (28)strategic thinking, (29) competing, and (30) controlling costs. Questionnaires were mailed to more than 12,000 leaders in government, academia and industry. Leaders in the three sectors were queried for their perceptions of their own sector's execution and their counterparts' execution on each of the management attributes.

TB-18.3 [A] Six-sigma and Culture Change in an Engineering Function

Terry R Schumacher; Rose-Hulman Inst. of Technolgy, United States
Clay Meredith; Rose-Hulman Inst. of Technology, United States

This paper describes an organizational development project in an engineering group that was organized into functional engineering groups until 2003. The culture was bureaucratic with 'silo' tendencies as is common in military contractors. The group was restructured to achieve greater cross-functional collaboration. A new manager was challenged to accomplish changes including: 1) The functionally-oriented culture needed to become a project-oriented culture. 2) The engineering organization did not collaborate with manufacturing and other internal customers resulting in poor communication and the growth of redundant engineering positions within manufacturing. 3) Project Management was too often ad-hoc with daily pressures driving task schedules and priorities. The client used Six-Sigma as its improvement process but individuals frequently said they were too busy to participate. The new manager defined six six-sigma projects to achieve the designated changes. His awareness of the organizational cultural guided project design. A brief review of the culture change literature and a discussion of the measures tracked during the year following the six-sigma projects demonstrates the effectiveness of this approach. These measures show dramatic improvements in how the engineering function is assessed by customers as well as substantial savings in cost and schedule against estimates.

TD-01 PLENARY-3

DATE: TUESDAY, AUGUST 2
TIME: 13:30 - 15:00
ROOM: PAVILION

KEYNOTE:
Bulent Atalay; University of Mary Washington, United States

"Integration of Art and Science"

Bulent Atalay presents science through art, and art through science, and approaches the larger goal of achieving a synthesis of the two fields. He invokes the model of Leonardo – part-time artist, passionate scientist, consummate inventor. The qualities of timelessness and universality in Leonardo's miraculous works speak eloquently for themselves. With Leonardo's model providing the unifying thread, however, it becomes possible, first, to glimpse Leonardo's restless intellect, that extraordinary psyche; second, to see whence the ideas for his works of art came; and ultimately to appreciate his art at a different level. What also emerges is a timeless message: Leonardo's model can assist in bridging the cultural divide prevailing in our age of specialization, and it can help make us all more creative.

TE-01 International Issues in Technology Management-1
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Pavilion East**
Chair(s) Audrey M Alvear Báez; Portland State University

TE-01.1 [R] Global Innovation Management: When Traditional Approaches Fail

Hosein Fallah; Stevens Institute of Technology, United States
Thomas G Lechler; Stevens Institute of Technology, United States

The emerging knowledge economy is fundamentally changing global competition. A sustained competitive advantage will much more rely on the ability to optimize innovation output for the global market than simply globalize the functions of the value chain. This paradigm shift is embodied in competencies to integrate globally dispersed technological and market know-how, and innovate products, services and processes for the global market. The traditional response to global competitive pressure by simply increasing the globalization of the value chain may provide short term gains, but overtime will lead to declining competitive positions and increased potential for market failure. The theoretical discussions on the management of technology in a global environment are particularly focusing on the impact of cultural issues. Although cultural influences are important in the performance of global operations, other managerial considerations such as coordination of information, allocation of

resources, organizational structure and processes for research and development are also critical to success or failure of global corporations. This paper discusses the competitive paradigm shift for managing innovation in a global context. The authors examine a number of cases from multinational companies mainly in the telecommunications industry to illustrate this shift and its implications for global corporations in terms of strategy for innovation and management of technology globally.

TE-01.2 [R] Concert: Lessons Learned from Innovating in a Multinational Environment

Thomas G Lechler; Stevens Institute of Technology, United States
Thorsten Teichert; Universitaet Hamburg, Germany
Audrey Curtis; Stevens Institute of Technology, United States

Companies and researchers are struggling with the daunting challenges of both radical as well as global innovation. We analyze Concert, a joint venture between AT&T and BT (British Telecom), that started out with a global innovation vision and ended in a failure with US$ 5 billion reported losses. We specifically focus on the innovation processes and conceptualize generic problems above and beyond the joint venture setting. The data were collected by analyzing public documents and by conducting 18 in-depth interviews with nine key members of the former management board. In contrast to the general conception our results show that cultural problems had only minor negative effects on the innovation performance. In contrast, we identify the concept of an innovation strategy as a distinctive and critical element of corporate strategy. For Concert, a lack of an innovation strategy led to divergent and dynamically adapted objectives over time. As a consequence, Concert was not able to build up the organizational competencies of knowledge and process integration critically needed in a global context. In the end, two thirds of the original innovation projects were finished successfully but they did not serve the initial radical vision and were accompanied by failure of the entire company. We conclude that an innovation strategy is needed in the global context to avoid local optima. Its main functions are twofold: the downward transformation of corporate vision into a balanced innovation portfolio for program and project planning as well as the backward integration of resources and knowledge to shape long-term core competencies.

TE-01.3 [R] Managing Global Virtual Technology Teams

Hans J Thamhain; Bentley College, United States

The paper presents the findings of a two-year field study into geographically dispersed product development teams who must integrate their work across international borders. Because of their geographic separation, these work groups function as virtual team who utilize the advances in collaborative technology, such as groupware and general telecommunications, to unify the work process. The results show that, in spite of modern technology, a great deal of sophisticated leadership is necessary to organize and manage these virtual teams to achieve unified results and corporate objectives. To perform effectively, multinational managers must understand the infrastructure of their organization and deal with the complex social, technical and economic issues that determine the culture and value system of the multinational enterprise. The drivers and barriers to effectively organizing and managing global virtual technology teams are being discussed together with criteria for managerial effectiveness.

TE-02 PANEL: Engineering and Technology Management Journals

Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Pavilion West**
Chair(s): Timothy R Anderson; Portland State University
Panelists(s): Timothy G Kotnour; University of Central Florida
George Farris; Rutgers University
Harold Linstone; Portland State University

Editors of the leading journals in Engineering and Technology Management will discuss the philosophies and strategies of each journal, and answer questions from the audience.

TE-03 Government Sector-2

Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Broadway-1**
Chair(s) Alp Erkoller; University of Applied Sciences Wiener Neustadt

TE-03.1 [A] eGovernment in Estonia: Best Practices

Ahto Kalja; Tallinn Technical University, Estonia
Aleksander Reitsakas; Cell Network Ltd., Estonia
Niilo Saard; Cell Network Ltd., Estonia

eGovernment in Estonia got started by developing a functional architecture that includes secure data transport backbone X-Road, distributed software systems and different hardware components like portals, elements of public key infrastructure (PKI), governmental databases and information systems. This is the very basis of hundreds of services that have been created today. The recent success with eGoverment services and the common architecture of eGovernment will be described.

TE-03.2 [R] The Main Issues for Effective Competition and Its Assessment Standards in Telecommunications Sector

Byung-sun Cho; ETRI, Korea, South
Shin-Won Kang; ETRI, Kyrgyzstan

The criteria to evaluate effective competition should be based on assiduous analysis of the telecommunication market's competitiveness status, liberalization and the performance of effective competition. This means the investigation should contain not only the structural aspect, such as number of operators or market share, but also an overall analysis including deregulation level and telecommunication charge. A thorough analysis of this kind can suggest a desirable direction for government regulation and be adapted to boost effective competition. On the other side, examining the main issues of the effective competition discussion shows that the concept of effective discussion is ambiguous and the judging standard is arbitrary and comprehensive, making the analysis essentially incongruent to be used as a measurable standard. Therefore, the followings are suggested to supplement the shortcomings of the current criteria: more clearly defined concept of effective competition, objective indicators, and also quantifiable indicators. In this research, market structure, market liberalization, and competition performance are proposed as three aspects of index for evaluating effective competition. This is because the standard of telecommunication business' competitiveness status, the standard of telecommunication market's competition status and liberalization, and the performance of effective competition are demanded to rationally evaluate effective competition.

TE-03.3 [A] Transformation of the Mexican Electric Research Institute

Fernando A Kohrs; IIE Research, Mexico

The Instituto de Investigaciones Electricas (IIE) was founded in 1975 for the purpose of supporting the electric industry of the country, and for 20 years it suffered some changes, but not radical. By the end of 1994 the country suffered a financial crisis, and the Board of Directors asked it to change its operation with the purpose of achieving self-sufficiency to obtain 75 percent of its revenue from contracts and the national company of electricity, and the Federal Government would supply the other 25 percent with the purpose of maintaining the installed capacity (Laboratories and Human Resources). The aim of this presentation is to describe the analysis and the process of change followed to achieve these goals.

TE-04 Management of Intellectual Capital

Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Broadway-2**
Chair(s): Jeet Gupta; University of Alabama in Huntsville

TE-04.1 [R] The Determinants of Performance on Patent Strategy in Japanese Firms

Akiya Nagata; Kyushu University, Japan

As the recent trend toward pro-patent policies, Japanese firms have started to stress intellectual property management as part of their management strategies. Nevertheless, research on the function of intellectual property management in strategies continues to be an unexplored field. Based on data of a questionnaire survey conducted on Japanese firms, we analyzed what kind of patent strategies contribute to the performance of these strategic goals.

Our analysis revealed two types of patent strategy: a positioning strategy and a strategy based on constructing of core technology. We found that the two were symmetrically different in efficiency before and after establishment of technological paradigms. The approach of constructing core technology is effective for performance of various goals before the establishment of technological paradigms, but becomes ineffective when it comes to most of goals after the establishment of paradigms. On the other hand, the positioning approach is limited in efficiency before the establishment of technological paradigms, but becomes a powerful technique relative to all strategic goals after the establishment of paradigms. The result of our analysis suggest that which approach is most rational cannot be said in general, but business strategies differ depending on the degree of maturity of the technology relied on.

TE-04.2 [R] Centralized versus Decentralized Patent Licensing Models

Julie L Reed; Marger Johnson & McCollom, United States
Nitin Mayande; Portland State University, United States
Manikanta Venkatesh; Portland State University, United States

In the competitive and lucrative patent licensing arena, corporations tend to take a centralized approach to patent licensing. In a centralized approach, advantages lie in the control, efficiency and economies of scale. Centralized control translates to clarity of purpose and alignment with overall company strategies. Having one centralized function eliminates redundant function. Disadvantages exist in servicing the needs of divisions within the larger organization as the needs of different divisions may conflict with others, and the cost of maintaining a central function that is largely an overhead expense. Decentralized systems have the advantage of flexibility, faster response time, close coupling to local needs and desires and more self-sufficiency at the local level. Disadvantages lie in higher need for coordination and a lack of revenue sharing. While decentralized licensing seems to currently reside only in the public sector, some lessons may transfer to organizations have decentralized management structures that may benefit from moving to a decentralized licensing program.

TE-04.3 [R] Basic Approaches to Patent Strategy

Vittorio Chiesa; Politecnico di Milano, Italy
Elena Gilardoni; Politecnico di Milano, Italy

Patents are playing a greater role in the economy today than they have ever done. The patent strategy is an important tool for creating value and reflects a coordinated effort for developing, managing and using patents to accomplish a company's goals. It is composed of three dimensions: intent (why a patent is filed), strategy (how an invention is protected), management (how a company holding strong patent rights manages them for generating value). The literature considers these elements as independent of each other and neglects that some factors could influence them. The study aims at (i) systematizing and organizing the literature contributions, a large number of different terms and definitions is used, (ii) defining the basic approaches to patent strategy able to suggest a patents strategy policy and establish a relationship among the different patent aspects, (iii) studying the dynamics in basic approaches to patent strategy with time, and (iv) identifying which factors affect the adoption of a specific basic approach. The study, based on an academic literature analysis and multiple case studies among different industries, identifies five basic approaches to patent strategy. Afterwards, the dynamics in approach to patent strategy and factors affecting them have been studied based on a case study.

TE-04.4 [R] Historically Explore on the Patterns of Business Model for Silicon Intellectual Property (IP) Providers in the Semiconductor Industry

Yea-Huey Su; National Central University, Taiwan
Ruey-Shan Guo; National Taiwan University, Taiwan
Wen-Yuan Hsieh; National Taiwan University, Taiwan

Since 90s the advances in semiconductor manufacturing technology and the "system-on-chip (SOC)" design concept have brought a big change in IC Industry. IC design business has dis-integrated into three major business entities: IC product design, IP (Silicon Intellectual Property) component, and IC design service. Each business entity formulates their business portfolio differently. For example, in the IP-related business entities, some companies focus only on IP business, some companies provide a mix of design service, IP and EDA tool service, and some IP providers have been merged or acquired. It is then the goal of this research to explore the underlying business patterns of these IP-related business entities. In this research, 35 IP providers were taken as the samples companies and classified into six patterns, which are (1) Pure IP providers who provide Star-IP or specialized techniques, (2) Pure IP providers who provide IP components with multiple functions, (3) IP providers who provide EDA tools as their core business, (4) IP providers who provide design service and turnkey service as their core business, (5) IP providers who focus on IP and design service, and (6) IP providers or their IP department that have been acquired or merged. Next, history of each IP providers was collected and accordingly causalities underlying these IP business model shifts were provided. Correlation between their business model shifts with economic events or technological changes was then constructed. In addition, managerial implications to the IP-related business were then provided. This study will enlighten the transactional arrangement for IP business in very dynamic contexts for practitioners and will give researchers the industrial insights with strategic foresights.

TE-05 Technology Planning and Forecasting-2
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Broadway-3**
Chair(s): Steve T Walsh; University of New Mexico

TE-05.1 [R] Applying System Dynamics Model in Technology Foresight: A Case Study of Wireless VoIP in China

Hongyi Chen; Portland State University, United States
Wayne Wakeland; Portland State University, United States

Technology foresight is a process to identify critical technologies to develop in order to shape a desired future. In this paper, a two-stage technology foresight model is proposed. The first stage is to identify critical technologies through expert judgment, and the second stage is to set related parameters by carrying out experiments on a system dynamics model. The focus of this paper is on the second stage: to demonstrate the application of system dynamics model in technology foresight. An example of building a system dynamics model to foresee the Voice and Video over Wireless Area Network (VVoWLAN) technology in China is shown in detail. In doing so, the VVoWLAN technology is assumed to be the critical technology identified from the first stage of the foresight activity.

TE-05.2 [R] Technology Foresight for Long-term S&T Planning: The 3rd Technology Foresight Exercise in Korea

Byeongwon Park; KISTEP, Korea, South
Seokho Son; KISTEP, Korea, South
SangYoub Lee; KISTEP, Korea, South
Donghoon Oh; KISTEP, Korea, South

Technology Foresight is an activity applying a systematic means of assessing scientific and technological developments which could have a strong impact on wealth creation and quality of life to advance generic technologies and their applications. It is also about building and sharing of vision, developing future scenario and aligning of relevant policies on the basis of which we can shape policy decision today. Naturally it involves the debates among the stakeholders including citizens, normally left at the receiving end. In Korea, currently the third TF is underway facilitated by KISTEP (Korea Institute of Sci. & Tech. Evaluation and Planning). The prospect of future Korean society up to the year 2030 was developed. Additionally, future demands and needs based on the prospects were deduced through survey of the normal citizen. The needs and issues were refined through the panel consisting of not only scientists but also futurists, sociologists, etc. The technical committee is to develop the technology topics that may satisfy the demands and needs of future Korean society, and the topics were Delphi-surveyed. In parallel, the scenario workshop is running to build an internally consistent picture of possible changes in the future social system, which may be useful for envisaging the implication of uncertain development and examining the scope for action. In the paper, the result of the Korean Technology foresight exercise are provided, focusing on the results of the Delphi survey and the following action plan for prioritization of technology

subjects.

TE-05.3 [R] Clustering Analysis of Parameter Variation for Multi-generation Demand Forecasting Model: Mobile Service Case

Choonmo Ahn; ETRI, Korea, South
Sang-Sup Cho; ETRI, Korea, South
IlSoo Rho; ETRI, Korea, South

Digital mobile service is a good example of technology innovation which substitutes analog service in mid- or long-term sense. Each service in technology innovation can have the same diffusion rate, but generally, we can assume that the diffusion rate is different depending upon the services and technology and demographical changes. In this paper, we discuss the difference of diffusion patterns for several countries. The multi-generation diffusion model proposed by Ahn and Roh (2004) is applied to classify the several countries and to find the characteristics of each country. We also conduct cluster analysis and regression to find the significant factors that affect the different diffusion rate. The idea in this paper can be used to deploy a new service or marketing strategy..

TE-06 Management of Technical Workforce-2
Tuesday, 8/2/2005, 15:30 - 17:00 Room: Broadway-4
Chair(s): Loretta Evans; The George Washington University

TE-06.1 [R] Do Supervisors Coach?

Dahlia Barakat; University of Alberta, Canada
Guy Breault; Spar Aerospace / L3, Canada
Peter Flynn; University of Alberta, Canada

A previous survey of employees in a technical setting revealed a gap between supervisors believing that they are giving coaching and employees believing they do not receive it. Two follow-up studies explore this: one at the same firm, an aircraft revamp company, and one at an Engineer/Procure/Construction Management (EPCM) firm focused on petroleum and petrochemical plant revamp projects. Both studies confirm that supervisors report that they provide coaching far more than employees report that they receive coaching. The perceived motivation for coaching is different between supervisors and employees: supervisors more frequently see it as a means to help ensure company performance targets are met, while employees see it as a means of personal development. The desire to be coached was independent of age, and at the aircraft firm over 65 percent of employees indicated that they wished they received more coaching than they currently received. Encouraging supervisors in a technical setting to coach employees would appear to be a mechanism for improving employee satisfaction.

TE-06.2 [R] Workforce Engagement: Implications for Engineering and Technology Managers, Employees, and Researchers

Stephen P Hundley; Indiana University-Purdue University Indianapolis, United States
Fred Jacobs; American University, United States
Marc Drizin; Performance Assessment Network (pan), United States

Finding, keeping, and motivating employees are critical components for organizational effectiveness in engineering and technology management enterprises. This paper defines workforce engagement and describes its importance to a company's success. Employee perspectives, including their priority for participation in the workforce, their attitudes held about the workplace, their performance at work, and their intentions to remain with an organization or seek employment elsewhere, are presented. Organizational practices, including strategic issues, core human resources processes, and operational components, are described. Finally, the results of a recent national study of 2,600 employees – including specific cohorts of engineering and technology respondents – will identify levels of workforce engagement, top drivers of workforce engagement, and implications of the findings for senior leaders, managers, individual employees, and researchers.

TE-06.3 [R] Management: Leadership or Annoyance?

Donald A Kennedy; University of Alberta, Canada

A general consensus of management literature concludes that interaction with superiors is a major cause of stress and dissatisfaction in the workplace. It is often noted that no one escapes this because everyone has a boss, even at the CEO level. With promotion, a worker certainly notices the aggravation that their new superior causes. However, they often act like they have forgotten the grief their predecessor caused and may be continuing the same annoying practices in their new job. This paper examines many of the breakthrough studies in management from the Hawthorne experiments, Drucker's management by objectives, and Mintzberg's model of manager's roles and continues up to more modern research papers. In addition, other papers are examined that identify a theme of disjuncture between managerial decision-making and economic principles. Both groups of studies are applied to help generalize directly observed cases that typify common workplace situations. On-going Ph.D. research is also considered. A paradigm is then proposed with the intent to help workers understand and deal with the demands of the workplace. This could also help managers recognize the impact of their interactions with subordinates and help them focus on more desirable outcomes.

TE-07 Project/Program Management-5
Tuesday, 8/2/2005, 15:30 - 17:00 Room: Forum Suite
Chair(s): Gary Chen; Montana State University

TE-07.1 [R] Towards a Project Governance Model for Large Capital Projects

Michiel C Bekker; University of Pretoria, South Africa
Herman Steyn; University of Pretoria, South Africa

While research on project performance has focused extensively on improving project management practices, no improvement is observed in meeting of initial planned time schedules, budgets and operational performance requirements of large capital projects. This leads to the argument that potential performance problems are not easily managed once the project is in the execution stage and should rather be prevented beforehand. Focus should therefore shift towards improving the conceiving phase of a project rather than the development and implementation phases. By nature large capital projects in the private and public sectors attract investor and taxpayer attention. Balancing different, and sometimes opposing, group and individual stakeholder interests and objectives becomes complicated, creating areas for opportunism. A similar dilemma exists with the corporate world where the eventual pressure to perform could, and have, lead to misconduct. The corporate world responded to this challenge by developing corporate governance policies and laws whereby various accountability and transparency requirements are stipulated. These corporate governance principles set the framework within which management should function. Although large capital projects can benefit from corporate governance developments their very nature of often being multi-company and multi-national entities complicates the adherence to a specific country's corporate governance framework. This research views large capital projects as temporary organizations and aims at developing a project governance model to assist stakeholders in establishing realistic, objective and acceptable criteria for conceiving and eventually managing large capital projects, thereby improving the potential for project success.

TE-07.2 [R] A Project Strategy: Matching Customers to the Right Project

Michael Poli; Stevens Institute of Technology, United States
Aaron J Shenhar; Stevens Institute of Technology, United States
Richard R Reilly; Stevens Institue of Technology, United States

This paper introduces empirical findings based upon exploratory research of real-life case studies that illustrate the concepts of Project Strategy. Multiple raters classified their real-life case studies as to project type using project type definitions from Wheelwright and Clark's Aggregate Project Portfolio framework. The raters also classified the customer for the same real-life project using customer type definitions from Rogers' Technology Adoption Life Cycle model. Inter-rater reliability was used to verify that the variables were well understood by the raters. The variables tested exceeded the Chronbach Alpha level used for exploratory work. Customer types were then cross-tabbed with respect to the project types. The resulting chi-square analysis indicated a very significant relationship between customer type and project

type. To many this result was considered intuitive but this research provides empirical evidence that this relationship exists. One key element of an explicit Project Strategy is to match the customer type to the project type. This is new ground for the project management body of knowledge.

TE-07.3 [R] A Contingent Method for Buffer Management in Critical Chain Project Management

Yongyi Shou; Zhejiang University, China
Xiaobo Wu; Zhejiang University, China

Critical chain project management provides an alternative way to manage projects. Though it has achieved successes in industrial applications, it is not without flaws. One of its deficiencies criticized heavily is concerned with its innovative but over-simplified buffer management method. Knowing its deficiency, the author argues that the method for estimate buffer size should take into consideration the uncertainty of the activities, the expected protection, and the project manager's risk attitude. Based on the classification of activity uncertainties, a contingent method for buffer estimation is suggested. According to this method, it is also deduced that the path with largest variance should be used to estimate the buffer size while in previous methods the longest path was used for estimation. A Monte Carlo simulation is used to demonstrate that the buffer sizing by the proposed method is rational to provide effective protection for the project.

TE-08 Innovation Management-5
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Council Suite**
Chair(s): Jaegul Lee; Carnegie Mellon University

TE-08.1 [R] Product Competitiveness and Integrated Innovation Between Technology and Organization: Some Evidences in China

Jiancheng Guan; Beijing University of Aeronautics & Astronautics, China
Jianyan Liu; Beijing University of Aeronautics & Astronautics, China

Recent studies have advocated integrated innovation between technology and organization and discussed its impact on a firm's competitive performance. The purpose of this research is to explore the relationship between product competitiveness and integration of technology and organization. Therefore, a study framework of technological capability and organizational capability audit is first proposed and the relevance of the integration of technology and organization and product competitiveness of Chinese firms is then examined. Empirical data were acquired through a recent study of innovative firms from Beijing, China. Five hypotheses to identifying the relationship amongst product competitiveness and integration of technology and organization are put forward. The instrument of Organization-Technology map and some statistical analysis methods, such as Canonical Correlation Analysis, are used to testify the five hypotheses. The results effectively verify the positive relationship among technological innovation, organizational innovation and product competitiveness. The application of Advanced Manufacturing Technologies has significant and positive impacts on the product competitiveness of the surveyed firms. However, the heavier investment in manufacturing equipment alone cannot lead to stronger product competitiveness. Particularly, the findings also reveal that integrated innovation between technology and organization is then substantial to the improvement of product competitiveness of Chinese firms.

TE-08.2 [R] Between Manufacturing and Systems Integration: The Case of a Brazilian Manufacturer

Carlos E Sato; University of Sussex / SPRU, United Kingdom
Dario E Dergint; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil
Kazuo Hatakeyama; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil

This paper aims to extend the resource-based perspective proposed by [4], considering strategic, functional and project capabilities, and introduce the networking capabilities, as an important organizational capability for systems integrators in order to succeed in a fast changing business environment. The paper builds upon the concepts of core competence, core rigidity, routines, absorptive capacity and dynamic capabilities, and show in an illustrative case how all these organizational capabilities affected the business of the systems integrator. The case firm is an Asian multinational subsidiary, a manufacturer of telecommunications cables and wires, which moved downstream into services and systems integration in the second half of 1990´s, delivering turnkey solutions to the cable TV market in Brazil. We argue that, besides the strategic, functional and project capabilities, the networking capability, as the ability to build networks, collaborations and trust in the long term, building the so-called 'business ecosystem,' is of fundamental importance for systems integrators to sustain their business in the long term and better manage changes and unpredictable events.

TE-08.3 [R] Managing Technological Innovations in Emerging Industries: An Exploratory Study of Two Indian Pharma-Biotech Organizations

Karuna Jain; IIT Bombay, India
Rajiv S Narvekar; IIT Bombay, India

It is now widely accepted that technological innovations have fueled unprecedented business opportunities and economic growth. Of special mention are the discontinuous technological innovations that have brought a paradigmatic shift in business operations. The concerns of senior managers stem from the growth of specific technologies related to genetic engineering, computer science and technology, robotics etc. These technologies provide immense opportunity for business growth on one hand and on the other, are destroying well developed competencies in many industries such as healthcare and communication. This paper explores the evolution of technological innovations in two Indian organizations from the pharmaceutical industry. Seven innovation projects from these two distinctly different organizations are examined. The two organizations differ in their approach to managing technological innovations; one organization has a broad medium to long term view of the innovation process, while the other has a focused short to medium term view. This differing strategic intent has implications to the two different technological innovation systems of the organizations. By comparing the two different technological innovation systems, including the role of intellectual capital insights are presented in the management of the innovation process. Based on the study's findings, recommendations are offered in the design of technological innovation systems in emerging industries.

TE-09 Technology Marketing-2
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Directors Suite**
Chair(s): Fred Phillips; Maastricht School of Management

TE-09.1 [R] Modelling Intangible Value in Business-to-Business Buyer-Seller Relationships

Roger A Baxter; Auckland University of Technology, New Zealand

A supplier's relationships with its buyers are important resources that may comprise a substantial part of its shareholder value, because they facilitate resource flows. It is not only tangible or relatively easily tangibilised resources such as money, goods and services that flow through buyer-seller relationships. There are also flows of less tangible but equally important resources in the form of information and knowledge, such as when there is inter-firm technology development and management. However, managers currently have limited tools for assessing the value of relationships in terms of these less tangible resource flows. Such tools are required to enable them to effectively manage portfolios of relationships, but the development of these tools requires that the dimensions of relationship value must first be more fully understood. This paper therefore describes a project to identify dimensions of the intangible aspects of relationship value and relates the project to technology management issues. A proposed model of intangible relationship value and its dimensions in business-to-business buyer-seller relationships, from the seller's perspective, is synthesised from the intellectual capital literature. The model and dimensions are validated using data from a survey of sales and marketing managers. Data analysis is primarily achieved using the structural equation modelling technique. The study provides a structure of intangible relationship value that can be used as the basis for further research. It also provides a potential basis for the quantitative assessment of the relative values of a seller's relationships with its buyers and can be applied to relationships in which substantial technology development occurs.

TE-09.2 [R] Risk Management Based on Perception of Stakeholders Against

Corporate Brand

Gaku Shoji; University of Tsukuba, Japan
Ikumi Matsushima; University of Tsukuba, Japan
Mariko Yamamoto; University of Tsukuba, Japan
Tomonori Akiyama; University of Tsukuba, Japan

Recent studies of risk management by users, developers, managers, and experts involved in high technology, such as use and implementation of nuclear power, genetic modified technology, and in-vitro fertilization, have concentrated on the perception of speculative risks. In the management of risks related to corporate management, the assessment of consumers' perception of a corporate brand is crucial to achieve desirable corporate governance. In this study, consumers' perception of corporate brands was assessed and analyzed. First, a questionnaire survey was conducted to evaluate how consumers perceive a corporate brand and what factors consumers use to select a product. Six companies were the target companies in the survey: two beer companies, two airlines, and two convenience-store companies in Japan. Then, based on the survey results, the dominant factors in the consumers' perception of corporate brands were revealed based on analysis using self-organizing maps.

TE-09.3 [R] Technology Integration on Manufacturing & Marketing: Extended Approach of Technology Innovation

Ling Wang; Tsinghua University, China
Wu Yang; Tsinghua University, China
Jiasu Lei; Tsinghua University, China
Chuanming Liu; Tianjin University, China

The global competition drives enterprises to make adjustment and innovation within the external environment variation and inner resource restriction. Since the 1980s, technology innovation has been adopted widely in many Chinese enterprises; most of them have benefited from it. Technology Integration on Manufacturing & Marketing (TIMM) is the extended approach of technology innovation, which solves the transferred problem from product innovation to batch production and sales successfully. TIMM has been brought forward to help corporations in China improve technology capability and management competence. It also offers a new conceptual foundation for the government to adjust policy of technology innovation in enterprise and even in industry. On the basis of the accurate definition of TIMM highlighted by professor Jiasu Lei of Economics & Management School at Tsinghua University in China (2002), correlative knowledge has been investigated in this paper. Process model has been established to clarify TIMM system. Research methods have also been put forward to study the whole running process including technology selection, technology sourcing and technology internalization.

TE-10 Telecommunications Industry-1
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Studio Suite**
Chair(s): Yutaka Kuwahara; GVIN Ltol

TE-10.1 [R] Innovation in Telecommunications Services: Framework and Analysis Based on the Case of Brastel International

Kumiko Miyazaki; Tokyo Institute of Technology, Japan
Edmar Wiggers; Brastel, Japan

This paper looks into innovation in the service industry. We present a theoretical framework focused on capability integration applied to the telecommunications service sector. Effective application and integration of standard IT can lead to significant benefits. We apply the model to the case of an international telephone communications provider, Brastel, which has introduced significant innovations in international calling services, in the form of rechargeable pre-paid calling card. In doing so, the market for international calls is analyzed. Brastel is compared against its competitors considering price and service breadth. A competitive advantage was maintained, due to internal and external integration capabilities.

TE-10.2 [R] Characteristics of Individuals Affecting Adoption Intentions for WiBro Service

Moon-Koo Kim; ETRI, Korea, South
Kyoung-yong Jee; ETRI, Korea, South
Jong-Hyun Park; ETRI, Korea, South
Dong-sup Oh; ETRI, Korea, South

This study aims at defining the factors affecting adoption intentions for WiBro Service based on the characteristics of individuals creating the markets and developing strategies of the service, which is expected to be the next-generation telecommunication service. For this purpose, two types of sub-factors are defined: characteristics of individuals including demographic statistics, usage of existing services, advanced cognition, adoption attitudes and service assessments; and adoption intentions including willingness for subscription, subscription period, willingness to pay, types of usage and preferred device. The results of the study indicate that demographical statistical variables vary depending upon the levels of adoption intentions, and that users of mobile Internet services via mobile phones and wireless LANs are highly probable of being targets for the WiBro Service. Furthermore, the results demonstrate demands for enhancing recognition of the usefulness and ease of use of the services and intense marketing activities for potential users bearing innovativeness to stimulate the market of the portable Internet service. Therefore this study will significantly contribute to the successful market entrance of portable Internet service, and also to growth in the market.

TE-10.3 [R] A Bottom-up Long-run Incremental Costing Model for Calculating Mobile Termination Charge in Korea

Sun Me Choi; ETRI, Korea, South
Tchanghee Hyun; ETRI, Korea, South

It is a dominant paradigm which is the use of the forward-looking long-run incremental cost (LRIC) methodology. The main idea of the LRIC is to set the wholesale charges on the basis of an efficient cost benchmark rather than on the operator's actual cost. For setting the charges, network element cost derived from an engineering model is needed. In this paper, we suggest a neutral and automatic mobile network-planning model for estimating the incremental investment cost of a mobile network. The current cost-based model, which is a fully allocated costing model, includes non-network costs creating inefficiencies, but our model can delete the unreasonable costs through an efficient cost benchmark derived from restructuring the mobile network. In addition, our model can consider the traffic demand and geographical data simultaneously so that it results in a more accurate estimation. By utilizing this model we can determine that if the operator does not have critical mass, then their incremental cost can be very low. In the minimum coverage presence scenario, the effect is less than 1 percent, but in other scenario, it can be diminished from 4 percent to 47.61 percent based on traffic density.

TE-13 Supply Chain Management-4
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Galleria-1**
Chair(s): Charles Weber; Portland State University

TE-13.1 [R] Managing the Technology of Integrating the Production and Transportation Functions in Assembly or Flow Operations for Make-to-order Industries

Xuying Zhao; University of Texas at Dallas, United States
Kathryn E Stecke; University of Texas at Dallas, United States

When a make-to-order manufacturing company commits a delivery due date for an order, we call it a commit-to-delivery business mode. In this mode, the manufacturing company is responsible for the shipping cost and selecting a shipping mode which is usually provided by a third party logistics company. Generally, shipping cost is higher when the selected shipping mode requires shorter shipping time. How should a company schedule production in production lines for all accepted orders so that the company can leave enough shipping time for orders to take slow shipping modes to reduce the shipping cost? We study the production and transportation integration technology for a make-to-order manufacturing company with a commit-to-delivery business mode. In the distribution scenario where partial delivery is allowed, we provide an optimal production schedule which minimizes the total shipping costs for all finished orders. When partial delivery is not allowed, we provide a near-optimal heuristic algorithm, which is proved to be efficient and effective by numerical tests.

TE-13.2 [A] Remanufacturing at CES Inc.

Stella Hua; Western Washington University, United States

In this case study, we examine remanufacturing issues at a Northwest company. The company grew from a small start-up company in the early 1990s to a dominant player in the electronics service industry. We first describe the rapid evolution and growth of the company over the past decade. We then focus on how the company chose between contract remanufacturing and in-house remanufacturing. Our discussion focuses on three areas within the company that were critical in the remanufacturing decision-making decision process: product and service offerings, product design philosophy, and supply chain operations. Different alternatives of remanufacturing are presented to show why the company proceeded with in-house manufacturing. This success story highlights the importance of synchronization between remanufacturing and supply chain operations. In addition, it provides insights on design for manufacturability and serviceability.

TE-13.3 [R] The Role of Supply Chain Management for System Management in Utility Industry

S. Gary Teng; University of North Carolina at Charlotte, United States
Juan P Niebles; Jacobsen A Textron Company, United States

The improvement process in the electric utility industry applies new methodologies to achieve better quality, increase the expected length of the equipment life, and therefore, reduce the costs for operating and maintaining systems for delivering electricity to customers. This paper discusses the system management process for a power distribution system based on reducing overall costs while maintaining the value and reliability of the system through identifying the role of supply chain management in making power distribution systems more effective. The study involves three functions in power systems management, the distribution system, the maintenance department, and the management of supply chain activities, as the main components of the management process. The results of this research provide utility industry the link between systems management, maintenance operations, and supply chain management for efficient power distribution systems. It shows that supply chain management plays a major role in system design and in helping utility companies to reach their ultimate system design and management goal, high system service quality and reliability with least incurred cost.

TE-14 Technology Transfer-3
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Galleria-2**
Chair(s): Tugrul Daim, Portland State University

TE-14.1 [R] University-Industry Cooperation in Japan: Some New Evidence from Universities

Yong Cao; Tohoku University, Japan
Yasutaka Iguchi; Tohoku University, Japan
Yuko Harayama; Tohoku University, Japan
Akio Nagahira; Tohoku University, Japan

University-Industry Cooperation began to attract attention during the recent recession in Japan. Particularly, the Japanese National Universities became independent administrative entities in 2004, university-based research is increasingly leading to business opportunities beyond academia. This paper aims at providing some new evidence on some key factors behind the mechanism for promoting of University Technology Transfer, and on the major forms of University-Industry cooperation in Japan. The important mechanisms and forms of cooperation and technology transfer between university and industry in Japan include (1) collaborative or sponsored research agreements, (2) licensing, (3) start-up companies, (4) consultation or advisory agreements. Based on this analysis, this paper will also provide an assessment of the current situation and associated issues in order to check the effectiveness of Japanese Bayh-Dole system.

TE-14.2 [R] Perceptions of Competitive Advantage of New University Technology and Their Impact on Exclusivity of Licensing Transactions

Larry G van den Berghe; University of Waterloo, Canada
Paul D Guild; University of Waterloo, Canada

Commercialization of new university technology within the new product development process is an important tool by which established firms can expand their innovative capabilities. The strategic importance of the university technology to the firm, however, can vary considerably. An exclusivity agreement is a useful tool to protect the firm's investment and help ensure that value is appropriated through the commercialization process. An empirical study of 66 technology transfer projects reveals that when firms' perception of competitive advantage afforded by the new technologies is high, licensing transactions are usually secured by some form of exclusivity agreements.

TE-14.3 [R] A Study of Motivational Factors Driving Industry University Collaborative Research

Larry G van den Berghe; University of Waterloo, Canada
Paul D Guild; University of Waterloo, Canada

Firms engage in collaborative industry-university research for a variety of reasons. Increasingly firms need to search outside organizational boundaries to find new sources for technological innovation and tapping into collaborative industry-university research is one mechanism. A framework for classifying the motivational factors driving industry-university research is developed using the five dimensions of getting access to new technology, getting access to scientific frontiers, increasing the predictive power of science, outsourcing selected development activities and lack of resources. The framework was operationalized using twenty-three measure-items and applied to 250 collaborative industry-university research projects from across Canada spanning a four-year period. The resulting analysis identified top motivations as being getting access to new product or process technology, obtaining state of the art information, getting access to university facilities and maintaining an open window on non-targeted research.

TE-15 Decision Making in Technology Management-2
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Galleria-3**
Chair(s): John Whittaker; University of Alberta

TE-15.1 [R] A Systems Approach to Stranded Asset Impacts on Electrical Power Supply

Steven R Harper; University of Illinois Urbana/Champaign, United States
Deborah L Thurston; University of Illinois Urbana/Champaign, United States

In the aftermath of the major electrical power blackout in the Northeastern United States, a renewed effort to restructure electrical generation and delivery has been under way. Many authors make a case for replacing the centralized electrical power generation system with one that has smaller, distributed electrical generation facilities. The increase in reliability has been one of the foundational arguments supporting a new distributed approach, with increased security also being given as a reason for spreading out the "target." The environmental implications of a distributed system, as well as the cost of building and operating the new distributed system have been studied. However, many of the arguments are made in isolation and do not consider the effects of system change on the environment, on the cost of the system, and on the reliability of the system concurrently. This paper presents a new engineering systems approach employing the concept of stranded assets to assist designers in modifying existing electrical power systems. The costs and environmental impact of the proposed systems are determined and then compared to determine the best strategic course of action for electrical utility infrastructure planning.

TE-15.2 [R] Do Emotions, Strength of Ties and Type of Communication Impact the Rationality Underpinning Collective Action of Technology Management Projects

Malavika Sundararajan; Rensselaer Polytechnic Institute, United States
Binod Sundararajan; Rensselaer Polytechnic Instittute, United States
Lois Peters; Rensselaer Polytechnic Institute, United States

This study investigates the interactive effect of emotions and the rational choice process along with network ties and type of communication on the individual's rational choice to act col-

lectively in a group towards achieving a common goal. In doing so the study contributes towards the behavioral theory of the collective action process, specific to technology management projects by establishing the effects of emotions and the impact of network ties respectively on the rational thinking of individuals during the group decision making process. The sample for our study included students from the management and IT departments involved in group projects that required collective action. Two approaches were taken to collect data, namely self-reported surveys and focus group discussions. The self-reported survey results showed that emotions do impact the rational choice to act collectively at a highly significant level, whereas only certain aspects of network ties and types of communication have a moderate to high impact on the rational choice of individuals' contributions to collective actions of groups. However, all of the focus group participants were unanimous in their opinions about the need to consider specific emotional factors while designing educational and CMC (computer-mediated communication) technologies that are used for collaborative group work. The application of these findings is not only important in the design of educational programs using CMC, but also more specifically to group projects in firms dealing with the management of technology.

TE-15.3 [R] Evaluating Models of Investment Value for Management Based on Partial Distribution

Feng Dai; Zhengzhou Information Engineering University, China
Ling Liang; Zhengzhou Information Engineering University, China
Feng Han; Zhengzhou Information Engineering University, China
Hui Liu; Zhengzhou Information Engineering University, China

Based on Partial Distribution (F. Dai, 2001), this paper discusses increment value of investment to enterprise management, gives the models and methods of evaluating the real value and market risk of the management investments in the average and optimal ways. Finally, by the examples, this paper shows the practical way to evaluate the values for management investment in fixed quantity and in proportion of enterprise production scale.

TE-16 R&D Management-2

Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Parlor-A**
Chair(s): Antonie Jetter; Aachen University of Technology

TE-16.1 [R] The Adoption of Quality Management Systems by Research and Development Organisations in South Africa

Raynold M Zondo; University of Pretoria, South Africa
Cornelis C van Waveren; University of Pretoria, South Africa

The aim of this paper is to generate an understanding of the factors, which research and development organisations consider when implementing quality management systems. Thereby, the research provides an overview of the quality management systems, which these organisations have adopted, and the extent to which they use quality techniques. Fifty-three South African organisations participated in the study and eighteen of these were state funded institutions. The study revealed that most organisations have adopted ISO 9001, do apply the principles of Total Quality Management and perform benchmarking against peers. This has had a positive impact on the quality of the outputs from these organisations. The key external drivers for the adoption of a quality management system was found to be meeting client and tender requirements, maintaining relationships with clients and achieving a competitive edge. The main internal drivers identified included achieving quality control and improving project management. The implementation of quality techniques in supporting the quality management system was low and decreases as R&D spending, as a percentage of gross income, increases. Management and personnel support were found to be critical in the successful implementation of quality techniques.

TE-16.2 [R] Building a Model to Evaluate R&D Projects

Shinji Imoto; Waseda University, Japan
Yoshiyuki Yabuuchi; Shimonoseki City University, Japan
Junzo Watada; Waseda University, Japan

Engineering and technology are playing an important role in strengthening the competitive power of a company and in surviving a severe competition in the world. About 70 percent of the total R&D investment in Japan comes from the private sector. It is the most important to decide which research projects have to be adopted for a future research out of proposals from divisions and sections in a company. The objective of this paper is to analyze how experts evaluate and select proposals submitted for R&D and to model the evaluation and selection of experts. This paper analyzes a research and development of a certain manufacturing company in a heavy metallurgy industry. We employed principal component model, dual scaling, AHP and fuzzy regression analysis to analyze the results by which experts evaluated proposed research projects for single or plural of fiscal years. The experts' evaluation was pursued on the basis of (1) the objective of a research project, (2) its background, (3) its research contents, (4) the expected effect, (5) the possibility of obtaining patents, (6) project schedule, (7) developing cost, etc. The obtained model could realize the same selection of projects as the experts did.

TE-16.3 [R] Future-oriented Mind to Determine Corporate Researchers' Motivation: From The Japanese Big Manufacturing Company Survey

Kunio Shirahada; The University of Tokyo, Japan
Kiyoshi Niwa; The University of Tokyo, Japan

Researchers in large Japanese manufacturing companies have demonstrated a decreased motivation in R&D activities. In addressing this problem, this paper focuses on the concept of the 'future-oriented mind' and analyzes its effect on research motivation. Questionnaires were administered to corporate researchers. Structural Equation Modeling analysis is applied to construct a model (by AMOS 4.0); research motivation is broken down into the factors of the three factors of "The Impact Need toward future society," "The Advancement Need toward future career," and "Identity with organization." As a result, it was clarified that the factor of "The Advancement Need toward future career" has a significant impact on research motivation. In addition to this, the "future oriented" components of the needs are different according to research property, including process-oriented research and applied oriented research. These findings indicate that what researchers value in terms of the future or what researchers are motivated by is different in accordance with the subject matter of the research. This paper will contribute to the improvement of motivational management for corporate researchers by their employers.

TE-16.4 [R] R&D Networks as Complex Systems: A Framework of Analysis Across Technological Projects

Nieves Arranz; Universidad Nacional de Educacion a Distancia, Spain
Juan Carlos fdez.de Arroyabe; Escuela Superior de Gestion Comercial y Marketing, Spain

The aim of this paper is to study the management of technological networks. It works from the basic axiom that networks are a complex reality that present multiple aspects which need to be tackled from different theoretical approaches. The network, considered as a system, will be studied through the different subsystems making it up (structural, strategic, technological and management subsystem), analysing the different variables that are underlying and delimiting the management thereof. An empirical study will be made of the networks set up for the development of technological projects in the framework of the European RTD programmes. The sample comprises 189 institutions taking an active part in said programmes, enabling a description of the main features of the networks and the main challenges posed in the management of technological projects in the network.

TE-17 PANEL: Melting the boundaries between academia and industry for immediate impact

Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Parlor-B**
Panelist(s): Kenneth Chelst; Wayne State University
Frank Plonka; Wayne State University
Ken Riopelle; Wayne State University
Leslie Monplaisir; Wayne State University

Wayne State University developed the Engineering Management Master's Program (EMMP) for high potential engineers on the path to technical leadership. The program began by an exclusive offering to Ford Motor Company, taught at Ford facilities. Today EMMP is offered

as a Ford-only program, and as a Visteon-only program, and as a customizable program to OEMs, suppliers, and non-automotive organizations interested in applying advanced engineering, manufacturing, and management models to their businesses. It prepares experienced engineers for progressively responsible roles within the technical arena, developing them as leaders and change agents. Following two years of coursework, students execute team-based leadership projects over the final year of the program. The students take corporate priorities and translate them into highly visible projects, immediately providing returns on program investment. In this panel discussion, key faculty and corporate executives that manage EMMP will discuss how this program has closed the gap between academia and industry through high value team projects and leadership research project that address corporate priorities identified by executives at Ford and Visteon over the last ten years.

TE-18 New Product Development-2
Tuesday, 8/2/2005, 15:30 - 17:00 **Room: Parlor-C**
Chair(s): Seiichi Watanabe; Terumo Corp.

TE-18.1 [R] High-tech New Product Development Project Organisation Design to Support the Communication and Coordination Across Project Strategic Partners

Yuosre F Badir; EPFL, Switzerland
Christopher Tucci; EPFL, Switzerland
Bettina Buechel; IMD, Switzerland

The high competition and uncertainty in technology intensive sectors enforce organisations to innovate and develop new products to keep their market share and survive. Developing new products increases the need for resources. As the need for resources intensifies, organisations are more likely to partner with others in order to gain access to these resources. This leads to interdependency between the partners participating in new product development (NPD) projects. Heightened interdependence within the network of strategic partners increases problems of communication and coordination between them. This study focuses on a network lead company, which is a 'hub firm' that sets up the network and is responsible for the entire process of the NPD project, from idea to the market, with input from its strategic partners. The question this research tries to answer is how the network lead company can best design its NPD project organisation to support and facilitate the communication and coordination with its project strategic partners. Based on the NPD and organisational theory literature and drawn on a previous study done by the authors, hypothesises related to the organisation design and its impact on communication and coordination across project strategic partners have been developed. Then, the authors investigate three NPD projects in three different high-tech sectors - electronics, biotechnology, and mechanics - to look for evidence that support or refute these hypothesises. Four organisational attributes have been studied: number of hierarchal levels, centralisation, formalisation, and team empowerment.

TE-18.2 [R] Reducing Ambiguity and Uncertainty During New Product Development: A System Dynamics Based Approach

Giovanni D'Avino; Universita' di Napoli Federico II, Italy
Paolo Dondo; CRF - FIAT Research Center, Italy
Corrado Lo Storto; Universita' di Napoli Federico II, Italy
Vincenzo Zezza; IPI - Institute for Industrial Promotion, Italy

This paper presents an approach useful to analyse the performance of the product development model adopted by a company. It was implemented to analyse a specific sub-system - "the climatic system" - of a new car model developed by a large Italian car manufacturer. The activity chain was modelled by using the Design Structure Matrix (DSM) tool, while the nature of the information and knowledge flows coordinating tasks were the primary focus of our study. DSM offers several advantages for process mapping compared to other tools available in the literature and widely used in the new product development environment (i.e. PERT, IDEF suites, etc.). System dynamics was implemented to analyse the dynamic behavior of the product development process relatively to the subsystem considered. In particular, the effect of both ambiguity and uncertainty of the information and knowledge flows on the process performance was taken into account. The analysis was supported by the continuous feedback from the technical managers and engineers involved in the subsystem development. A questionnaire was developed and administered to technical managers and engineers to collect data. Most of the data were collected using measuring scales designed for the purpose.

TE-18.3 [R] Reuse of Technical Solutions Resulting from Collaborative Product Development Projects

Gita Mathur; San Jose State University, United States

Suppliers and customers often collaborate in product development efforts. The division of development activity between their organizations can affect the potential for reuse of technical solutions that result from such product development projects. Findings from a field study of semiconductor component development illustrate the managerial challenge of relationship-specific technical solutions resulting from collaborative development activity. The point at which development activity is partitioned and the potential for reuse of technical solutions emerge as important variables in structuring such projects.

WA-01 PLENARY-4

DATE: WEDNESDAY, AUGUST 3
TIME: 08:00 - 09:30
ROOM: PAVILION

KEYNOTE
Seiichi Watanabe; Terumo Corp., Japan

"Technology Driven Business Creation – Carve-out Methodology and Frameworks for Enhancement"

As the economy changes, the technology side is expected to take initiatives in creating significant corporate values for the future. One effective way is the "carve-out venturing". Flexible corporation systems such as LLC in the US are extensively used in relation to such efforts. Similar systems are being studied and employed in Europe and Japan. The joint study at JATES (Japan Techno-Economics Society) aims to find appropriate methodologies for such initiatives including "carve-out venturing". The speaker would like to discuss how "carve-out venturing" can be effectively undertaken and how corporation systems can assist in such efforts.

KEYNOTE
T. Nejat Veziroglu; University of Miami, United States

"Hydrogen Civilization"

Fossil fuels (i.e., petroleum, natural gas and coal), which meet most of the world's energy demand today, are being depleted fast. Also, their combustion products are causing the global problems, such as the greenhouse effect, ozone layer depletion, acid rains and pollution, which are posing great danger for our environment and eventually for the life in our planet. Many engineers and scientists agree that the solution to these global problems would be to replace the existing fossil fuel system by the Hydrogen Energy System. Hydrogen is a very efficient and clean fuel. Its combustion will produce no greenhouse gases, no ozone layer depleting chemicals, little or no acid rain ingredients and pollution. Hydrogen, produced from renewable energy (e.g., solar) sources, would result in a permanent energy system, which we would never have to change. It is expected that during the present century the whole world will convert to the Hydrogen Energy System or to Hydrogen Economy (since energy is the locomotive of the economy). Three major economies of the world, U.S.A., Europe and Japan have worked out Road Maps for conversion to Hydrogen Economy. The United Nations has established the United Nations Industrial Development Organization - International Centre for Hydrogen Energy Technologies (UNIDO-ICHET) in Istanbul, Turkey, to assist developing countries in converting to the Hydrogen Energy System. The Metal Hydrogen Electric Batteries are already commercial. Hydrogen Fueled Buses are already available for sale. Toyota and Honda companies are leasing Hydrogen Fueled cars in California and Japan. Airbus Company is working on a Hydrogen Fueled passenger plane. German Navy has decided that their new

generation of submarines should be hydrogen fueled. There are already various types of Hydrogen Fuel Cells producing Electric power. Soon, there will be very small Hydrogen Fuel Cells in the market in order to provide electricity for mobile phones. As a result of Hydrogen Economy, not only the Global Environmental Problems will disappear, but also noise levels in the streets will be greatly reduced and the landscape pollution produced by electric power lines in the cities and between the cities will disappear. Using any and all primary energy sources available to it, each country will be able to produce the fuel, hydrogen, it needs to support its economy. They will not have to spend foreign exchange to buy petroleum or natural gas, which is concentrated in certain locations of the globe. Consequently, petroleum wars will disappear; each country will speed up its economy to improve the standard of living for its people, slow down and stop the population growth, and reach a sustainable state. In summary, Hydrogen will provide the World Economy with a clean and efficient fuel, which will end the environmental problems, petroleum wars and will provide the humankind with higher quality of life and sustainable future, or the Hydrogen Civilization.

WB-01 International Issues in Technology Management-2
Wednesday, 8/3/2005, 10:00 - 11:30 Room: Pavilion East
Chair(s): Loretta Evans; The George Washington University/Loop Technology

WB-01.1 [A] Achieving Technological Improvement Through Global Manufacturing Network: A Case Study

Xiaobo Wu; Zhejiang University, China
Guannan Xu; Zhejiang University, China
Zhenzhen Pei; Zhejiang University, China

Globalization has opened an opportunity window for companies in developing countries to improve their competitive capabilities through global manufacturing network (GMN). This paper examines how Foxconn Group, a Chinese Electronic Manufacturing Service (EMS) provider, takes this advantage to carry out its catching-up strategy and achieves technological improvement. Some implications are also provided.

WB-01.2 [R] Triad Structured Competition: Patenting Technology in China from the US, European, and Japanese Sources

Xiangdong Chen; Beijing University of Aeronautics & Astronautics, China
Ni-li Ha; Beijing University of Aeronautics & Astronautics, China

This paper concerns patent application in China from three major sources in the world, the US, Europe, and Japan. Based on overview of international studies over patent data analysis, the paper suggests two measures to define country specific filed concentration and overall field concentration. A two-dimension model of technological focus is structured to assess field concentration patterns. By investigating data of patent application from 7 top countries out of 116 nations, on 40 IPC fields out of 117 detailed IPC technical areas, the paper provides a two-time period maps to present filed concentration position of the three major sources (Europe is represented by 5 countries). The study concludes that patent application in China is highly driven by market strategies of overseas companies from those regions, and behaves differently in terms of technology concentration: patenting from the US shows strongest technical strength in terms of patent share on most favorable IPC fields and multi-technology backed, patent application from Europe shows almost equally competitive in the hot IPC areas if compared with sources from the US, and also multi-technology in nature, however, this is a much improved situation if compared with the region in early time between 1985 and 1995, and patenting from Japan indicates a highly multi-technology pattern and a modest shift of technology focus away from the most concentrated IPC areas in the second time period.

WB-01.3 [R] Effects of Technical Barriers in Brazilian Fuel Alcohol Exportation

Eduardo L Machado; Instituto de Pesquisas Tecnologicas, Brazil
Mauro S Ruiz; Instituto de Pesquisas Tecnologicas, Brazil
Abraham S Yu; Instituto de Pesquisas Tecnologicas, Brazil

The paper aims to analyze the impact on the Brazilian exports of fuel alcohol of technical barriers adopted by the importer countries. Different technical regulations and product standards are additional difficulties posed to producers and exporters. Additionally, this paper also identify technical regulations that can restrict to the commercialization of fuel alcohol, identifying from an analysis prospective some technologies that could affect the sector in the next five years

WB-01.4 [R] Organisation of International R&D of Multinational Pharmaceutical Companies in Emerging Markets

Claudia Fabian; University of St. Gallen, Switzerland

Traditionally, international R&D is a phenomenon of developed nations. Despite the growing importance of foreign R&D in developing countries, academic research started only in previous years and comprehensive knowledge is often missing. Based on 36 interviews with multinational pharmaceutical companies, the theoretical objective of this paper is to develop propositions for a comprehensive organisational framework for the integration of local activities in the global R&D organisation of multinational companies (MNC). It aims to maximise the advantages and minimise the disadvantages of R&D activities in peripheral, non-traditional regions. The topic is investigated based on the R&D activities of pharmaceutical MNCs in India. The pharmaceutical industry has to consider new strategies to cope with the changed conditions. Many experts hope that a relocation of activities to low-cost countries will improve the difficult situation of the pharmaceutical industry. India has a very well-established pharmaceutical market with an experienced workforce, low costs and increasingly improved legal environment for pharmaceutical R&D. The integration of competencies of R&D locations in emerging markets is hardly considered in literature. Therefore, propositions for an organisational approach for a smooth integration are derived. Sourcing of knowledge, the major motivation of traditional R&D internationalisation, becomes, for example, less important. Moreover, collaborations and outsourcing are more significant in India.

WB-02 TUTORIAL: Keeping a Technology Roadmap Alive By Applying the Technology Development Envelope (TDE) Approach
Wednesday, 8/3/2005, 10:00 - 11:30 Room: Pavilion West
Speaker(s): Nathasit Gerdsri; Portland State University
Dundar Kocaoglu; Portland State University

Technology Development Envelope (TDE) is a new concept and methodology for identifying the optimum path in developing a technology roadmap in which technology strategies and business strategies are combined. The TDE is developed to transform the technology roadmapping approach to the level in which it is dynamic, flexible, and operationalizable. This new approach provides an effective way to help organizations overcome the challenge of keeping a roadmap alive. This tutorial explains the TDE methodology and processes applied to technology roadmapping. An example is presented for a detailed application of TDE to develop a company's roadmap of emerging technologies in electronics industry.

WB-03 Science and Technology Policy-1
Wednesday, 8/3/2005, 10:00 - 11:30 Room: Broadway-1
Chair(s): Audrey Alvear; Portland State University

WB-03.1 [R] The Policy Dynamics of the e-Infrastructure Evolution in Developing Countries

Jiang Yu; Chinese Academy of Science, China
Xin Fang; Chinese Academy of Science, China

Most developing countries are trying to build national e-infrastructure to support the development of the economy and improve the existing governing process. Through the case studies of China and Korea, we hope to explore the policy dynamics from their successful stories. It is found that the governments in developing countries can play the key roles like monitor, support, sponsor and enabler in such a process. The strategic roles of the government from the demanding-supplying perspective or the direct-indirect involvement perspective need to change in different stages of e-infrastructure development.

WB-03.2 [R] Review of Korea's Science and Technology Policy:

Understanding the Dynamics of National Innovation Systems

Deok S Yim; STEPI, Korea, South
Ki Kook Kim; STEPI, Korea, South
Eun Jung Choi; STEPI, Korea, South

For the past four decades, Korea has developed its economy rapidly and emerged as one of the newly industrialized countries in the world. The rapid development of industries means rapid changes in the National Innovation System (NIS). This paper aims to understand the dynamics of Korea's NIS in relation with Korea's Science and Technology policies. The S&T policies of Korea were analyzed using not only policy statements but also data of S&T investment and manpower. Among many innovation actors, the Government Research Institutes (GRIs) led the development of Korea's science and technologies in the beginning, but gradually the private companies began to take the leading role in the development. Recently, as the economy grew and industries were developed, the lack of basic technology became the weak point of Korea's NIS. Realizing this, the government took new initiatives in basic S&T and selected 10 strategic technology areas to prepare for the next 10 years. In addition, a new S&T administrative system was set up to coordinate overall national S&T policy, investment and evaluation. In conclusion, Korea's NIS is still in the evolutionary process, and the government is playing a key role in shaping the whole NIS.

WB-03.3 [A] National ICT Development Policy in Korea

Byoung N Lee; ETRI, Korea, South
Wung Park; ETRI, Korea, South

This paper is concerned with the policy employed by the Ministry of Information and Communication (MIC) in Korea. The authors briefly present the changes of key industries in Korea and the current state and trends in thet ICT industry. They state that developing new technologies and finding new markets are the most critical challenges to delivering continuous growth in the ICT industry. To this end, they introduce the IT 8-3-9 strategy set up by the MIC recently. They also discuss the ICT development practice and experiences in Korea.

WB-04 Technology Assessment and Evaluation-2
Wednesday, 8/3/2005, 10:00 - 11:30 Room: Broadway-2
Chair(s): Peter Jeziorek; Massachusetts Institute of Technology

WB-04.1 [A] A New Practical Approach for Technology Valuation

DooHyun Ahn; STEPI, United States

To be important in technology valuation is to develop the analytical frameworks that can analyze the relationships between the markets and technologies. This study suggests a conceptual framework for technology valuation, which has three analytical steps of industrial production system, technological positions and economic valuation. The analysis of industrial production system employs the strategic cost management (SCM) framework, based on three concepts of value chains, cost (value) drivers and competitive advantages. The analysis of technological positions is mainly based on patent mapping. Finally, the economic valuation of a technology could be estimated by utilizing the numerical methods such as DCF and real options, based on the results of the above analyses. Some cases of technology valuation by this framework are provided.

WB-04.2 [R] Planning Under Uncertainty: Assessing the Robustness of Technology Real Options

Tarik Driouchi; Aston University, United Kingdom
Michel J Leseure; Aston University, United Kingdom

This paper studies the issue of flexibility in long-term planning decisions. By shedding light on the converging and complementary features of Real Options Valuation (ROV) and Robustness Analysis (ROA), we suggest a new framework for assessing investment decisions under uncertainty. A two-dimensional model is thus provided to measure the feasibility of medium and long-range investments. Three IT projects are analysed for illustration.

WB-05 Technology Planning and Forecasting-3
Wednesday, 8/3/2005, 10:00 - 11:30 Room: Broadway-3
Chair(s): Alan I Porter; Georgia Institute of Technology

WB-05.1 [R] DEA & Fuzzy Regression Time Series Approach for Measuring and Forecasting the Performance Efficiency of R&D in Taiwan's Science and Technology Research Institutes

Wen-Han Tang; National Chiao Tung University, Taiwan
Chih-Young Hung; National Chiao Tung University, China
Gwo-Hshiung Tzeng; National Chiao Tung University, China

This paper seeks to conduct a comparative analysis of the performance of R&D programs at the Chung-Shan institute of Science and Technology (CSIST) and Industrial Technology Research Institute (ITRI). With respect to differences in organizational framework and operating mechanisms between the CSIST and ITRI, we employed database statistics concerning technology R&D project results (excluding all military secrets) for the period of 1998~2002 as our basis. We employed the DEA method to gain an understanding of the research performance of each organization's technology R&D projects, and then utilized fuzzy regression analysis to predict likely R&D project performance trends, with the intention of assessing and predicting the research performance of R&D projects. ITRI's six research institutes and CSIST's fourth and fifth institutes generally exhibited relatively good scale efficiency, CSIST's first research institute showed an improving trend, and its third research institute had relatively poor performance. Due to the logistic transformation and the learning effect caused by project participants, from the point of view of overall predictive effectiveness, the upper and lower limit intervals predicted by fuzzy regression time series analysis encompass the 11 research units in this study and achieve adequate predictive goals and accuracy. This study seeks to provide a relatively objective and efficient model for assessing and predicting R&D performance to CSIST to guide its operations and future transformation.

WB-05.2 [A] Technology Forecasting Using Bibliometric Analysis and System Dynamics

Tugrul U Daim; Portland State University, United States
Guillermo R Rueda ; Portland State University, United States
Hilary T Martin; INTEL Corp., United States

This paper presents models integrating multiple forecasting methodologies in an attempt for a more comprehensive analysis of the technology systems. System dynamics modeling is integrated with trend analysis, scenario planning, historical analogies, bibliometrics and patent analysis for two different technologies: fuel cell and food safety technologies. Results from the two case studies help us validate bibliometric analysis and system dynamics as appropriate tools for technology forecasting where non-linear and feedback structures play an important role.

WB-05.3 [R] Technology Foresight Review: Concept, Activities, Challenges and Limitations

Pisek Gerdsri; Portland State University, United States
Dundar F Kocaoglu; Portland State University, United States

Increasing the global competition and shrinking the innovation cycle have poised decision makers to carefully plan their technology strategies and policies. The consequences of this circumstance impact organizations regardless of their type and size. Technology foresight has been introduced and widely practiced to help organizations addressing their long-term planning. The objectives of this paper are first to aggregate information on technology foresight from various aspects and to review the recent technology foresight activities in a developing economy. Later, conclusions about the challenges and limitations of technology foresight are made.

WB-06 Strategic Management of Technology-2
Wednesday, 8/3/2005, 10:00 - 11:30 Room: Broadway-4
Chair(s) Hak J Kim; University of Houston-Clear Lake

WB-06.1 [R] Identifying Differences in Space Programs

Brian Sauser; Stevens Institute of Technology, United States

Aaron Shenhar; Stevens Institute of Technology, United States
Edward Hoffman; National Aeronautics and Space Administration, United States

From its inception in the early years of Apollo, NASA has prided itself on pushing the boundaries of science and engineering and knowing how to manage these types of projects. However, pushing the management boundaries requires a careful adaptation of risks, resources, and procedures, and projects must clearly assess the complexities and uncertainties of the task. The purpose of this study was to develop a better understanding of the management of strategic system projects at NASA. Such projects are typically characterized by advanced technology, new types of missions, complex integration of hardware and software systems, and inflexible time frames that are often dictated by "launch windows." To analyze strategic projects, this investigation used the framework of Strategic Project Leadership® (SPL) correlated to the management of systems projects at NASA. Of particular interest in this study was the analysis of fit between project type and the appropriate project management style. This research found that there was a good fit between project type and project management style and there is a need to develop a specific NASA framework to assess a project's risk and its appropriate project management style.

WB-06.2 [R] Can Open Source Software Become Commercially Feasible on a Wide Scale?

Lee N Davis; Copenhagen Business School, Denmark

Initially, Open Source Software (OSS) was developed by academics and hackers. But recently, more and more firms have begun to incorporate OSS into their business activities. An example is Red Hat, which launched a successful business model based on OSS applications. The company gets the Linux source code for free, tests and improves the software, and earns profits by offering customers further services like packaging, consultancy, quality verification, maintenance, updating and training. Other companies, such as IBM, are increasingly integrating OSS into their products and services. While innovations in OSS are copyrighted, the copyright is not used to exclude others, but as the legal basis by which to keep the knowledge in the public domain. The logic of open source software conflicts with that of the proprietary approach to software development, most prominently espoused by Microsoft, which argues if firms are to have the incentive to invest in R&D, they must be able to protect their innovative activities through effective intellectual property rights. This paper investigates how and why some firms have found it to their advantage to incorporate OSS into their business models, and the similarities and differences between OSS and the proprietary approach. We then discuss whether or not OSS might ultimately grow so widespread as to displace Windows as the standard for computer operating systems.

WE-06.3 [R] Strategic Uses of Information Technology: A Framework

Mercy L Escalante; University of Sao Paulo Brazil FEA USP, Brazil
Eduardo Vasconcellos; University of Sao Paulo Brazil FEA USP, Brazil
Jose de J. Perez-Alcazar; Universidad Autonoma de Bucaramanga, Colombia, Colombia

This article describes advances in a methodology for evaluating the strategic uses of Information technology (IT) in companies. Its objective is to help fill in for the absence in the literature of an integrated, flexible and holistic methodology with the necessary contemporary tools that will sustain analyses of different aspects related to the use of IT and its effects on the competitive advantage of companies. The article shows that a methodology for evaluating the strategic uses of IT is an essential component in the process of strategic planning in information technology. The methodology described here encompasses different aspects not considered in current methodologies and refers to contributions from different authors, some in the area of technological auditing and others who deal with IT. The abovementioned methodology has been applied as a pilot project and is in its first phase at a large oil company in Colombia. In this article we will show only the procedures followed and the results of the application of certain components of this methodology. The research was bibliographic and exploratory, and involves a case study.

WB-07 Project/Program Management-6
Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Forum Suite**
Chair(s): Gary Chen; Montana State University

WB-07.1 [R] Verification of the Conditions for Implementation of Earned Value Management (EVM) Methodology in the Governmental R&D Organization in Taiwan

Hsueh-Ming Steve Wang; Chang Gung University, Taiwan

In order to verify the conditions for implementation of Earned Value Management (EVM) methodology inside a R&D organization for the public sector in Taiwan, the key factors were found based on a research effort over a two-year period in Chung Shan Institute of Science and Technology. This institute has 10,000 employees and is the major domestic defense R&D organization in Taiwan. The findings include: (1) the accounting for the implementation of budget needs to offer sufficient incentives for promotion of programs; (2) the hierarchical structure of human resources needs to be flexible enough for project management; (3) project management information system (PMIS) needs the agility to concurrently upgrade; and (4) in order to evaluate earned value, the planning of baseline for a R&D project must be appropriate.

WB-07.2 [A] The Advantages of Project Status Reporting Using Earned Value Management on System Integration Projects

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

The project management community is encouraging the implementation of Earned Value Management (EVM) into existing business systems. Earned Value Management is being used to improve project planning, forecasting, and reporting of budget and schedule. However, if your company's existing business system is outdated or lacks EVM functionality, it may be difficult to implement EVM in your organization. This presentation will discuss a methodology for implementing EVM using simple spreadsheet tools. The advantages of this methodology include the ease with which data and calculations can be manipulated to meet project needs. Each project resides on its own worksheet, and the critical data can be summarized on a single worksheet within the project workbook. This critical data can be color-coded based on preset limits to provide a quick visual indication of all the projects within the organization. This presentation will conclude with an example using EVM on a typical system integration project.

WB-07.3 [R] Introducing a Holistic Project Management Tool: Project Management Simulation Model (PMSM)

Afsin Bulbul; Portland State University, United States

Wayne Wakeland; Portland State University, United States

In spite of the broad acceptance of traditional static and decomposition-based project management tools, such tools do not offer the capability to capture project dynamics and therefore to understand overall project behavior. Without understanding these basic dynamics, it is very difficult to successfully manage projects. Although project management techniques, concepts and tools are important to determine the success of projects, especially for complex projects, the destiny of the project is highly dependent on the capabilities of the project manager(s). Therefore, improving the skills of project managers is critical for success. However, available project management training tools do not provide a holistic understanding of the project, and therefore they cannot even begin to provide an experience comparable to actually running a project. To overcome these problems, a higher-level perspective should be incorporated into traditional project management concepts. This research develops a system dynamics simulation model that can be incorporated into the project management processes in order to provide this much-needed perspective.

WB-08 Innovation Management-6
Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Council Suite**
Chair(s): Joe Amadi-Echendu; University of Pretoria

WB-08.1 [R] Experience with the Management of Technological Innovations Within the Australian Construction Industry

Mary Hardie; University of Western Sydney, Australia
Graham Miller; University of Western Sydney, Australia
Karen Manley; Queensland University of Technology, Australia

Stephen McFallan; CSIRO, Australia

The BRITE Project (Building Research Innovation Technology and Environment) was established by the Australian Cooperative Research Centre for Construction Innovation to encourage and report on innovative developments in the construction industry. Using both case studies and extensive industry surveys the BRITE Project has examined the creation, adoption and diffusion of innovations. A nexus is reported between technological innovations and the adoption of advanced management practices. Indeed the management of the innovation process is found to be critical to the successful implementation of technological innovations. The BRITE Project's combination of specific detailed case studies with a broad industry-wide survey allows the testing of the hypothesis that organizational and technological innovations are linked from two different perspectives. In both instances, a strong correlation is observed between high technological innovators and the proactive management of organizational knowledge with emphasis on continuing education and training. In contrast, the low innovators surveyed were characterized by a lack of business strategies to improve and monitor performance and by minimal investment in research and development. Technological innovations were found to be significantly more likely to occur in those firms with good profitability and with managers who seek out a broad range of sources for new ideas as well as actively working to capture project learning for ongoing reference. Such ongoing active management involvement fosters the appropriate atmosphere for new technological innovations to occur. The BRITE Project experience highlights the primacy of management skills for the encouragement of ongoing technological advancement within the often conservative construction and engineering sector.

WB-08.2 [R] A Model for Technological Innovation Management in Small and Medium Companies (SMES)

Florangel Ortiz; University of Carabobo, Venezuela

This work describes a management of technological innovation model from the perspective of strategic planning in engineering and technology applied to the case of small and medium companies. Most of the research is focused on great companies or companies that perform formal activities of research and development. This is not the case of SMES, especially in developing countries. Based on antecedents, a model of management of technological innovation is developed, adapted to the characteristics of these companies in developing countries, validated in Venezuelan manufacturing sector. This model considers several internal aspects that take part in the process in an integrated and systemic way, from the perspective of balanced scorecard, and it constitutes a tool of supporting management decisions for the development of a process-oriented innovating strategy. The model contributes to generating knowledge in this area, giving a significant social contribution in the sense that it serves for improving innovating and technological abilities for small and medium companies, which represent the majority of companies in Latin America, fortifying them to survive in this global markets age. This implies the preservation and generation of new jobs, which is translated to improvements of the quality of life of its people.

WB-08.3 [A] Analysis on the Innovation System of Telecommunications Industry in China

Jing Zhang; Beijing University of Posts and Telecommunications, China
Xiongjian Liang; Beijing University of Posts and Telecommunications, China

This paper gives the general definition and components of an innovation system firstly. It discusses the components of innovation system of telecommunications industry and divides them into five groups: main bodies, managing and guiding bodies, research organizations, innovation supporting bodies and environmental factors. Following that, it analyzes the operation of the innovation system by focusing on the administrative system of the telecom industry and the enterprises in the industry in China. It gives a summary of China telecom reform, introduces the development of operating companies, value-added service providers and equipment manufacturers, and discusses the interaction between the government and enterprises in China. The characteristics of China innovation system of telecommunications industry are concluded accordingly.

WB-09 Information/Knowledge Management-2

Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Directors Suite**
Chair(s): Antonie J Jetter; Aachen University of Technology (RWTH)

WB-09.1 [A] Supporting Strategic Decision Making Through Technology Intelligence

Noordin Than Myint Hlaing Shehabuddeen; University of Cambridge, United Kingdom
David Probert; University of Cambridge, United Kingdom

Investment decisions taken today affect the future shape and direction of a company. The decision to invest in a strategic technology today may mean that crucial resources and financial capital are locked-up and unavailable for future investment needs. The development of a radically new technology, changes in business and competitive environments, and introduction of new legislation are all examples of major factors to be considered. In order to ensure that appropriate strategic decisions are taken, company managers have to take into consideration both the factors and multiple planning horizons that are clearly present in today's business climate. Such planning horizons span the issues of 'which product technologies should we adopt' and also 'which business should we be in'. Technology intelligence has been recognised as an indispensable process for supporting such decisions in technology intensive businesses. An effective technology intelligence system can help identify the potential technological opportunities and threats that a company faces in the medium and longer-term. A good system promotes the sharing and dissemination of intelligence gathered by the organisation, and aligns existing business processes to enable key decisions to be taken. This paper discusses the stages involved in developing a technology intelligence system and the various issues present at each stage of development.

WB-09.2 [R] Modelling of Competitive Intelligence System in the Faculties as Learning Organisations in Serbia

Viktor D Radun; Faculty of Management, Serbia-Montenegro
Zoran T Lovrekovic; Faculty of Management, Serbia-Montenegro

The purpose of this paper is to make a model of Competitive Intelligence (CI) system as a competitive Knowledge Management (KM) system, which could be used for analyzing the competitive environment and improving competitiveness of organizations in the Serbian economy and implemented in the faculties in Serbia. In the presented model, CI system is regarded not only as a strategic competitiveness factor, but also as a KM system, as a specific means of learning through analyzing the turbulent competitive environment. As the economy of Serbia is currently going through a period of transition, tending to develop into a knowledge economy, the competition becomes more and more complex and demanding, especially with the growing importance of knowledge as a key competitiveness factor and critical resource. The transition means vast and fast exposing of the economy to the wave of globalization and the importance of knowledge. This paper considers the faculties in Serbia as unique learning organizations in the Serbian economy, where the primary goal is to create, process and disseminate knowledge to the students and other interested individuals and groups. In such a dynamic learning process, the distinct way of dealing with knowledge becomes a real competitiveness factor and a value of crucial importance.

WB-09.3 [R] Implementing the Data Quality Maturity Model Through Capability Maturity Model

Kyung-Seok Ryu; ETRI, Korea, South

Previously many studies on data quality have been focused on the realization and evaluation of both data value quality and data service quality. Also, those studies revealed that poor data value quality and poor data service quality were caused by the poor data structure. Meanwhile, in this study we focused on meta data management, namely, data structure quality. Especially, Data Quality Management Maturity Model is introduced as a way of maturity model. And then we empirically proved to show the improvement of the data quality as the data management matures.

WB-10 Telecommunications Industry-2

Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Studio Suite**
Chair(s): Jeet Gupta; University of Alabama in Huntsville

WB-10.1 [R] How to Determine the Optimal Level of Limited Flat Rate Tariff for Broadband Internet in Korea

Jee Hyung Lee; ETRI, Korea, South
Jae Kyung Choi; ETRI, Korea, South

Recently, Lee (2002) compared the two Internet pricing systems, the flat rate and the usage-based pricing, in terms of their roles in the social welfare. He suggested that the flat rate pricing is better when there is no limit in the supportable volume of network source. Otherwise, the usage-based pricing system is better in the respect of reducing the unnecessary waste of network resource. But he does not offer practical method to calculate the usage-based pricing. This paper attempts to determine the optimal level of limited flat rate tariff as a sort of usage-based pricing for broadband Internet service in Korea. What we find in this paper is that the profit can be diminished if the service providers raise the tariff by taking advantage of the change of charging systems since the flat-rate tariff is the most favorite charging system of service users and 52 percent of the survey responders showed the intention of churn-out when the service providers introduces the limited flat rate tariff.

WB-10.2 [R] Subscription to the Internet Telephony in Korea: An Econometric Analysis of Stated-Preference Data

Ho Kim; ETRI, Korea, South

This study develops a model that relates the probability of subscribing to the Internet Telephony service to potential subscribers' telephone use behavior and socio-demographic characteristics. The subscription forecasting model is developed by applying binary probit model to stated-preference data. The model results show that variables affecting the Internet Telephony subscription include monthly expenditure on telephone calls, number of telephone calls made per month, pricing structure adopted by the household, telephone company the household subscribes to, age of household's decision maker, and monthly income of the household. The signs of parameter estimates are found to conform to a priori expectation or general industry belief.

WB-10.3 [R] Reviving Telecommunications R&D in New Jersey: Can a Technology Cluster Strategy Work?

Jiang He; Stevens Institute of Technology, United States
Hosein Fallah; Stevens Institute of Technology, United States

For almost a century, Bell Laboratories, a global icon of telecommunications innovation, was supported by the monopoly of the Bell System. The breakup of the Bell System and de-regulation of telecommunications has fundamentally changed the paradigm of telecommunications innovation in the United States and the state of New Jersey (NJ). The R&D capability of the Bell System was fragmented. Deregulation, however, has led to the emergence of many startup companies in the state. With the industry beginning to rebound, the issue facing the industry and the policy makers is how to support and re-grow the telecom R&D capabilities of the state. This paper discusses characteristics of successful technology clusters as a framework for developing a strategy for NJ. The authors also present the results of a survey of telecom start-ups in NJ to identify infrastructure and policy issues that could be addressed through a cluster strategy. The findings suggest that New Jersey at present provides inadequate support for telecom cluster development.

WB-13 New Product Development-3

Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Galleria-1**
Chair(s): Joseph P Martino; Yorktown University

WB-13.1 [R] Product Development Strategies for Innovative Products

Masaru Ishioka; Ishinomaki Senshu University, Japan
Kazuhiko Yasuda; Tohoku University, Japan

In the current competitive high-tech products market, product development based on customer preferences with applications of innovative technologies and continuous introduction of new products are the keys to staying in business for the organizations aiming for larger market share. However, not every organization holds enough skills for developing new and innovative products to take a higher advantage in the market. Therefore, the organizations need to recognize their innovative product development ability for selecting the target customers. The purpose of this paper is to develop a series of product development strategies designed for different innovation levels and recommend the strategic approaches for organizations facing the innovative products market. The strategies are developed from three viewpoints: level of product change, scope of product change, and speed of product change. The three factors are generated from the customer's point of view. Each strategy developed by applying the three factors is an effective method for designing their products to satisfy target customers' expectations. The factors are strategically generated by the analysis of current competitive innovative market condition. The suggested strategy enables organizations to define their competitive skills and target customers' characteristics. The strategy leads to more precise and accurate application of effective product development.

WB-13.2 [R] Speed: Too Much of a Good Thing?

Jiyao Chen; Stevens Institute of Technology, United States
Richard R Reilly; Stevens Institute of Technology, United States
Gary S Lynn; Stevens Institute of Technology, United States

Time-based strategy has become the latest key to competitive advantage. However, the implicit assumption that speed has a linear relationship with project success lacks examination. Several perspectives including time compression diseconomies resulting from the limits of the capacity for human information processing, bounded rationality of decision making, "absorptive capability" of organizations, and organizational learning, are applied to the study of new product development (NPD) teams. We argue that uncertainty is a critical contingency for understanding speed in NPD. We propose that whether speed has a linear or curvilinear relationship with success will depend upon the degree of uncertainty. Our results show that the relationship is curvilinear when either technology uncertainty or market turbulence is high but linear when such uncertainty is low. In contrast, we find a curvilinear relationship under conditions of low market newness but not under conditions of high market newness. An important implication is that it is necessary to analyze the source and degree of uncertainty of a project before a time-based strategy is selected. The limitations and future research related to these results are discussed.

WB-13.3 [R] Improving Time to Market Forecasts: A Comparison of Two Technology Forecasting Techniques for Predicting U.S. Fighter Jet Introductions from 1944 to 1982

Lane Inman; Veritas Software, Corp., United States
Timothy R Anderson; Portland State University, United States
Robert Harmon; Portland State University, United States

Since its origin in 2001, technology forecasting using data envelopment analysis (TFDEA) has been tested with a number of applications. This paper uses a previously published technology forecast comparison of U.S. fighter jets between the years 1944 and 1982 to compare TFDEA to basic regression. Both techniques use aircraft introduced between 1944 and 1960 to predict the first flights of those fighters introduced between 1960 and 1982. TFDEA was found to better predict the first flight dates than the forecast using regression. These results indicate that TFDEA may be a powerful new technique for predicting complex technological trends and time to market for new products.

WB-14 Technology Transfer-4

Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Galleria-2**
Chair(s): Larry G van den Berghe; University of Waterloo

WB-14.1 [R] Analysis of the Technology Transfer, Measurement of Impact and Management Implications

Mario M Coccia; National Research Council of Italy, Italy

This paper analyses the spatial behaviour and measures the economic impact of technology transfer on the geo-economic environment and the adopters, by an indicator, which is similar to the Richter magnitude of earthquakes. The data of some research labs operating in the field of technology and in different economical regions are used. The results show that, when the distance from the source of knowledge increases, the spatial-temporal dynamics

of technology transfer decreases with damped oscillations. The magnitude of technology transfer shows a high value within the industrial district and a low one far from the epicentre (i.e. the place where the research institute or source of technology transfer is located).

WB-14.2 [R] Effective Technology Transfer Pattern and Design Methodology for Chinese Technology-intensive Small & Medium Enterprises

Caijin Huang; Shanghai Jiao Tong University, China
Wei Cao; Shanghai Jiao Tong University, China
Wenhao Pan; Shanghai Jiao Tong University, China

Based on the broad investigation, the characteristics of Chinese technology-intensive SMEs, as well as their successful experiences and the problems they encounter, are summarized in this paper. Since the technology output of colleges/research institutions does not meet the technology demand of technology-intensive SMEs, it is proposed here that the government may take advantage of market measures to establish three platforms, which are organization platform, technology platform and investment platform, via the collaboration between colleges/research institutions and enterprises, and therefore to promote technology transfer. The Spiral Propulsion Principles methodology is proposed in this paper as well in order to effectively guide the design of transfer solutions.

WB-14.3 [A] What Does 'Technology Transfer' Mean in the Knowledge Economy?

Mohammad Packniat; Ministry of Industries and Mining, Iran

Arise of the new concept of "knowledge-based economy" has brought up changes in management and economics literature. After Machlup's first tries in the 1960's, the concept re-emerged in the 1990's when global competition was formed by the growth of ICT. The global competition in the new economy turned "innovation" into a critical factor for the firms. The importance of innovation was also marked by Schumpeter in the 1940's. The systematic approach to innovation claims that innovation is the output of the innovation system. Some functions should take place in the innovation system so that the system works appropriately. Two important necessities of the innovation system were R&D and knowledge creation and technology diffusion. On the other hand, technologies have changed in their content from being more material-based in the industrial economy to being more knowledge-based in the new economy. Also, the term 'technology transfer' brings two different pictures to mind. The old one is international technology transfer from developed to developing countries. The new one is the transformation of science to technology and movement of technology across legal borders towards production units of the firms. The question the author is trying to answer is the reason for the coincidence of the new economy and the new meaning. The need for innovation in the new economy and the systematic approach to it gained attention for the necessity of innovations, which were technology R&D, knowledge creation and technology diffusion. So the borders which the transfer was defined across it changed from national borders to the border between science and technology and the legal borders in the path of the movement of the technology towards being used in the production unit of the firm.

WB-15 Decision Making in Technology Management-3
Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Galleria-3**
Chair(s): Hongyi Chen; Portland State University

WB-15.1 [R] Adding Value in Project Portfolio Decision Processes

Jeffrey M Keisler; University of Massachusetts Boston, United States

Simple portfolio decision processes estimate the value and cost of each candidate project, rank them in order of bang-for-the-buck and then fund them in that order until the available budget is exhausted. Recent work shows that the ultimate value of the portfolio depends on the process through which anticipated value for different funding alternatives is determined. Along several problem dimensions the portfolio manager may ignore various considerations, include them in a way that requires only limited effort, or examine them exhaustively. A quality process should specify process requirements for portfolio decision making in terms of precision of project level value estimates, degree identification of project interdependencies, fineness of project level funding alternatives, degree of identification of multiple attributes and weights, etc. A useful approach to understanding the benefit of obtaining these different inputs is to treat the outcome of pre-decision analysis as an uncertain event which depends on the choice of analytic tactics and which precedes the actual funding decisions. This creates a workable analogy between value of analysis and the decision theoretic concept of value-of-information. This integrating framework synthesizes previous results that considered the different problem dimensions independently and suggests a comprehensive approach to designing value-adding portfolio decision processes.

WB-15.2 [R] Optimal Project Selection and Budget Allocation for R&D Portfolios

Leonardo P Santiago; Federal University of Minas Gerais, Brazil
Pirooz Vakili; Boston University, United States

We introduce a new formulation of the problem of project selection and budget allocation for R&D portfolios. Due to R&D budget constraints and limited resources, firms are often forced to select a subset of all potential idea/products to carry on the development process. In the formulation presented we make a distinction between budget constraints during the development phase and the commercialization phase by arguing that the latter constraints are not hard constraints. Firms that succeed in developing promising and breakthrough products have little difficulty in securing resources for their commercialization. The portfolio selection at the commercialization phase therefore can appropriately be treated as an instance of selection among a set of financial instruments and the rich theory of financial portfolio formation can be utilized. Optimal selection of projects at the development phase, on the other hand, needs to be performed with the optimal selection at the commercialization phase taken into account. Following this line of argument, we formulate a two stage optimal project selection and budget allocation problem. Properties of the solution and the implications of adopting this formulation are discussed. Project interdependencies at both stages of development and commercialization are considered and illustrated via examples.

WB-15.3 [R] Interactive Visualization Techniques for the Sensitivity Analysis of Decision Models

Kawintorn Pothanun; Old Dominion University, United States
David A Dryer; Virginia Modeling, Analysis and Simulation Center, United States
William R Peterson; Old Dominion University, United States

Sensitivity analysis is one of the most import analysis techniques in decision modeling. Using such techniques, decision makers can make small changes to key model input parameters and assess changes to model outcomes and recommendations. Unexpected or non-intuitive changes can indicate decision model weaknesses and point to recommended changes to the decision analysis input and methodology. With current practices, there are some limitations concerning user interaction and graphical information processing of sensitivity analysis methodologies and associated graphical interfaces. Most of the current techniques and displays are "one-dimensional analysis", which are typically presented in static two-dimensional statistical displays. Therefore, decision makers have to switch among many separable displays to make a decision or detect the results of input variations. If the relevant models have many attributes, it is very difficult for decision makers to interact with and process model input and output variations, due to model complexity and large cognitive loading. This paper presents current practices and associated interfaces concerning sensitivity analysis and reviews these analysis techniques, including advantages and limitations concerning human information processing. This paper also introduces three-dimensional statistical visualization techniques that have theoretical or experimental potential as candidates for future integrated sensitivity analysis display interfaces. Among those techniques are shape transformation, dynamic attributes, vertex shading, texture mapping, and lighting. Recommendations are made for promising theoretical and experimental research directions, which can contribute to decision analysis and graphical information process bodies of knowledge.

WB-16 Technological Changes-1
Wednesday, 8/3/2005, 10:00 - 11:30 **Room: Parlor-A**
Chair(s): Elicia M Maine; Simon Fraser University

WB-16.1 [R] Open-up or Shake-out: Managing Technological Convergence

Through Value Networks

Fredrik Hacklin; Swiss Federal Institute of Technology Zurich (ETH), Switzerland
Christian Marxt; Swiss Federal Institute of Technology Zurich (ETH), Switzerland
Martin Inganäs; Swiss Federal Institute of Technology Zurich (ETH), Switzerland

The phenomenon of technological convergence, originating from the increasing overlap of application parameters among previously separate technologies, can be observed as an emerging source for the transformation of industry boundaries, and the creation of new competitive constellations. Hence, existing business models tend to collide, or might even turn obsolete, causing a wave of industrial consolidation and market shake-outs. This paper argues, that an opening-up of proprietary innovation processes and the expansion of strategic value networks is essential for the management of technological convergence in terms of handling both cause and effect. On the one hand, collaborative innovation efforts support involved actors in the competition for industry foresight, assessing indicators and gaining a deeper understanding of trends and discontinuities that could create new competitive spaces. One the other hand, once the convergence has reached a critical stage, the management of implications can be tackled through a continuous network-oriented strategic repositioning, allowing responses to emerging customer demands by creating new value propositions on a collaborative basis. A case study conducted in the ICT sector examines how the value network approach can support the formation of new dynamic capabilities required for emerging market and technology landscapes, enhancing the competitive advantage of actors in converging environments.

WB-16.2 [R] Implementation of Advanced Manufacturing Technologies in Response to Business Opportunities in Two Small Companies

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

This paper investigates technological implementation in response to specific business opportunities. The case study companies examined in this paper are a small UK engineering company and a small UK automotive supplier. Each of the companies discovered that the impact of the technology driven opportunities would not be felt in production alone. In order to realise the opportunities new administrative procedures would be required and managerial political barriers would need to be overcome. This paper forms part of a research project that will identify the critical factors for the implementation of advanced manufacturing technologies (AMT) in small companies. Previous research has indicated that although many firms adopt AMT for profit-motivated reasons they fail to achieve such benefits because they are unable to manage the politics of the technology and its impact upon organisational design. Much of the literature examining AMT places little or no emphasis on the differences between large and small organisations. Given the resources required to implement AMT, such indiscriminate study may provide results with a bias to large companies with more opportunity to invest in AMT. This research will resolve the absence of an understanding of the particular issues facing small companies when implementing AMT.

WB-17 Collaborations in Technology Management-4
Wednesday, 8/3/2005, 10:00 - 11:30 Room: Parlor-B
Chair(s): Kazuo Hatakeyama; Federal Center Technology Education

WB-17.1 [R] Survey of Methods Adopted at Intel Corporation to Resolve Challenges in Cross-Site Collaborative Engineering

Ketan Paranjape; Intel Corporation, United States
Will Hobbs; Intel Corporation, United States

Corporate mergers and acquisitions, and growing trend towards globalization have increasingly resulted in project teams being split between different geographical locations and time zones. The result is workers spend many hours every work day in meetings which are conducted entirely over an audio bridge or who share project plans and presentations with key stakeholders and you distribute them via e-mail. If you answered yes to any of the statements, then you know the difficult nature of working on cross-site teams. In this paper we will cover cross site project management, the need to develop standards for availability and acknowledgement, and taking responsibility for prioritizing communication and project partitioning. We will talk about the impact of Economics on overhead in terms of travel, infrastructure, extra communication and meeting times and then cover decision making and cultural impact on the organization. Building the cross-site budget is very important when working globally because of the need for collaboration tools, travel for meetings and team-building, temporary relocations, debug and validation labs, project rooms, job rotation, overtime, computer resources/licenses and the need to be creative to make the most of your budget. Managing daily cross-site interactions will cover relationships and trust between teams, setting clear roles and responsibilities, resolving conflicts, achieving effective communication and addressing language barriers. Working across different time zones will touch upon asynchronous reviews, shift timings, post-work-hour support and block-out times. Finally, we will talk about recommendations for Cross-site meetings, member participation, scheduling meetings, the change-ABLE behavior model, discuss a case study and explore what are the next steps to improve your cross-collaboration flow.

WB-17.2 [A] The Applied Molecular Biology Laboratory in Rio de Janeiro, Brazil (LBMA/IFF/FIOCRUZ): An Assessment of Opportunities for a Strategic Health Research Network

Marleide P Cruz; Instituto Fernandes Figueira, Brazil
Marcelino J Jorge; Evandro Chagas Clinical Research Institute, Brazil

Cooperative network is considered an emergent model of economic development. Nowadays it deeply strikes research organization – as well as its main characteristics – according to the logic of innovation. In this present study we draw up a plan to develop a cooperative network, which permits reinforcement of the identification and integration of the different actors who share interest in the Applied Molecular Biology Laboratory-LBMA/Fernandes Figueira Institute-IFF/ Oswaldo Cruz Fundation-FIOCRUZ's clinical research area of genetics. As we conceive it, the model fits together the various multidisciplinary research groups, aiming at establishing linkages among the distinct phases of product and process innovation. Furthermore, the author expects to encourage new lines of communication with other research organizations, which include universities, public and private research business centers, and medical and hospital corporations. Our aim is to strengthen LBMA's financial support through the joint production of knowledge and referred services, searching for a competitive and self-sustained position, in an attempt to assign efficiency to the productive process of the laboratory. It is finally hoped that social recognition and legitimization of this research program, based on the possibility of application of its results, will assure the necessary funding of LBMA.

WD-01 PLENARY-5

DATE: WEDNESDAY, AUGUST 3
TIME: 13:30 - 15:00
ROOM: PAVILION

KEYNOTE

Eric von Hippel; Massachusetts Institute of Technology, United States

"Democratizing Innovation"

Innovation is rapidly becoming democratized. Users, aided by improvements in computer and communications technology, increasingly can develop their own new products and services. User innovation, the data show, is strongly concentrated among "lead users." These lead users--both individuals and firms--often freely share their innovations with others, creating user-innovation communities and a rich intellectual commons. The trend toward democratized innovation is visible both in information products like software and also in physical products. Lead user innovation provides a valuable feedstock for manufacturer innovation, and produces an increase in social welfare relative to a manufacturer-only innovation system. Freely-revealed innovations by users forms the basis for a user-centric innovation system that is so robust that it is actually driving manufacturers out of product design in some fields. I will suggest ways that manufacturers can redesign their innovation processes to adapt to

newly-emerging user-centric innovation systems. Changes should also be made to governmental legislation and policies, such as the Digital Millennium Copyright Act, that inflict "collateral damage" on user innovation. The emergence of democratized innovation systems will be disruptive to some, but I propose that the end result is well worth striving for.

WE-01 Technology Management Education-1
Wednesday, 8/3/2005, 15:30 - 17:00 Room: Pavilion East
Chair(s): William T Flannery; University of Texas - San Antonio

WE-01.1 [R] The Characteristics of Recent 'Japanese-style Innovation' and How to Promote Management of Technology Education

Hiroyuki Yamasaki; Renesas Technology Corp., Japan
Takeo Matsubara; Innovation Promotion Association-Japan, Japan
Shin'ichi Otsuki; Hannan University, Japan

With the adaptation of the executive director system in Japan, the roles of "governance" and "management" in research and development processes have become clearly divided. Using "digital camera innovation" in Japan as an example, this paper analyzes why the innovation was successful. Also introduced are non-profit organization (NPO) activities related to management of technology (MOT) education based on Japanese-style innovation research.

WE-01.2 [A] Technology Management - Building Bridges or Melting Boundaries

Frederick Doern; Red River College, Canada
Morgan Ross; Red River College, Canada

"Experience the process, document the deliverables" is the catch phrase that symbolizes the Technology Management Advanced Diploma at Red River College (Winnipeg, MB Canada). As the only full-time program in Technology Management offered by a Canadian college, there were a number of challenges to balance applied skills vs. the often-taught knowledge of management theory. Developed as a tangible academic bridge for technical college graduates en route to industrial management, the one-year program challenges students to demonstrate MOT skills through project-centered assignments and well-documented deliverables. Learning while doing enables the student to experience the process and develop a portfolio of accomplishments to demonstrate their operational and tactical knowledge of MOT disciplines. Program stakeholders have embraced this approach as a cross-cultural bridge between industry and academia, full-time and part-time learning options, and domestic and international student credentials.

WE-01.3 [R] Constructing a Career Intelligence Program for Undergraduate Students in Taiwan

Hsi-Chi Hsiao; Cheng Shiu University, Taiwan
Chun-Chi Lan; National Changhua University of Education, Taiwan
Tsair-Rong Chen; National Changhua University of Education, Taiwan

With the growing trend of the knowledge-based economy, the measure for both academic research and industrial applications should be on equal terms. Traditional cooperative educational programs cannot fulfill the comprehensive demand for human resource needs in industry. This paper aims to construct a career intelligence program for Taiwanese undergraduate students with an industrial specialization and an emphasis on human resource needs in industry. Students acquire career development skills and judgment competency by taking this program's specially designed courses. This program allows students to possess career intelligence before entering the future work world. The value of this program serves at least three main purposes. The first purpose is to narrow the gap between academic research and industrial applications. Another goal of this program is that students will gain more specialized expertise, correct work ethics, and positive attitudes. As a final point, while interacting with enterprises, university educators can enhance the preparation of academic recruits, expand the application of human resources in industry, and also advance their own professional development.

WE-01.4 [R] Reinventing Management of Technology Education

Meng Li; Shanghai Jiaotong University, China
Fuji Xie; Shanghai Jiaotong University, China
Hongmin Chen; Shanghai Jiaotong University, China

This paper discusses the recent MOT education progress in Japan and China, compared with the original U.S. pattern. To meet increasing demand for quality professionals with technology and management knowledge, both counties adopt MOT education programs, but they also adapt MOT education to their particular contexts based on different development stages, existing capability resource constraints while keeping the essence of the education, which gradually makes it into a new cross- discipline between business management and engineering management.

WE-03 Science and Technology Policy-2
Wednesday, 8/3/2005, 15:30 - 17:00 Room: Broadway-1
Chair(s): Sul Kassicieh; University of New Mexico

WE-03.1 [R] ITC and the Reduction of the Internal Digital Divide in a Developing Country

Audrey M Alvear Báez; Portland State University, Costa Rica
Dundar F Kocaoglu; Portland State University, United States

With the latest Information and Communication Technologies (ICT) such as Wireless, the Internet, and e-commerce, societies have been changing dramatically. These technologies can be the engines of change, and can offer to developing countries an opportunity to bridge their internal digital divide. This study presents a systematic approach to identify ICTs, technology applications and sectors for reducing the internal digital divide in developing countries. Our specific case study is Costa Rica. The methodology selected for this purpose is the Analytic Hierarchy Process (AHP), and the model is based on the UNDP report titled "Creating a Development Dynamic: Final Report of the Digital Opportunity", supplemented with additional literature and comments from an expert panel. A four-level hierarchical decision model has been developed. The overall objective is the reduction of the internal digital divide, determined by the reduction of the digital divide in key sectors, ICT applications and ICTs. The model was tested and verified by the expert panel for the years 2003 and 2010. This study concludes that the reduction of the digital divide in the education sector has a major impact followed by the reduction of the digital divide in the economic, government and health sectors in both 2003 and 2010. The applications with high impact in the reduction of the internal digital divide are those that focus on making effective use of human and ICT resources for the year 2003. And for 2010 the applications with higher impact are those that focus on innovation and creativity as well as improving the efficiency of public administration. Land-based devices, general-purpose software, the Internet content and infrastructure have a high impact on the overall reduction of the internal digital divide in 2003. The impact of collaborative tools increases dramatically from the year 2003 to the year 2010. This leads us to conclude that the role of technology in the year 2010 will be distinctively oriented toward Internet mobility and collaboration.

WE-03.2 [R] Science, Industrial Technology and Economic Development: Empirical Study of China 1992-2002

Xiaobo Wu; Zhejiang University, China
Suli Zheng; Zhejiang University, China
Dongqin Li; Zhejiang University, China

The interaction between science, technology and economic development has drawn much attention in the academic world. In the era of knowledge-based economy, the catching-up process of developing countries depends much on the progress of science, technology and their mutual efforts. After a brief literature review, we take out an empirical study using panel data of 30 provinces of China. We find that there are strong interactions between science, technology and economic development. However, technology plays a much more important role in economy development and the interaction between science and technology influences the economy negatively. Based on these tentative results, we provided some policy implications and potential fields of further study.

WE-03.3 [R] A System Dynamics Model of R&D in the South African System of Innovation

Saartjie Grobbelaar; University of Pretoria, South Africa
André J Buys; University of Pretoria, South Africa

This paper presents the conceptual design of a System Dynamics simulation model of R&D activities, a subsystem of the South African System of Innovation. It represents the initial phase of a research project to develop a dynamic simulation model of R&D activities. It does not contain information regarding the calibration, verification and validation phases of the model. This paper contains an overview of models and quantitative analysis tools currently used to plan and assess policy in the South African R&D system. This is followed by a description of the performance of R&D in the higher education, government and business sectors of the South African System of Innovation. From these qualitative descriptions, the conceptual design of the System Dynamics simulation model is presented. The intended outcome of this research project is the creation of a simulation model that could be used as a practical tool for decision makers in government. This model could be used as a tool for policy testing, policy optimization, or what-if scenario testing. Through the development of this tool a better understanding of the dynamic nature of the South African R&D system will be gained, enhancing our understanding of the long-term consequences of policy decisions on the system.

WE-04 Technology Assessment and Evaluation-3

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Broadway-2**
Chair(s): Christian Marxt; Swiss Federal Institute of Technology Zurich

WE-04.1 [R] Rapid Technology Assessment Methodology (RTAM): A Decision Support System for Allocating Technology Investments

Changyu Xue; Tennessee Technological University, United States
Kenneth R Currie; Tennessee Technological University, United States

We live in a generation where the rate of technological change is fast-paced and dynamic. The firms that achieve success in this backdrop of rapidly changing technology, will be those that adapt technology management strategies and align limited R&D budgets with market forces to improve their competitive edge. Quality Function Deployment (QFD) is a planning methodology that focuses on customer requirements in coordinating the design, manufacturing, and marketing of goods. The proposed methodology (Rapid Technology Assessment Methodology) is a modified QFD process for the integration of customer preferences, technology strategies, and allocation of R&D resources to enhance competitive positions. The methodology presented in this paper analytically quantifies the relationships between "Performance Characteristics" and "Technology Characteristics". By using a combination of decision-making techniques, a company's technological competitive profile is established quantitatively in relation to its major competitors. In addition, leverage of specific customer preferences is used to optimize technology investment decisions when scarce resources exist. The complexity of the technology investment decision problem is reduced into manageable levels, and the outcome of optimization can be used to develop a product-technology roadmap. A case study is presented to illustrate the proposed methodology.

WE-04.2 [R] Quantifying Technology Value: An Application of Digital Imaging Development in Health Care

Nathasit Gerdsri; Portland State University, United States
Jeff Zawada; Portland State University, United States
Randy Lonsdale; Portland State University, United States

This paper presents an application of Technology Value (TV) model used for evaluating and quantifying the impacts of technologies on a company's objective. A case study is also included in the paper to demonstrate how one of the leading companies in health care equipment manufacturing applied the TV model to strategically set the company's target on the development of the next generation of digital imaging technologies.

WE-05 Technology Planning and Forecasting-4

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Broadway-3**
Chair(s): Harold A Linstone; Portland State University

WE-05.1 [R] Knowledge Intensive Work in Finland Year 2020: Any Help from Technology?

Martti Soininen; Lappeenranta University of Technology, Finland
Mikko Seppänen; Lappeenranta University of Technology, Finland
Antti Vanhanen; Lappeenranta University of Technology, Finland

In Finland, the future of labor-related issues is currently an important topic of discussion. This paper studies the current state of knowledge intensive work in Finland with a particular focus on the effects information and communication technologies have on work. The influential variables as well as the megatrends that affect the future of knowledge intensive work will also be studied. Using the scenario methodology, the future possibilities created by information and communication technologies in the field of knowledge intensive work will be portrayed. Based on the gathered information, three scenarios will be constructed and they will be situated in Finland in the year 2020. Through discovering both positive and negative outcomes of scenarios, favorable options for the future society will be proposed.

WE-05.2 [R] Using Expert Knowledge to Envision Technology Trends

Enrique Diaz de Leon; Tec de Monterrey, Mexico
Paul D Guild; University of Waterloo, Canada

Normally, the difficulty of describing expert knowledge about future technology or market trends is its tacit or hidden nature. In other words, such knowledge is typically part of the intuition of an expert. It is, therefore, difficult to portray since, even though it resides within the person itself, it is not always formalised. However, such internal thoughts are typically revealed as probes that can be further developed. That is, it is sometimes communicated as hints into what could be the next generation of technologies almost as a fantasy out of the expert's imagination. This also applies to new market trends. In this case, we are after customer's intuitions. Again, it is not always easy for customers to reveal with all clarity what are their actual needs because such needs reside, typically, well within themselves. This article describes a proposal to study a group of experts and key players from different areas to be interviewed using the repertory grid technique. The collected information will help as a first step within the research process in this area to the generation of hypotheses that can be tested in future research. With this research it is expected to advance knowledge in the area of market and technology forecasting and at the same time improve our understanding of which technologies will more likely take place in the market in the future.

WE-05.3 [R] Technology Futures Analysis Methodologies for Sustainable Energy Technologies

Joanne G Phillips; University of Alberta, Canada
Ted R Heidrick; University of Alberta, Canada
Ian J Potter; Alberta Research Council, Canada

Futures Analysis Methodologies are reviewed and assessed to determine the most appropriate methodology for assessing the future value of a current investment in a sustainable energy technology. Assessment criteria are defined and each method is evaluated against these criteria. The paper provides preliminary conclusions regarding which methodologies to pursue for the purpose of developing a model to predict the future value of a current energy/environmental technology.

WE-06 Strategic Management of Technology-3

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Broadway-4**
Chair(s) Kazuo Hatakeyama; Federal Center of Technology Education

WE-06.1 [R] An Organization-wide Approach for Assessing Strategic Business-IT Alignment

Narcisa Jonsson; KTH Royal Institute of Technolocy, Sweden
Mathias Ekstedt; KTH, Royal Institute of Technology, Sweden
Leonel Plazaola; KTH, Royal Institute of Technology, Sweden
Enrique Silva; KTH, Royal Institute of Technology, Sweden
Norman Vargas; UNI, Universidad Nacional de Ingenieria, Nicaragua

Contemporary firms operate in a dynamic environment for a number of reasons such as new technologies, entrepreneurial ideas, strategic alliances, mergers and acquisitions, and regulatory changes. A key for a well-functioning company is an information technology (IT) that is efficiently deployed to support the business objectives. Keeping business and IT strategies aligned as they evolve has for several years in a row been amongst the top-ranked concerns of companies' executives. Despite this fact, there are few documented concepts and operation approaches for assessing business and IT alignment. This paper builds on one of the most well-known works in this area, namely the alignment maturity model proposed by Jerry N. Luftman. On-going research proposes further development of Luftman's approach in terms of measurability, traceability and organizational involvement. This paper describes an organization-wide assessment approach, where the maturity model criteria and attributes are assessed with sub-questions for clarity. The questions are translated into a questionnaire that addresses a wider set of respondents from all levels of the business and IT organizations respectively. For the cause of credibility, the questionnaire triangulates the posed questions by collecting evidence from both direct interviews as well as alternative sources such as documents. Results from applying the proposed approach in two case studies in companies in Sweden and Nicaragua are presented.

WE-06.2 [R] Strategic Planning of Information Technology: A Proposal of a Model

Mercy L Escalante; University of Sao Paulo Brazil FEA USP, Brazil
Jose de J. Perez-Alcazar; Universidad Autonoma de Bucaramanga, Colombia, Colombia
Javier Mendoza; Autonomous University of Bucaramanga, Colombia

This article introduces the proposal of an integral model of strategic planning for Information Technology (IT) in the context of the new economy. This model allows the formulation, implementation and follow up of IT strategies through the Balanced Scorecard (BSC) and Total Quality Management (TQM). Initially, the focus of this model was oriented towards the formulation phase, and that is why we used the BSC and TQM in order to strengthening it, mainly in the implementation and control processes. TQM associated to BSC will allow an organization to rely on an integral system for the management of IT, where both the tangible and the intangible assets are valued. Moreover, they facilitate that the technological strategies are executed according to what was planned. The proposed model gives priority to an exhaustive, strategic and competitive analysis with the aim of obtaining a good direction of IT aligned with corporate strategies, thus facilitating the application of BSC and TQM. We consider that an integral IT system will contribute to increase the competitiveness of companies in a sustainable manner.

WE-06.3 [R] How to Identify and Measure the Level of Alignment Between IT and Business Governance

Enrique J Silva Molina; National University of Engineering and KTH , Nicaragua
Leonel J Plazaola Prado; National University of Engineering and KTH , Nicaragua
Johnny Flores Delgadillo; National University of Engineering, Nicaragua
Norman Vargas Chevez; National University of Engineering, Nicaragua

Studies have shown that misalignment, or the lack of alignment, between information technology (IT) and business strategies is one of the main reasons why enterprises fail to exploit the full potential of their IT investments. Within enterprise governance, the alignment between IT and business governance is becoming more important in achieving the organization's goals by adding value and balancing business risk versus return over IT. IT governance is integral to the success of business governance by assuring efficient, and effective measurable improvements in related business processes. In order to identify and measure the level of alignment between IT governance and business governance, this article proposes a novel correlation analysis approach. The approach consists of selecting a list of IT and business processes with their respective groups of key performance indicators then developing a correlation analysis between perspectives of business balanced scorecard and IT balanced scorecard. An illustrative example of correlation analysis is presented. The main contribution of this paper consists of presenting a new perspective and preliminary concepts on how to identify and measure the level of alignment between IT and business governance by means of correlating IT and business balanced scorecards.

WE-07 Project/Program Management-7

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Forum Suite**
Chair(s): Boonkiart Srivannaboon; Portland State University

WE-07.1 [R] Project Task Coordination Using Design Structure Matrix and Genetic Algorithm

Mazur Lukasz; Montana State University, United States
Gary Chen; Montana State University, United States
Michal S_siadek; University of Zielona Gora, Poland
Roman Kielec; University of Zielona Gora, Poland
Waldemar Semik; University of Zielona Gora, Poland

This paper is to study the underlying structure of project tasks so that the three basic task types (i.e., independent, dependent and interdependent) are clearly revealed and the entire project task structure is well coordinated. Design Structure Matrix (DSM) is used to represent the relationship among project tasks. Genetic Algorithm (GA) is used to help coordinate/optimize the project task structure in terms of task cost, task time and their coupling strength. The effectiveness of this model is demonstrated by an illustrative example.

WE-07.2 [R] A Simulation Approach for the Estimation of Project Completion Time

Enzhen Huang; Montana State University, United States
Gary Chen; Montana State University, United States

Tasks in a complex project are often interdependent on each other, which require much iteration before the interdependent tasks are completed. Traditional CPM/PERT is not applicable to estimate the project completion time when task iteration is involved in the project. This paper is to solve such problem based on a simulation approach. Design Structure Matrix (DSM) is used to represent the relationships among project tasks and the project structure. The simulation dynamically assigns tasks to the appropriate members/engineers according to each member's knowledge level to the task, teamwork capability, work schedule availability, and learning curve improvement. The goal is to develop a simulation model to help estimate the project completion time and offer the solution for task-member assignments.

WE-07.3 [A] Use of the Analytical Hierarchy Procedure for Project Selection in the Nuclear Power Industry

Joseph P Martino; Yorktown University, United States

Nuclear power plants all use some method for selecting among projects during the budget cycle. However, many of these methods lack a framework to link projects to asset value. This paper describes the development of an improved method for ranking projects using both financial and non-financial criteria to assess value to owners, customers and other stakeholders. After review of project selection methods, the Analytical Hierarchy Procedure was selected as most appropriate. It allows inclusion of both quantitative factors (cost and revenue) and qualitative factors (business risk, strategic considerations), and allows different levels of management to provide input as appropriate. It also allows comparison of projects across different plants within the same enterprise. Five first-level factors were identified as contributing to maximizing risk-adjusted asset value. These were further decomposed into lower-level factors. Anchored scales were then devised to allow individual plants to develop their own scores on factors at each level. These scales are intended to be developed by upper management, to reflect company policy. The scales will then be used by lower-level managers to carry out project selection. This allows each level of management to make appropriate inputs to the process, avoiding either micromanagement from above or emphasis on parochial low-level interests.

WE-08 Innovation Management-7

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Council Suite**
Chair(s): Jari Hyvarinen; Tekes, the National Technology Agency

WE-08.1 [R] Business Models for the University in the National Innovation System

Gideon de Wet; Self employed, South Africa

During the 50 years after World War II, the paradigm of innovation evolved from a concentration on R&D, to the notion of the management of innovation in the context of the national innovation system (NIS). During this time the role of institutions in the NIS developed along with the view on the value chain of science and technology and the economic forces in various countries. The major driving force for change in many universities was the decreasing fraction of funding received in the form of government grants and increasing pressure to become competitive in the global innovation market. This caused severe "institutional trauma" because university management structures were focused on and experienced in the delivery of academic qualifications in a range of disciplines, rather than the utilization of the academic resources to earn money for survival. This led to the development of integrative delivery mechanisms, such as "laboratories" or "institutes", where prospective clients could interact with experts from several appropriate disciplines to find a solution to their business problems. Many universities created "secondary integrative mechanisms", but with limited skill and understanding of how these business concepts had to be managed – at least somewhat differently from the running of an academic "business". The paper looks at this evolution and identifies areas for further research.

WE-08.2 [A] A Combined Behavioural and Tangible Systems Model for National Systems of Innovation

Joe Amadi-Echendu; University of Pretoria, South Africa

The knowledge and learning economy paradigm of the modern era provides impetus for coalescing economic, socio-political, science and technology issues into the concept of national systems of innovation (NSI). The consistent attribute is the learning interaction between and among economic, socio-political, science and technology agents and institutions. This paper discusses the formulation of a combined behavioural and tangible systems model for NSI. In adapting ideas from physical systems theory, the paper describes the research-to-innovation value chain as a tangible controlled subsystem, and the behavioural elements as the controlling, actuating and transducing subsystems of NSI. The goal is for each behavioural subsystem to intervene in an appropriate manner, either to maximise a desired overall NSI outcome, or to minimise undesired sensitivities of the tangible controlled subsystems, whilst concurrently ensuring that the elements of the NSI network re-organise in such a manner that all responses are bounded within a given time interval. Policy makers, academics, researchers, and students, together with agents and institutions active within NSI, should find the approach discussed in the paper very perceptive, with regard to technology management, analyses of innovation tendencies, and strategic planning for a knowledge-based economy.

WE-08.3 [R] Innovation, Work and the Knowledge Economy

Joao M Simoes; Portland State University, United States

Since the first industrial revolution, Technology Innovation has steadily been molding the way we live and work. Currently, changes by the Digital and Information Revolutions, which beginnings we are experiencing, will truly occur in the decades to come. A long process where, widely available information covering Knowledge, Technology, Culture and Politics, the maturing of the high-tech industry, and new markets yet to be invented and explored, will take our society to new limits, bringing the World, it's People and Cultures closer than ever. A new world developed around what many call the Experience, Services and Knowledge triangle, will value work differently. Free time will gain new value, and in order to maintain sustained job growth (low unemployment), reduced weekly working hours leading to continuous growth in the self-employed share of the labor market. Such economy will be ideal for Innovation and Creativity, with a growing attention on developing a Culture For Innovation and Entrepreneurship. This paper will consider ideas being defended by philosophers and economists from the US and Europe, together with existing lasting trends like the decreasing length of the work week, high productivity growth, and the quick "catching up" of developing countries in relation to the most industrialized. To defend the idea that a future society of Knowledge and Information sharing, making way in the most industrialized nations, will strongly depend on Creativity and Innovation capacity of its labor force, in order to maintain current sustained growth and continuing improvement of living standards.

WE-09 Information/Knowledge Management-3

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Directors Suite**

Chair(s): Yutaka Kuwahara; GVIN Limited

WE-09.1 [R] Collegial Leadership

Robert J Parden; Santa Clara University, United States

You can manage manual workers, but you must lead Knowledge Professionals. To reach the next level of creative achievement, leaders must help Knowledge Professionals satisfy the self-actualization needs described by Maslow [6]. The term Collegial Leadership is used to describe this distributed, shared, leadership among colleagues.

WE-09.2 [R] Do Maps Guide the Way to NPD Success? Theoretical and Practical Aspects of Knowledge Mapping in Product Development

Antonie J Jetter; Aachen University of Technology (RWTH), Germany

New product development success largely depends on the ability to combine newly acquired information on customer demands and technological options with knowledge that exists within the company. Project organization and high employee turnover, however, make it difficult to be informed about what knowledge is available within the company and to access it successfully. Knowledge maps, a popular concept in present knowledge management, offer a possible solution by "guiding the way to knowledge". Their purpose, structure and content varies greatly, as does their ability to capture different aspects of knowledge. This paper investigates the theoretical basis of different types of knowledge maps and investigates their applicability in development projects.

WE-09.3 [A] Learning Cells: The Case of Innovative Insights Process in a Limited Technology Investment Company

Enrique Martinez; Universidad Autónoma Metropolitana, Mexico
Jordi Michely; Universidad Autónoma Metropolitana , Mexico
Celso Garrido; universidad Autónoma Metropolitana , Mexico

This is the case of a Mexican company that faced the severe effects of globalization process and later the huge 1994-95 national economic crisis to survive by the development of its own insights based on the workers' creativity and a strategic plan that stimulated the intellectual capital as an answer to unstable local and international markets. The case shows how the empowered people and the use of a knowledge management model to develop and measure intangible assets triggered an interesting attitude that realized profound roots of innovation among company people. This company faced a faster change of economic trends, since being a local monopoly to a competitive one in an almost immediate economic openness since the end of the 80's, losing competitiveness, that worsened by the financial crisis in Mexico few years later. Without financial resources, the CEO decided to learn faster how to create innovative conditions to rescue its position as the main national provider. A new strategic plan was created based on knowledge management and innovation to enhanced activities in a record time under a systemic vision. An important result was the implementation of "learning cells", whose experiences will be shared here.

WE-10 Telecommunications Industry-3

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Studio Suite**

Chair(s): Poondej Krairit; Assumption University

WE-10.1 [A] A Regulatory Direction for Internet Interconnection Market

Sun A Kang; ETRI, Korea, South

A settlement among ISPs in internet interconnection was not an issue because it was used for pure research purposes in its early stage. But today internet interconnection and settlement have become issues for operators because the internet is popular all over the world, and its purpose has become a commercial usage, which causes the appearance of various ISPs with different sizes. Anti-competitive behavior of large ISPs is seriously considered and dissatisfaction of medium and small ISPs on existing internet interconnection is high as more seamless and universal internet connectivity is required with internet market expansion. For these reasons, regulation issues on internet interconnection are caused in many countries

where competition is spread at internet market, and we intend to introduce internet interconnection system and regulatory direction in Korea. So, we review the regulatory trends on US and European activated internet market and derive spreading effects for many other regulatory parties from this review as well as study on the reasonableness for regulatory intervention in the Korean internet market.

WE-10.2 [A] Status and Trends of Regulation for Internet Interconnection

HyunMi Baek; ETRI, Korea, South
Jaeho Byun; ETRI, Korea, South
Eunjin Cho; ETRI, Korea, South

This paper reviews the domestic and overseas status of Internet interconnection as well as change in the direction of regulatory regimes. Each government in the world has implemented the discriminating regulations against the data service in order to bring up the data industry that appears later than the voice services. However, it is found difficult to make the competitive market environment in this regulatory regime of data services because of the nature of the network industry. To overcome this difficulty, the direction of Internet interconnection regulation is being changed in each country. This paper studies the status of the Internet industry and change in regulation in U.S., Australia and United Kingdom. Based on the study, this paper attempts to suggest the direction of Internet interconnection regulation in Korea, and to propose the standard of revising the current Public Notice about Interconnection that is not suitable for the TCP/IP based Internet. To calculate the Internet interconnection fee, study of rate pricing method, paying subject with regards to origination and termination, and interconnection fee pricing standard such as cost-plus pricing and retail-minus pricing are needed. Besides these prerequisites, regulations are also needed such as securing transparency of the rate and the agreement, and the obligation of providing network access indiscriminatingly.

WE-10.3 [A] Strategic Factors for Wireless Technologies in Developing Countries: The Case of Thailand

Poondej Krairit; Assumption University, Thailand
Vichit Avatchanakorn; Assumption University, Thailand

Wireless technologies have been adopted as a telecommunications technology infrastructure of choice in many developing countries because of its low implementation costs and a wide variety of applications available. This research attempts to examine the driving factors of wireless technologies from both the demand and supply sides in developing countries, using Thailand as a case study. On the demand side, econometric method will be used as a well-proven approach to capture the dynamics and the complexity of the wireless technology demand at both corporate and individual levels. The demand analysis will provide a basis for understanding the importance of wireless network system elements and services. On the supply side, technical cost models of wireless technologies will be constructed based on the demand and other technical data. The model will provide the framework for determining typical cost requirements of future wireless services and will be used to determine the market potential of each service from the providers' perspective. The expected outcome will show the possibility of future wireless services that suppliers might be interested in offering.

WE-13 New Product Development-4
Wednesday, 8/3/2005, 15:30 - 17:00 Room: Galleria-1
Chair(s): Richard R Reilly; Stevens Institue of Technology

WE-13.1 [A] Bibliometric Study of Dynamic Modeling in Product Development: Literature Research

Tugrul U Daim; Portland State University, United States
Guillermo R Rueda ; Portland State University, United States

The objective of this project is to use bibliometric analysis as an important tool to narrow research processes. System dynamics area is used as initial scope and later on focused into the product development area. Results show bibliometrics as a critical tool that may help researchers to determine patterns and trends reducing the research cycle time. The databases considered as information sources for this research were the system dynamics database (SDD) and the system dynamics review (SDR). Longevity, maturity level, communication index and Lotka's law are used as indices to narrow the funnel research process, optimizing time and efforts, and allow researchers to concentrate only on the critical information.

WE-13.2 [A] The Relationship Between Technology Management and Product Development Boundaries in Small- and Medium-Sized Enterprises

Huw R Millward; PDR, UWIC, United Kingdom
Christopher Byrne; PDR, UWIC, United Kingdom
Andy T Walters; PDR, UWIC, United Kingdom
Alan Lewis; PDR, UWIC, United Kingdom

Small and medium-sized enterprises (SMEs) are in a prime position to develop new products due to their close relationships with customers, suppliers and competitors. The new product development (NPD) process is interdisciplinary in nature, typically covering early concept design, detailed engineering and high-volume manufacture. This paper examines how technology management in SMEs can overcome the boundaries inherent across these product development disciplines, and thereby refine and accelerate the whole process. The National Centre for Product Design & Development Research (PDR) has employed government-backed Knowledge Transfer Partnerships (KTPs) to establish two-year collaborative projects with SMEs who are undertaking NPD activities, and this research study employs a case-study methodology based on 15 KTPs that have been successfully completed over the last eight years. The case studies represent a diverse range of SMEs operating across numerous sectors, implementing an equally diverse range of technology. Analysis of these case studies assesses the impact of the product development activities and maps out the interactions between the technology and the management systems for each company. The results highlight the key technology management drivers, which in turn are related to overcoming the main barriers to NPD. Recommendations are made for enhancing technology management for NPD activities within SMEs.

WE-13.3 [R] Strategic Issues in Managing Complexity in NPD Projects

Jongbae Kim; Dankook University, Korea, South
David Wilemon; Syracuse University, United States

With rapid technological and market change, new product development (NPD) complexity is a significant issue that organizations continually face in managing their innovation projects. A product is more likely to be successfully developed and marketed when the complexity inherent in NPD projects is clearly understood and carefully managed. In this paper, several strategic issues in managing NPD complexity are identified.

WE-13.4 [A] Product Portfolio Management: An Example Using Bubble Diagram and Product Life Cycle Curves

Plínio S Pereira; University of Sao Paulo, Brazil
Marly M Carvalho; University of Sao Paulo, Brazil

Portfolio Management (PM) is considered by senior management in big companies as a task of highest importance in business, being used mainly as a management instrument in the following areas: technology management, product and project management, marketing and sales management. Two important tools for Portfolio Management are the Bubble Diagram and the Product Life Cycle Curve. In this paper a real product portfolio of a big Brazilian food company is analyzed. Data from 1997 to 2002 about a family of products was collected, and bubble diagrams were elaborated representing some determined moments for a group of products. The purpose of this paper is to demonstrate that the analysis of a diagram like this in conjunction with product life cycle analysis can give managers a good view of product portfolio as a whole, allowing managers to identify products that should receive more attention of marketing and sales departments, identify products that should be discontinued in production lines because of their low performance in the analyzed market (low profitability, low sales, high production cost), and even help in a decision of launching new products in old markets in substitution or in addition to existing ones, or launching old products in new markets.

WE-14 R&D Management-3
Wednesday, 8/3/2005, 15:30 - 17:00 Room: Galleria-2

Chair(s): Steven Walsh; University of New Mexico

WE-14.1 [R] Corporate R&D and Outsourcing in the Open Innovation Paradigm

Jason M Pattit; Syracuse University, United States
S. P. Raj; Syracuse University, United States
Dave Wilemon; Syracuse University, United States

Firms have always relied on R&D to increase profits through the development of new products and processes. However, the mobility and availability of knowledge workers, government technology initiatives, and the global interconnectedness of firms due to technology-related networking have contributed to the erosion of the dominance of the centralized corporate R&D lab. Additionally, developing complex new products and systems often requires the integration of knowledge and skills from disparate technical and scientific fields. Consequently, firms lacking adequate technical and scientific competencies to completely develop complex products and systems frequently look to external sources of knowledge and technology to supplement internal expertise. Collectively, these factors have contributed to a shift in the innovation landscape to a paradigm of Open Innovation (Chesbrough 2003). This shift has implications for the sourcing of basic scientific research and the development of commercializable technologies, presenting new practical and theoretical considerations. In this article we draw on transaction cost economics, the resource-based view of the firm, and real options theory to develop propositions regarding the influence of transaction-level and firm-specific characteristics on R&D outsourcing decisions in the Open Innovation paradigm. We also forward implications for managers and identify research gaps and challenges for future R&D sourcing research.

WE-14.2 [R] Quality Maturity Method QMM – Theoretical Background

Pekka Berg; Helsinki University of Technology, Finland
Jarno J Poskela; Helsinki University of Technology, Finland
Ade Mabogunje; Tampere University of Technology, Finland
Hanna Nordlund; Helsinki University of Technology, Finland
Malkus Lindroos; Helsinki University of Technology, Finland
Jussi Pihlajamaa; Helsinki University of Technology, Finland
Virpi Leivo; Tampere University of Technology, Finland

Continuously improving overall effectiveness of R&D requires adequate practices, in other words, maturity throughout the innovation chain. The first requirement is that the company has well-defined strategies that take R&D into account and provide information that serves as a basis for R&D decisions. Furthermore, the information has to be utilised and the R&D process itself has to be carried out so that the outcomes are in line with the strategic objectives. In addition, there has to be a way to manage these practices as a whole and at every individual stage to optimise the input-outcome ratio and to maximise the contribution to the business. Such a comprehensive measurement system makes it possible for the R&D manager to get a picture of the R&D effectiveness. This paper describes the theoretical backgrounds of a method, Quality Maturity Method QMM, we have developed and tested in 30 Finnish companies for assessing the maturity level of R&D. Together with before published description, implementation and verifying of QMM the paper establishes the strong platform for further development of assessment of, not only R&D but also, innovation processes in the companies. The paper combines the studies dealing with national innovation systems and corporate level innovation processes.

WE-14.3 [R] Moving R&D to Newly Industrialised Countries: The Case of Microsoft R&D in China

Peng Zhi; University of Cambridge, United Kingdom
Yongjiang Shi; University of Cambridge, United Kingdom
Mike Gregory; University of Cambridge, United Kingdom

This paper presents an exploratory study of strategic and operational approaches of a major multinational company to establishing R&D in a newly industrialized country. The globalisation of production in many industries is now being followed by the globalisation of R&D. In recent years, increasing numbers of multinational companies (MNCs) have set up R&D to newly industrialized countries such as China, India. The reasons include accessing local expertise, proximity to local market, production inspiration and cost advantages. This research studies five R&D units of Microsoft in China, explaining why they established these R&D units, describing the organization patterns, strategic roles in global R&D networks and mapping out the evolution paths. Some preliminary conclusions are drawn about drivers and configurations in global R&D networks.

WE-14.4 [A] Managing a R&D Portfolio: A Practical Case Study

Laura Canez; Mexican Research Oil Institute, Mexico
M Garfias; Mexican Research Oil Institute, Mexico

This paper describes a case study of the Mexican Petroleum Research Institute (IMP, its acronym in Spanish) where a R&D portfolio management analysis was carried out. The case study results suggest that having a technology strategy in place as well as a resource allocation policy prior to the portfolio management exercise is essential. Additionally, the need to incorporate qualitative and quantitative issues is highlighted and the practical implications of managing an R&D portfolio are discussed.

WE-15 Decision Making in Technology Management-4

Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Galleria-3**
Chair(s): Jeffrey M Keisler; University of Massachusetts Boston

WE-15.1 [A] Leadership and Vision on Decision Making

Chun-Yen Chang; National Chiao-Tung University, Taiwan
Gwo-Hshiung Tzeng; National Chiao-Tung University, Taiwan
Mei-Chen Lo; National Chiao-Tung University, Taiwan

With fundamental shifts in the forces dominating business, managers are struggling to find ways to build and sustain leadership positions in their industries. To identify and develop effective decision-making styles, there must be a clear understanding of the nature of managerial work. This study reviewed several organizations and individuals to truly discover that companies convert global presence into global competitive advantage, and achieve their wildly important goals that companies also need to change their mindset to manage and leverage the geographical and cultural diversity in their business. This study uses an expert system to interview leaders in the industry, and the proposed approach uses a Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to assign weights, enabling varied groups and the leaders to identify generic management elements that are relevant to the current business cycling. The result demonstrates a greater sense of accomplishment, and a consistent focus on their highest priorities while the different stages of embryonic stages, high-growth stage and maturity stage were needed for enterprising managers who can thrive in high-risk environments and respond rapidly to changing business conditions.

WE-15.2 [R] Applying Sensitivity Analysis to the Strategic Evaluation of Emerging Technologies in Taiwan Semiconductor Foundry Industry

Hongyi Chen; Portland State University, United States
Dundar F Kocaoglu; Portland State University, United States
Jonathan Ho; Portland State University, United States

In a recent study, Chen developed HDM (Hierarchical Decision Model) Sensitivity Analysis, a comprehensive sensitivity analysis for Hierarchical Decision Models. This paper applies that analysis to a technology evaluation model built by Ho to evaluate the strategic impact of new IC (integrated circuit) manufacturing technologies in the Taiwan semiconductor foundry industry. Sensitivity analysis on Ho's model tested the model's robustness under changing experts' opinions. It demonstrated the impacts of changes at the policy and strategy levels on decisions at the operational level.

WE-15.3 [A] Fuzzy Multiple Criteria Decision Analysis for Evaluating the Performance of R&D Consortia in Taiwan's M&S Enterprises

Chia-Chin Wan; Kainan University, Taiwan
Hua-Kai Chiou; National Chiao Tung University, Taiwan
Gwo-Hshiung Tzeng; National Chiao Tung University, Taiwan

While entering WTO, Taiwan has become one of the members in the international community of globalization. The medium & small enterprises (M&SE), which account for 98 percent of Taiwan industries, are facing even more competition due to insufficient capital, human resources, and limited organization scale. To achieve competitive edges for globalization requires efficiency in doing business and scale in industry development; meanwhile, medium & small enterprises should aggressively form strategic R&D consortia so as to effectively consolidate resources to jointly develop technical capabilities to multiply the synergy. In this study we established an analytic frame for evaluating the performance of R&D consortia from government officials, specialists, scholars, and industrialists. As a result, it comes up with five levels of structure and twenty evaluating principles for forming R&D consortia. Analysis Hierarchy Process (AHP) was applied to determine the weights of considered criteria in an analytic frame. We also employed Fuzzy Multi-Criteria Decision Making (FMCDM) to evaluate the performance of each strategy course of action and outrank these strategies according to their synthetic utility. Finally, we summarized four findings of this study and provided some suggestions for the development direction of M&SE in the near future.

WE-16 Technological Changes-2
Wednesday, 8/3/2005, 15:30 - 17:00 **Room: Parlor-A**
Chair(s) Ian P McCarthy; Simon Fraser University

WE-16.1 [R] Combining Highly Cited Patents with Patent Co-Citation to Foresee Technological Trajectories: A Conceptual Framework

Kuei-Kuei Lai; National Yunlin University of Science & Technology, Taiwan
Calvin S Weng; National Yunlin University of Science & Technology, Taiwan

This study proposes a citation-analytic methodology to foresee possible technological trajectories and to assist a patent manager in understanding the future trend of technology and the evolution of a technology for developing technological research strategies. The main contribution of this approach is to develop a framework based on the new concept of technology topic, technology area and technology field.

WE-16.2 [A] Opportunity Creation from Technology Convergence

Elicia M Maine; Simon Fraser University, Canada
J. Utterback; Massachusetts Institute of Technology, United States

We investigate both the literature and past examples of technology convergence in order to explore the following hypotheses: 1) Opportunities are greater at the confluence of technology streams, and 2) These opportunities are increased by an environment which supports experimentation. We then present some data about the current co-evolution of new ventures with competencies in both biotechnology and nanotechnology, and outline our future research agenda.

WE-16.3 [A] Promoting or Preventing Innovation Management in Technologyical and Business Discontinuities? Three Different Ownership Structures

Pekka Pesonen; National Technology Agency of Finland, Finland
Jyrki Kettunen; DAWO, Finland
Lasse Kivikko; Otakon, Finland
Susanna Kääpä; Tampere University of Technology, Finland
Kristian Packalen; Abo Akademi University, Finland

What kind of innovations a company aims at or what kind of innovations it prefers to use in its operation is the result of a complex interaction between the management, the organization, owners and capital markets. If the governance architecture of a company functions successfully, it may result in a wealth of innovations and their efficient use. However, some of the recent phenomena, such as short-term quarter-based management, outsourcing of research and development activities or the overemphasised interests of owners provide good grounds for the assumption that innovative activity, innovations and "open innovation"--principles meet nowadays more often structural thresholds and friction. The paper will present the results of three case studies that examine how and to what extent the features of the governance and ownership architecture of a company promote or prevent innovativeness and the use of innovations. These companies have met several profound changes in technological and business environment. The case studies are a multi-national enterprise owned by a number of stakeholders, a large cooperative and a medium-sized family enterprise. The results indicate that the ownership has a certain role and impact on renewal processes.

WE-16.4 [R] Perception of Radicalness of Innovation

Thomas G Lechler; Stevens Institute of Technology, United States
Otmar Schreiner; Technische Universitaet Darmstadt, Germany

Attractive business opportunities are often linked with radical innovation. But, how are radical innovation per-ceived by individuals? If the perception of radicalness varies, a reliable assessment is not possible. But, consis-tent perception of radicalness is crucial for all following management tasks. Although a lot of research is done in the field of radical innovation, our comprehensive review of the innovation literature showed that the perception process of radicalness is neglected. Thus, this study examines how individuals perceive radicalness. This paper will examine the perception of radicalness of innovation. To get a deeper understanding of the per-ception process of innovation an experimental design was developed and exploited. Finally, a "function of per-ceived radicalness" was developed. This function explains how entrepreneurs or innovates will perceive techni-cal and market change and how this perception influences the opportunity recognition of ideas. Valuable advices are given based on the function. We propose that technical aspects are more often considered in perceiving radicalness than are market aspects. Additionally, we assume that the individual background influences the perception process. In our experiment the "perceived radicalness of innovation" is used as the dependent variable. To examine the dependence on technological and market aspects, the technological and market change of the innovation will be used as independent variables. The experiment is performed with managers from the industry and with entrepreneurs. The planned sample size will be over 150 respondents. The key theoretical implication of this research project is the development of a "function of perceived radicalness". This function explains how individuals will perceive technical and market change and how this perception influences the perception of radicalness.

HA-01 PLENARY-6

DATE: THURSDAY, AUGUST 4
TIME: 08:00 - 09:30
ROOM: PAVILION

KEYNOTE
Jay Lee; University of Cincinnati, United States

"Infotronics Technologies for Innovative Product Service Business"

For the past decade, the impact of web-enabled and tether-free technologies have added "velocity' and "transparency" to business productivity in globally integrated enterprise. Today's competition in industry depends not just on lean manufacturing, but also on the abilities to provide customers with proactive services for sustainable value. This presentation introduces how Infotronics technologies can transform today's service industry to value-added innovative business. Infotronics technologies provide precision information to enable products and systems to predict their performance and autonomously request service and synchronize business decision.

KEYNOTE
Bob Colwell; R & E Colwell and Associates, United States

"Where Computing is Going...and How Not to Get There"

The computer industry has always prided itself on how fast it changes. But for the past two decades, those changes have been planned, predictable, and monotonic - Moore's Law told you the rough shape of what was coming. Not any more. The industry is attempting to navigate a sharp turn in the road, forced upon it by physics (power dissipation), and a maturing base of users with a finite appetite for performance. The challenges we face now will not be like what we have faced before. This talk will outline these challenges and some technical

management tactics that we must also leave behind.

HB-01 International Issues in Technology Management-3
Thursday, 8/4/2005, 10:00 - 11:30 Room: Pavilion East
Chair(s): Fred Y Phillips; Maastricht School of Management

HB-01.1 [A] Global Composite Indicator for Science and Technology for Developing Countries, Latin America as a Case Study

Guillermo R Rueda ; Portland State University, United States
Ivan P Hernandez; Portland State University, United States

This paper presents a definition of a global science and technology indicator for Latin America countries using multivariate data analysis: factor analysis and principal component analysis as a method to capture multidimensionality. Structural analysis allows reducing the number of variables into a small number of critical factors. Then, a knowledge composite indicator labeled in the study as Latin America Science and Technology Composite Indicator (LASTI) will be defined as a way to integrate multiple information from input and output science and technology (S&T) variables. Science and technology indicators are estimated using input and output variables as proxy indicators. For the analysis we considered the following input variables: i) bachelor's of science degrees conferred, ii) bachelor's of engineering degrees conferred, iii) R&D scientist/engineers, iv) government S&T budget, v) R&D expenditure, and vi) technology imports. And as output variables we defined: vii) number of scientific papers, viii) count of scientific paper citations, ix) number of domestic patents, x) number of external patents, xi) count of patent citations, xii) technology exports, xiii) product output and xiv) high-tech product output. Data will be extracted from RYCIT (Latin America Network of Science and Technology Indicators) for the following Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela from 1997 to 2003. Selection of the countries is based in data availability. The definition of LASTI as a S&T indicator may constitute an excellent tool for Latin American countries to compare performances with developed economies and focus efforts in the critical variables that finally will generate their transition into more industrialized countries.

HB-01.2 [A] An Initial Step to Redefine the General Indicator of Science and Technology (GIST) as a Composite Indicator

Guillermo R Rueda ; Portland State University, United States

The results of this research intend to show some improvements over the Global Indicator of Science and Technology Indicator (GIST) defined by the National Institute of Science and Technology (NISTEP) in Japan at the end of the 80's. The research proposed two modifications to the GIST computation: first, the use of a recursive algorithm for the selection of the critical variables necessary to compute GIST as a composite indicator; and second, two proposed methods to define the weights, relative importance, among the selected variables. For the second, two options are proposed depending on data availability: a) the use of expert knowledge, tacit and explicit, using the Analytic Hierarchy Process (AHP) method and b) the use of relative eigenvalues from multivariate methods as a way to differentiate importance among the variables. The two updates will produce an appropriate set of critical variables depending on a country's specificities, and knowledge from experts as a mechanism to distinguish among different investments.

HB-01.3 [A] Crossing Disciplinary Boundaries in Technology Management: Leveraging Biotechnology and Information Technology Solutions for Feeding Children in Africa

Denny Hooten; Pepperdine University, United States
Charla C Griffy-Brown; Pepperdine University, United States
Florence Wambugu; African Harvest, Kenya

This case study of African Harvest Biotechnology Foundation Incorporated demonstrates the successful use of both biotechnology and information technology in creating a sustainable self-perpetuating environment for feeding children in Africa. In contemporary technology management theory and practice, limited understanding exists bridging the technology gaps between the developed and the underdeveloped world. Efforts to effect such change significantly impact social as well as economic issues. Basic issues include closing the divide between the information rich and information poor nations as well as determining ways to ethically leverage biotech to assist in alleviating poverty in developing countries. This case demonstrates ways to accomplish both. The non-profit organization African Harvest exemplifies value centered business practice in which initiatives taken in developed countries leverage existing global technology infrastructure to address critical social and economic issues in Kenya. This case shows how non-profits can compete in the marketplace using leading edge technology tools. The model demonstrated is very different from government aid. Instead, the model works in the marketplace, using market based technological tools to create independent sustainable advantage for children in developing countries.

HB-01.4 [A] A Comparison of Technology Management in China and the United States

Loretta Evans; The George Washington University/Loop Technology, China

When discussing "melting the boundaries," we also need to consider the boundaries of the international sectors as the technical community grows closer in the world. Examining China's effectiveness level in technology management compared to the United States provides a better understanding of how both countries can increase performance and cooperation in this unique discipline. Technical management in industry, academia and government in the United States is different than technical management in China. This can be attributed to the level of advancement, cultural differences and political styles in both countries. Regardless of the differences, the technical communities in both countries share a common goal of technical excellence and technical prosperity. How the technology is managed within the respective countries as well as between the two countries will certainly impact the speed of growth and the dispersion of the technical advances. Case studies including comparisons of academic, industrial and government organizations in China and the United States will provide some insight into the level of technical management in organizations with similar features. The study is based on survey responses as well as personal interviews and provides a unique insight to the boundary issues encountered in two very different countries.

HB-02 TUTORIAL: Business Process Management and Gap Analysis
Thursday, 8/4/2005, 10:00 - 11:30 Room: Pavilion West
Speaker(s): Alptekin Erkollar; University of Applied Sciences Wiener Neustadt
Birgit J Oberer; UPC Ltd.

In this tutorial will be presented tools, concepts and optimization strategies for Process Management and Process Organization within production enterprises and service sectors based an international project experiences.

HB-03 Science and Technology Policy-3
Thursday, 8/4/2005, 10:00 - 11:30 Room: Broadway-1
Chair(s): Deok Soon Yim; STEPI

HB-03.1 [R] The Change Points of Strict Patent Law on Technology Innovation Using Structure Change Tests

Han-Joo Kim; Institute of Information Technology Assessment, Korea, South
Hwanjoo Seo; Sangji University, Korea, South
Sang Sup Cho; ETRI, Korea, South
Dong-Jin Chung; Institute of Information Technology Assessment, Korea, South

The study analyzes the change points for deriving technology innovation from the strict patent laws in Korea. There are two alternative hypotheses for the role of strict patent laws in the technology economics literature. The first is a deriving force for technology innovation from strict patent laws. Second is the no effect of strict patent law. To test the hypothesis, we construct the long data set related to technology innovation. We conduct a structure change test suggested by Bai and Perron (1998, 2003). Our structure change test results show that there is a structure change point between 1995 and 1996 in our data set. This result strongly supports the hypothesis of the role of strict patent law in deriving the technology innovation, at least in Korea's manufacturing sectors. We suggest several technology innovation

policies based on our empirical results in conclusion.

HB-03.2 [R] Management of Politics of Protection to the Copyright in Brazil

José Matias-Pereira; University of Brasília, Brazil
Isak Kruglianskas; University of São Paulo - FEA/USP, Brazil

The economic growth in the majority of the most advanced countries has origin in the inventions. The introduction of new technologies in an economy allows the rise of the capacity to compete, creating commercial enterprises, companies, jobs and marks (Dosi, 1988; Rosemberg, 1996). It is verified that this natural wealth is being mobilized of consistent form to promote the economic growth of the developed countries (Pavitt, 1998; Freeman, 1994). In the basis of this success is structuralized a wide and efficient system of intellectual property (OECD, 1999, 2001). Recent studies indicate that the unfamiliarity on register of marks and patents is affecting the Brazilian companies, generating unnecessary risks in the exportations of its products (Fiesp/Ciesp, 2002). Ahead of the deficiencies and fragility of the politics management system of protection to the intellectual property, we argue that it is essential for country to develop in this area, in particular in the segment of register of patents. We conclude that these changes must be implemented by means of management of consistent public politics, seeking to use the protection to the intellectual property as an instrument of support to the process of partner-economic development of Brazil.

HB-03.3 [A] Sector-based Intellectual Property Regimes in Developing Countries

Mohammad Packniat; Ministry of Industries and Mining, Iran

IP regimes are one of the tools that affect the innovation rate in a country. It is argued that a robust IP regime can help a country to increase the innovation rate in its firms, and therefore help the development of the country in the context of developed countries. In the developing countries, where scientific and technological development is based on foreign science and technology resources, IP regimes do not have the same effect as developed countries. Although international agreements, like TRIPS agreement, claim that an IP regime helps a developing country to develop, these claims are not justified by empirical studies. For a developing country, to obtain both benefits of IP regimes and neglect the deficiencies of an overall IP system, a sector-based IP regime for each sectoral innovation system is recommended. This is based on the idea that sectoral innovation systems act somehow independently. Also, the present status of different sectors and their needs for development are not the same, so a unique IP system can not be prescribed for the whole of the country. This can also help the countries that have never had an IP system to experience these systems and study their effects on country's domestic conditions. A probable problem of applying such a system is reviewed in the case of Thailand, which used a similar system years ago.

HB-04 Technology Asessment and Evaluation-4
Thursday, 8/4/2005, 10:00 - 11:30 Room: Broadway-2
Chair(s): Pisek Gerdsri; Portland State University

HB-04.1 [A] Technology Insertion for Major Aerospace Programs

Edward G Howard; NOAA (U.S. Dept. of Commerce), United States

The ability to plan for, and actually implement, new technology in subsequent generations of major aerospace programs is a difficult task. Too often, later, the technology is presented as a major effort that only adds minor improvements at substantial costs and schedule risks. If this add-on approach is used, many pragmatic program managers will not wish to implement new technology for later mission generations. From his experience on several major satellite programs with NOAA, the author suggests a more comprehensive approach with the following elements. First, present the opportunities and improvements for products with the new technology. Real potential benefits to the users are a key. Secondly, use technology roadmaps and other tools to show that technology insertion can be included in schedules, risks plans, and funding profiles. Some ideas of technology quadrants in the spiral development process are given. Thirdly, show that other satellite users know how to use new technology and have existing plans to mitigate risk associated with the new technology. The paper will develop this more integrated process for technology insertion for a higher likelihood of success.

HB-04.2 [R] A Framework for Evaluating High-Level Design Alternatives

Peter Jeziorek; Massachusetts Institute of Technology, United States
Marcus Bjelkemyr; Massachusetts Institute of Technology, United States
Hrishikesh Deo; Massachusetts Institute of Technology, United States
Beto Peliks; Massachusetts Institute of Technology, United States
AJ Schrauth; Massachusetts Institute of Technology, United States
Taesik Lee; Massachusetts Institute of Technology, United States
Nam Suh; Massachusetts Institute of Technology, United States

The design of large-scale systems presents an interesting challenge in that design decisions cannot always be immediately verified experimentally. This challenge is particularly evident when multiple high-level design alternatives are proposed to perform a given set of functions. The ability to evaluate these design choices a priori is crucial in the decision making. A structured framework to thoroughly and yet quickly identify potential problems for each of the options would be immensely valuable. This paper presents an approach based on Axiomatic Design Theory that provides a structured method to facilitate the evaluation of the competing technologies and solutions. This framework employs the Axiomatic Design process, functional decomposition and design matrix analysis, to quickly identify the functional differences between the proposed designs. It provides a method to determine what desired functions of the system would be affected by each of the design alternatives and identify critical areas to concentrate on in the evaluation process. Furthermore, this method leverages the Axiomatic Design concepts of coupling and complexity to evaluate which designs will best satisfy the functional requirements of the system. This framework is illustrated in the context of the NASA crew exploration vehicle.

HB-04.3 [A] Prospecting of Emerging Technologies: A Case Study of the Petrochemical Sector

Alexandre V Barros; SENAI RS, Brazil
Elisabeth Urban; SENAI RS, Brazil
Viviane M Lovison; SENAI RS, Brazil

This study approaches a central question for the institutions that act in professional education and technology: the prospecting of emerging technologies and its impacts on work organization. With the concern of anticipating demands for qualifications for which the institution offers regular courses, anticipating demands for Technical and Technological Services (TTS) aimed at the technological dissemination, reducing uncertainties of investments in infrastructure, and indicating perspectives for industrial occupations. The Servico Nacional de Aprendizagem Industrial (SENAI) National Industrial Training Service has developed a methodology for Prospecting Emerging Technologies, and has applied it as a pilot in the sectors petrochemicals, machines and equipment, textiles, electro electronics/telecommunications. The focus of this paper is the petrochemicals sector, where we aimed at identifying the specific emerging technologies of the sector, which would have the probability of dissemination in Brazil over a period of 5 to 10 years. With the participation of three specific groups: (A) Executor Group (GE) – Planning and coordination – set up by external sector consultants (corporations and university), members of SENAI schools with a vocation oriented toward the sector, academia and team of technicians of the National Department of SENAI; (B) Accomplishment Group – SENAI Schools – set up by teams from the SENAI Schools belonging to the GE, who applied the methodology developed for the panels and C) Specialist Technologists do petrochemicals sector, the respondents to the panels. We will also present the goals of this project, the priority sector, the model of prospecting along with its flowchart, results obtained, and the conclusions.

HB-05 Technology Roadmapping-1
Thursday, 8/4/2005, 10:00 - 11:30 Room: Broadway-3
Chair(s): Charles Weber; Portland State University

HB-05.1 [A] Developing a Technology Roadmapping System

Robert Phaal; University of Cambridge, United Kingdom
Clare Farrukh; University of Cambridge, United Kingdom
David Probert; University of Cambridge, United Kingdom

Technology roadmapping is becoming an increasingly important and widespread approach for aligning technology with organizational goals. The popularity of roadmapping is due mainly to the communication and networking benefits that arise from the development and dissemination of the roadmaps, particularly in terms of building common understanding across internal and external organizational boundaries. From its origins in Motorola more than 25 years ago, where it was used to link product and technology plans, the approach has been adapted for many different purposes in a wide variety of sectors and at all levels, from small enterprises to national foresight programs. Building on previous papers presented at PICMET concerning the rapid initiation of the technique and how to customize the approach, this paper highlights the continuing growth of the method and its application to general strategic planning. The communication and network development benefits of the approach are emphasized, considering how different stakeholder groups structure and process knowledge, and how roadmapping can help to bridge these barriers, to align perspectives across internal and external boundaries. The challenges associated with extending the roadmapping method to form a central element of an integrated strategic planning process are considered, based on applications in the telecommunications and defense sectors. .

HB-05.2 [R] An Analytical Approach to Building a Technology Development Envelope (TDE) for Roadmapping of Emerging Technologies

Nathasit Gerdsri; Portland State University, United States

This paper presents the research on the development of a new concept and methodology called Technology Development Envelope (TDE). TDE approach is applied for identifying the optimum path in developing a technology roadmap in which technology strategies and business strategies are combined. TDE allows the executive level decision makers in corporations, as well as the policy level decision makers in governments, to incorporate disruptive technologies and radical innovations in the development of technology strategies. The combination of Delphi method and hierarchical decision (AHP) is used as a foundation for building the TDE concept. The judgments from technology developers and technology implementers are utilized in the process to assure that the technology strategies are in full support of corporate goals and objectives.

HB-05.3 [A] Building a Technology Roadmap in High Performance Computing in the Indian Context

Hema Prem; Indian Institute of Science, Bangalore, India
N.R. Srinivasa Raghavan; Indian Institute of Science, Bangalore, India

While appraising the current scenario in HPC R&D in India, the current study seeks to map the emerging scenarios in this field. As the premier institutes in general are harbingers of pioneering technological solutions in such a field, a systematic interaction with the key professor and researchers would throw light in all pivotal issues germane to such a study. A number of research groups and projects were identified across the Indian Institute of Technologies, Indian Institute of Science, University of Hyderabad and Pune University. In view of various qualitative and subjective issues involved in such a study, an eclectic approach comprising Delphi and Ethnographic methodologies along with scenario planning is adopted. A blend of purposive and snowball sampling was done and thirty professors across various premier institutes were interviewed. Their responses are elicited and an attempt was made to explore the possibility of striking strategic alliances between the industry and the academic institutes in this regard. It implicitly thus depicts a wealth creation model to the R&D department of the industry and the academic institutions. However, the major focus in HPC being Grid computing, this paper presents the abridged information on grid technology world wide with a mention of the upcoming projects in India.

HB-06 Strategic Management of Technology-4
Thursday, 8/4/2005, 10:00 - 11:30 Room: Broadway-4
Chair(s): Ranjit Singh; Netaji Subhash Institute of Technology, New Delhi

HB-06.1 [R] Strategic Technology Choice in Network Industry

Hak J Kim; University of Houston-Clear Lake, United States

Real options have been popular in academics and practice by recognizing its fundamental importance. However, they do not feel the effect on how it leads to reframe the way they approach to solve a certain problem, and to build in much more flexibility into their problems. Our study attempts to develop and present explicitly how the real options approach link network design, by dealing with network technology choice problem. As a result, network designers get the inference of options thinking by reconsidering how to maximize overall gain in network design with highly uncertain network environments.

HB-06.2 [R] Technology Suppression Strategies as Illusion - The Practical Consequences of a Misunderstanding of the Function of Patents

John Howells; Aarhus Business School, Denmark

This paper critically reviews significant (highly cited) papers in the management studies (Dunford 1987) and business historical fields (Reich 1977; Basalla 1988) that purport to provide evidence of the existence of innovation and technology suppression strategies. It finds that the belief that such strategies have been documented is mistaken in these important empirical cases and that the mistake appears to derive from a widespread misinterpretation of the function of the patent system that assumes that patents can be understood and modelled as economic monopolies. This idea remains persistent in the economics literature, as has been documented recently by Kitch (Kitch 2000). This paper ends by discussing a plausible case of the suppression of useful technology, albeit suppression that derives from the threat of antitrust action (Clark 1993). It concludes that although it remains possible that corporations will fail to exploit patents that they believe would be both profitable and useful if developed, the strategy is likely to be rare.

HB-07 Project/Program Management-8
Thursday, 8/4/2005, 10:00 - 11:30 Room: Forum Suite
Chair(s): Jongbae Kim; Dankook University

HB-07.1 [R] Transformational and Charismatic Leadership in Project Management: A Contingency Model

Michael R Ryan; Stevens Institute of Technology, United States
Richard R Reilly; Stevens Institute of Technology, United States

Many different approaches to leadership have been studied but most of this research has been applied at the organizational level or to work groups. Our paper reviews models of leadership behavior as they apply to the project context within different organizational structures. Although trait approaches are useful for studying the antecedents of leadership, behavioral approaches offer a more useful route to understanding how projects can be led most effectively. We review theory and research on leadership in organizations from the perspective of the transformational, transactional and charismatic models of leadership. We then consider alternative frameworks for organizational structure and project types. We construct a map of leadership styles as they apply to a three-dimensional framework that includes the Project Management Institute's (PMI) structural models of organization as one dimension and Shenhar's two dimensional project typologies ((Shenhar 1992; Shenhar, Dvir et al. 1995) Shenhar 1992; Shenhar, Dvir et al. 1995; Dvir, Lipovetsky et al. 1998) as the other two. We outline a set of research propositions linking management styles to particular cells of our three-dimensional model. We support our research propositions with past empirical research and theoretical arguments and provide a research framework for a contingency view of project leadership.

HB-07.2 [R] Project Managers' Characteristics and Their Projects' Profiles

Arik Sadeh; Holon Academic Institute of Technology, Israel
Dov Dvir; Ben-Gurion University of the Negev, Israel
Ayala Malach-Pines; Ben-Gurion University of the Negev, Israel

The fit between project mangers' personality and management style and the profiles of the projects they manage is crucial for these projects' success. An on-going interdisciplinary research program focuses on the relationships among three aspects: projects' profiles, project managers' personality characteristics and the projects' performance. A classification framework of projects along four dimensions: novelty, complexity, uncertainty and pace (Shenhar et. al., 1997) is utilized with the hypothesis that a project with a particular profile

needs a manger with suitable personality traits in order to achieve good performance and success. The questionnaire, especially designed for use in the study, consists of three parts: The first part focuses on project managers' personality traits that seem relevant to projects' profiles. The second part classifies projects along the four dimensions. The third part assesses the projects' success from several perspectives including efficiency and customer satisfaction. Preliminary results will be presented and interpreted.

HB-07.3 [R] Understanding Project Leader Effectiveness: Is It the Person or the Position?

Zvi Aronson; Stevens Institute of Technology, United States
Peter Dominick; Stevens Institute of Technology, United States
Thomas G Lechler; Stevens Institute of Technology, United States

Many discussions and empirical studies consistently point out the importance of project manager authority and leadership skills for project success. Yet, the existing research does not analyze the interaction of both variables. This paper examines the extent to which there are complementing or excluding effects between the project manager's formal position (e.g. level of decision making authority) and the project manager's leadership style (e.g transformational) in predicting different aspects of project success. Our findings are based upon over 230 survey responses from members of 69 different project teams (to avoid common method bias, for each project we collected data from different individuals). We conclude that while formal authority may be helpful for project managers, it is not a key determinant of project success. His or her leadership skills play an even more critical role in relation to project success.

HB-08 Innovation Management-8
Thursday, 8/4/2005, 10:00 - 11:30 Room: Council Suite
Chair(s): Graham Miller; University of Western Sydney

HB-08.1 [R] The Function of Trust as the Agglomeration Factor of Headquarters Operations in Regional Innovation System

Kaori Shinozaki; Tokyo Fuji University, Japan
Akiya Nagata; Kyushu University, Japan

For agglomerating companies in a region, an involvement with a regional community would be one important factor that influences their growing up. This paper attempts to investigate the function of trust as the agglomeration factor of headquarters operations in the regional companies. A questionnaire survey was enforced to explain the agglomeration factor. The coverage of the survey is the manufacturers with the head office at Hokuriku area in Japan. There are some reasons for not moving headquarters operations to other areas, the first being "the existence of trusty suppliers" or "trustful relationships with customers." These imply the function of trust as the bonds of the industrial cluster. Moreover, these bonds could be classified backward linkage and forward linkage. Other reasons are "establishment of the company's brand in a regional community" or "the social reputation that the company has taken root in the region." For the companies which chose these reasons, the establishment in a region is a key factor in order to be trusted by their customers who are in other regions. Therefore, the geographical accessibility to market is not important for them. Through analyzing the above reasons by industry, this study can make clear what industries have a factor which is trusted by their customers, that is, geographical accessibility to market or establishment in a region.

HB-08.2 [R] The Key Factors of Outsourcing in CoPS Innovation

Jin Chen; Zhejiang University, China
Liang Tong; Zhejiang University, China
Tie Jun Chen; Zhejiang University, China
Xiaoyu Pu; Zhejiang University, China

The innovation of Complex products and systems (CoPS) has been considered as a new innovation paradigm. CoPS need a lot of multi-technology and inter-discipline input. None of the CoPS manufactures can specialize in all of the technology fields and provide the whole solution. Outsourcing is a necessary method in CoPS innovation. Therefore, it is necessary to explore what factors influence the outsourcing performances. Studies on outsourcing in CoPS are comparatively less researched. On the base of previous literature, the paper discusses the composition of outsourcing performance, the factors influencing performance, and the relationship between influencing factors and performance. Considering the characters of CoPS development and production, two concepts of CoPS and outsourcing are defined and interpreted firstly. A model of relationship between influencing factors and performance from four aspects is built up in this paper, including the production infrastructures resources, the technology infrastructure resources, the collaboration relationship and the difference between culture and vision. This paper consists of several components: (1) an introduction of why CoPS need outsourcing, (2) a brief review of some literature on CoPS innovation and outsourcing, (3) design of research, including conceptual framework and data collection by questionnaires, (4) data analysis, and (5) some managerial implications.

HB-08.3 [R] An Empirical Research on Influence Factors and Their Differences of Technology Innovation Ability for China's Private Enterprise

Libing Shu; Zhejiang University, China
Shenghua Jia; Zhejiang University, China
Aiqi Wu; Zhejiang University, China

The private enterprises had already become the important component of national economy in China. It put in invisible chains for upgrading quality of private enterprises because of excessively relying on low cost to win the market, which would bring extremely unfavorable negative effect for a new round of international division position. We found that the main influence factors of the technological innovation ability were product innovation ability, process innovation ability, technician resource, financing environment, and innovation policy through empirical research on private enterprises in China, and their differences also been examined. Appropriate innovation mode and public policy should be made to foster the technological innovation ability of China's private enterprise.

HB-09 Information/Knowledge Management-4
Thursday, 8/4/2005, 10:00 - 11:30 Room: Directors Suite
Chair(s): David W Moore; Colorado School of Mines

HB-09.1 [A] Business Balancing Through Knowledge Management

Gulgun Kayakutlu; Istanbul Commerce University, Turkey
Ozalp Vayvay; Marmara University, Turkey

Business re-engineering through success stories are left in the history. Reliable predictions for the future of an extended enterprise are only possible through a customised model based on company-specific knowledge of business relations, supply chains, intellectual capital and economic values added. Knowledge Management leads to effectiveness through modelling, documentation, certification, collaboration, automation, and compliancy to minimise costly errors. This study analyses evolutions in business balancing models for small- and medium-size production companies by implementing knowledge strategies in financial and intellectual management. It is shown that company specific modelling based on the above considerations conveys the sustainability with a global and innovative vision.

HB-09.2 [R] Knowledge Convergence Through Interdisciplinary Capabilities: Fostering Disruptive Innovation in Deconstructed Value Creation Environments

Fredrik Hacklin; Swiss Federal Institute of Technology Zurich (ETH), Switzerland
Jukka-Pekka Bergman; Technology Business Research Center, Finland
Anna-Greta Nystrom; Abo Akademi University, Finland
Christian Marxt; Swiss Federal Institute of Technology Zurich (ETH), Switzerland
Ari Jantunen; Technology Business Research Center, Finland

In recent trends of industrial dynamics and technological change, the effect of technological convergence can be observed as a major reason for disruptions and shake-outs. Driven by a global dispersion of involved resources, an increasing amount of technological intersections and overlaps, resulting business opportunities for collaborative innovation, as well as the sustained customer demand for full solutions and service provisioning, the conver-

gence phenomenon implies the deconstruction of value chains into networks, transforming industry boundaries and creating new competitive environments. Facing an endangered value proposition, actors in converging environments have to tackle the deconstructed, diverged landscape by opening-up their proprietary innovation processes, supporting the co-creation of knowledge, and sharing future-oriented activities for generating creative disruptive responses on an inter-organizational basis. This paper argues, that such an approach particularly requires interdisciplinary design and innovation capabilities, enabling potential for ideas and knowledge to emerge from a combination of horizontal and vertical integration, resulting in a value network. In such a combination, the innovators are not only closer to the customer, but are connected to the customer and other innovators on a much broader basis and through multiple points. The resulting notion of knowledge convergence is illustrated by two case studies from different industries.

HB-09.3 [R] Knowledge Management Capability and Intellectual Capital: An Empirical Study

Dongqin Li; Zhejiang Sci-tech University, China
Xiaobo Wu; Zhejiang University, China
Zheng Suli; Zhejiang University, China

This paper details an empirical study that explores the relationship among knowledge management (or KM) capability, intellectual capital (or IC) and firm performance. We use structural equation modeling to test the conceptual model. The results show that through the intellectual capital intermediary effect, the knowledge management capability has significant influence on firm performance. These results should help both academics and practitioners more readily understand the relation between IC and KM and provide insight into developing and increasing IC and KM capability within an organization.

HB-10 Telecommunications Industry-4
Thursday, 8/4/2005, 10:00 - 11:30 Room: Studio Suite
Chair(s) Robert Harmon; Portland State University

HB-10.1 [R] A Study on a Model for Determining Optimal VoIP Access Charge

Byung-Woon Kim; Electronics & Telecommunications Research Inst., Korea, South
Sung Uk Park; Electronics & Telecommunications Research Inst., Korea, South

The Ministry of Information and Communication plans to add a separate VoIP service different from PSTN services that are provided after being allocated service areas and frequencies within the key communication infrastructure after categorizing VoIP as an electronic communication service provided regardless of service areas over the Internet by using electronic communication systems. The ministry also plans designate VoIP as a key communication service by amending the Telecommunications Act after giving the number '0N0 (040 or 070)' for VoIP so that users can distinguish between VoIP and PSTN (Public Switched Telephone Network). Once VoIP is included in the policy, the VoIP providers distinguishing local and long-distance calls (local number is expected to be used) and the VoIP providers (using 0N0) providing services regardless of service area will pay Internet service providers (ISP) in order to provide telephone services just like PSTN. Therefore when major VoIP providers provide VoIP services to ISP, calculating optimal access charges will become a big issue. As of 2004, there are over 90 VoIP providers in Korea including the major telecommunications service providers KT, Hanaro Telecom, Dacom and Samsung Networks as well as special ITSPs (Internet Telephony Service Providers) like Anyuser Net, Serome Technology and KNSARAM Computer. Hanaro Telecom is one of the major VoIP providers providing VoIP services for a base price of 2,000 won (ADSL), 1,000 won (HFC) and 39 won for three minutes of every local and long-distance call. The VoIP costs of Hanaro Telecom are similar to the local and LM calls provided by KT, while the base price is 62%~80% cheaper and long-distance calls are 55%, 78% and 85% cheaper for one, two and three minutes. When VoIP is included as a part of 'Internet telephony', the access charges will affect the prices of major VoIP providers. The most important factor in the government's deciding the access charge is to improve the public welfare as much as possible without reducing the investments by existing companies. Also, optimal access charges for VoIP must be determined by considering the interdependency between VoIP and PSTN. Therefore, this study is focused on the comparative analysis of the demands for independent and interdependent data networks to figure out how to determine the access charges once VoIP is officially recognized in the data network market by considering the above factors.

HB-10.2 [R] A Study of Market Entrance Strategies for SOHO One-Phone Service

Eok-Soo Han; ETRI, Korea, South
Jung-Hwan Lee; ETRI, Korea, South
Min-Jeong Kim; ETRI, Korea, South

Given the figures of service acceptance and customer analysis taken from a survey on SOHO and small businesses, this paper segments the potential market for One-Phone service in Korea and establishes the direction for targeting and positioning strategies.

HB-10.3 [R] Economic Effect Analysis of the Introduction of Tailored Flat Pricing for Fixed Line Telephone Service

Seong Ho Seol; ETRI, Korea, South
Soo-Cheon Kweon; ETRI, Korea, South

With growing competition and decreasing traffic, many fixed operators offer more new tariff plans based on flat-rate to increase their revenue. The TFP (Tailored Flat pricing), which was introduced in Korea as a new tariff plan relatively of late, is achieving high market performance, but it becomes the target of a dispute, due to user discrimination. The most important criteria in judging whether or not the introduction of TFP is reasonable and desirable is its efficiency; however, there is almost no empirical analysis so far on the economic efficiency of TFP introduction. In this paper, social welfare, especially how much consumer surplus changed has been analyzed under the situation of multiple pricing plans, arising from the introduction of TFP. According to the result of empirical analysis, the consumer surplus has greatly increased, due to the introduction of TFP, which is consistent with the theoretical forecast. The result of this study is expected to be greatly utilized as a basic source for rational policy making on the tailored flat pricing in the future.

HD-01 TUTORIAL: The Institute for Leadership in Technology and Management
Thursday, 8/4/2005, 13:30 - 15:00 Room: Pavilion East
Speaker(s): Stephen C Stamos Jr.; Bucknell University

A tutorial devoted to the presentation and analysis of Bucknell University's Summer Institute for Leadership on Technology and Management. This is a special two-summer program for Management and Engineering students. The ILTM program has been running for 12 years. It is a program that has a very unique 6-week full-time interdisciplinary academic program that incorporates real-time corporate consulting group projects, field trips, and internships. This program is an educational initiative that embraces the practitioner community. This is a story that we hope PICMET will find to be important and interesting.

HD-02 Technology Management and the Service Sector
Thursday, 8/4/2005, 13:30 - 15:00 Room: Pavilion West
Chair(s): Daniel Berg; Rensselaer Polytechnic Institute
Norman G Einspruch; University of Miami

HD-02.1 [R] Technology Management and the Service Sector

Daniel Berg; Rensselaer Polytechnic Institute, United States
Norman G Einspruch; University of Miami, United States

An introduction to the issues of technology management involved in the Service Sector is presented. The special nature of the Service Sector as 80 percent (GDP and/or employment) of the United States economy is given emphasis. A variety of analyses using a technique called "Data Surface Mining" (DSM) is discussed. These analyses have been used to characterize and distinguish the Service Sector. In addition, the papers that follow concentrate on Fast Growth Technology Companies, Hot Shot Companies, Corporate Governance and Power Women. Earlier analyses of patent generation, brand value and productivity as well as ser-

vice system engineering will be discussed. All add insight to the characterization of the special nature of the Service Sector and implications for its technological management.

HD-02.2 [R] Technology Management: Economic Sector Analysis of 'Hot Shot' Companies

Daniel Berg; Rensselaer Polytechnic Institute, United States
Norman G Einspruch; University of Miami, United States

As part of a continuing study of management of technology issues for the developing Service Sector, a recently developed analytical technique, surface data mining, has been applied to a variety of factors. In the present study, 200 up and coming companies designated as "Hot Shots" were analyzed to ascertain the relative presence of the Service Sector and the Goods Sector in this population. It was found that 95 of the companies are in the Service Sector and the remaining 105 companies are in the Goods Sector. Although some 80 percent of the economy is involved in providing a broad spectrum of services, the analysis indicates that nominally half of these companies are service-based and half are goods-based.

HD-02.3 [R] Technology Management: Power Women and the Economic Sectors

Daniel Berg; Rensselaer Polytechnic Institute, United States
Norman G Einspruch; University of Miami, United States

As part of a continuing study of management of technology issues for the developing Service Sector, a recently developed analytical technique, surface data mining, has been applied to a variety of factors. In the present study, America's 50 most powerful women in business were analyzed to ascertain the relative presence of the Service Sector and the Goods Sector in this population. It was found that 66 percent of the women operate in the Service Sector and 34 percent operate in the Goods Sector. It was further found that 11 of the women in the Goods Sector were in companies generally related to the home and health care activities, family responsibility roles traditionally associated with women.

HD-02.4 [R] Fast-growth Technology Companies and the Economic Sectors

Daniel Berg; Rensselaer Polytechnic Institute, United States
Norman G Einspruch; University of Miami, United States

An analysis of a recently published report in FORBES on 25 of America's publicly traded technology companies that are enjoying exceptionally high growth rates indicated that 80 percent of them are in the Services Sector and 20 percent are in the Goods Sector. FORBES also identified 10 fast-growing technology companies that have not yet gone public; 60 percnet of them are in Services, and 40 percent are in Goods.

HD-02.5 [R] Technology Management: Corporate Governance and the Economic Sectors

Norman G Einspruch; University of Miami, United States
Daniel Berg; Rensselaer Polytechnic Institute, United States

As part of a continuing study of management of technology issues for the developing Service Sector, a recently developed analytical technique, surface data mining has been applied to a variety of factors. In the present study, an analysis of data recently disseminated by Institutional Shareholder Services (ISS) on the quality of corporate governance indicated that 70 percent of the 40 companies studied are in the Service Sector and 30 percent are in the Goods Sector. The sample taken is the set of the ten best governed companies in the S&P 500, S&P 600, S&P 400 and the Russell 3000.

HD-03 Science and Technology Policy-4
Thursday, 8/4/2005, 13:30 - 15:00 **Room: Broadway-1**
Chair(s): Deok Soon Yim; STEPI

HD-03.1 [R] A Statistical Analysis of Variables Affecting Technology-Based Economic Development

Sul Kassicieh; U of New Mexico, United States

Regions have focused on new technologies as a way to provide higher levels of wealth and higher paying jobs for their citizens. This has increased the focus on technology-based development and many regions have been torn between the mature and existing markets of current non-technology and technology products and the lure of future larger markets and larger margins on new high technology products. This paper presents the results of an empirical analysis of the determinants of economic development across many regions that are technology rich as well as regions that have non-high-tech environments. It examines the economic variables that predict economic development results and identifies the variables that affect technology-based economic development. It provides policy suggestions for regions that want to increase their economic development based on technology.

HD-03.2 [R] Education and Human Resource Strategy in Informatics in Japan: Curriculum Design upon Japanese National University Reformation

Akihiro Fujii; NISTEP, Japan
Terutaka Kuwahara; NISTEP, Japan
Yasunori Baba; University of Tokyo, Japan

There is a growing awareness of the importance of software production capability because it affects national competitiveness, and has an extensive ripple effect in other industries. In Japan, software production totals approximately 20 trillion yen. Currently, more than 10,000 students receive computer science-related undergraduate education at university every year. To develop human resources that meet the needs of the industrial world, it is necessary to strengthen educational content in this area. Because, in Japan, the curriculum has not focused on "software engineering," the industry is relatively weak compared to other countries. This paper examines the content of university-level training and education in Japan in terms of science and technology policy and a national innovation system. Considering this situation, this paper recommends measures to implement education to satisfy the needs of the industrial world. Firstly, greater flexibility in personnel rating, introduction of a training system to enhance the content of education, and provision of educational assistance from business people are considered in motivating instructors. Secondly, the relationship between the existing license qualification systems such as "technician certification" should be strengthened. In addition, the introduction of an "internship program" that directly leads to employment opportunities and positive evaluation of skills resulting in wage increase are effective in supporting students.

HD-03.3 [R] Assessing Behavioural Additionality Through Public Support of Industrial R&D in SMEs

Khaleel Malik; The University of Manchester, United Kingdom
Luke Georghiou; The University of Manchester, United Kingdom
Hugh Cameron; The University of Manchester, United Kingdom

The concept of behavioural additionality emerged as an observed phenomenon in early evaluations of collaborative R&D programmes when it was found that traditional formulations for additionality did not capture well the effects of programmes on firms. In this paper we assess the impact of government subsidies for R&D performed by technology-based SMEs. We are concerned with the context of direct support for specific R&D projects, rather than indirect support. After a brief discussion of the definition of behavioural additionality, in the context of broader additionality considerations, the paper considers some key aspects of firm technology strategy, and hence the dimensions in which firm behaviour may be affected. Exploratory research findings are presented based on interviews conducted with managers of technology-based SMEs in the UK. In strategic terms the research findings highlight some important issues relating to the question of how public support for R&D interacts with and affects the technology strategies and capabilities of smaller firms. In some cases this type of industrial R&D support helps firms to overcome a lock-in failure by introducing a firm to a new or extended technology or market area, it helps firms to build new networks and helps them to build up credibility at an international level. For these firms, public R&D support is vital in areas core to present and future firm strategy and is seen to enhance their innovation drive in some significant ways.

HD-04 Technology Assessment and Evaluation-5
Thursday, 8/4/2005, 13:30 - 15:00 **Room: Broadway-2**

Chair(s): Tugrul Daim; Intel Corp.

HD-04.1 [R] Assessing the Effective Integration of the Internet and the Mobile Phones in China

Hongyi Chen; Portland State University, United States

The year 2002 was a critical turning point of the Internet industry in China: Major Chinese websites began to break even and make profits in this year. Among the driving factors of this turning, the effective integration of mobile phone service with the Internet applications has played a vital role. Successful examples such as mobile phone doing online payment, SMS stimulating the Internet use and creating revenues, and the use of IP telephone system in the mobile environment have been seen in the last few years. With the fast development of technologies and the dramatic increase of the user numbers in both industries, more opportunities are seen for future cooperation between these two industries to stimulate further growth and better serve people in China.

HD-04.2 [A] Assessing the Learning Organization Profile of Ohio State University Extension Using the Systems-Linked Organizational Model

Angel A Berrio; Nat'l Institute for Agricultural Research (INIA), Venezuela

The systems-linked organizational model proposed by Marquardt (1996) was used to describe the learning organization profile exhibited by Ohio State University Extension (OSU Extension) personnel. This framework assesses the learning organization profile based on five sub-systems: a) Learning; b) Organization; c) People; d) Knowledge; and e) Technology. A descriptive-type of research design was used. A questionnaire was mailed to OSU Extension personnel (n=434) at the county, district and state levels during August and September 1999. Instrument validity and reliability were established. OSU Extension personnel expressed a positive belief that OSU Extension represents an organization holding the core characteristics of a learning organization.

HD-04.3 [A] Linking Idea Selection Scoring Models with R&D Portfolio Planning Tools

Sharon M LeRoux; Hewlett-Packard Co., United States

Business portfolios and strategic optimization options have become well established and respected by senior executives in the United States, Europe, and Japan since their inception in the 1970's. R&D portfolio analysis techniques have grown in acceptance through the 1990's. These tools, even though highly used by Fortune 500 companies, are not without criticism. They are simplistic and subjective. This paper highlights the tools that we have developed to combat the subjective nature of these R&D portfolio planning tools. We created idea selection scoring models for technology selection and combined this with the portfolio planning models to create an objective and analytical method to populate the portfolio. This portfolio focuses on the emerging technology projects of the Advanced Materials and Processes lab within the Imaging and Printing Group Technology Platforms division of Hewlett-Packard.

HD-06 Strategic Management of Technology-5
Thursday, 8/4/2005, 13:30 - 15:00 Room: Broadway-4
Chair(s): Aaron J Shenhar; Stevens Institute of Technology

HD-06.1 [R] Integration of Logistics and Core Competence

Xiaobo Wu; Zhejiang University, China
Songyi Xu; Zhejiang University, China
Shuai Geng; Zhejiang University, China

From the perspective of enhancing firm's competitive advantage, this paper examines the relationship between integration of logistics and firm's core competence. First, based on the view of resources integration of core competence, this paper argues that integration of logistics forms the main element of today's core competence. Then by introducing the concept model of logistics integration, the paper examines the competitive advantage brought by internal and external integration of logistics respectively. The main body of the internal integration of logistics is between traditional logistics activities, such as purchasing and distribution, and production. Meanwhile, the supplier relations and the customer relations form the access to the external integration of logistics. The efficiency of integrating all of the five factors decides the firm's competence to gain competitive advantage by logistics management, which constitutes the main content of the internal integration of logistics. The trend of refocusing to core activities in big companies these days boosts the external integration of logistics and the logistic chain was formed. Finally, based on the analysis of relationships between the internal/external integration of logistics and organizational/social capital, this paper illustrated the dynamic mechanism of enhancing core competence by using integration of logistics to enlarge firms' organizational and social capital.

HD-06.2 [R] Reflecting Technological Capability Cultivating on Competitive Strategy of Firms: An Evolving Perspective

Jiang Yu; Chinese Academy of Science, China

A firm's capabilities are important in sustaining its competitive advantage, and also in the designing of its competitive strategy. Furthermore, the technological capability-based strategy cannot simply be classified in terms of the differentiation or cost leadership in the business practices; they combine both. Facing the globally competitive environment, it is critical for the latecomer firms to link their strategic consideration with the technological capability building process. Based on the insights summarized from the case study of China's telecommunications manufacturing sector, we can see how the latecomer firms can penetrate the marginal market and gradually cultivate their own technological capability in the local mainstream market. The study highlights the importance of in-depth knowledge about local requirements and product redesign. We can find that the surviving local firms' competitive advantages over their multinational rivals most likely arise from the unique aspects of their technological and competitive strategies in the heterogeneous market.

HD-06.3 [R] Why is Asia Pacific So Strong in Liquid Crystal Display Industry? Approach from Industrial Architectures of Liquid Crystal Display

Yukihiko Nakata; Ritsumeikan Asia Pacific University, Japan

Liquid Crystal Display (LCD) and semiconductor devices such as Large Scale Integrated Circuit (LSI) are the key devices supporting the information society. Currently, LCDs are manufactured only in the Asia Pacific region. Why? The complex question was approached from industrial architecture of the LCD industry. At first, the technological progress in Japan was analyzed. Next, the LCD industry was compared to the LSI industry. The LCD makers compete with each other and use "Customized Equipment and Process" to make larger LCD panels than others. Moreover, they do not have "Technology Roadmap" and "Standard Equipment." Therefore, the LCD industry is an "Integral-type" industry. It needs integral ability, such as mutual adjustment, teamwork and mass-production technology, and these make Japan advantageous in the LCD industry. The LCD technologies have been transferred from Japan to Asia Pacific by Joint Venture and the "Customized Equipment" embedded the know-how. However, they did not transfer to the USA because the USA is not fit enough to the "Integral-type" industry. In addition, Korea and Taiwan aggressively invested in the LCD industry. I propose that the LCD industry is the "Integral-type" industry, and this industrial architecture is the key to determine the regional strength of Asia Pacific in the LCD industry.

HD-07 Project/Program Management-9
Thursday, 8/4/2005, 13:30 - 15:00 Room: Forum Suite
Chair(s) Dov Dvir; Ben Gurion University of the Negev

HD-07.1 [R] Managing Complex Development Projects – A Case Study of the Use of the System Anatomy

Joakim Lillieskold; The Royal Institute of Technology, Sweden
Lars Taxén; Linköping University, Sweden
Mikael Klasson; Jolex AB, Sweden

This paper investigates the use of a construct called the system anatomy for planning and controlling projects developing complex systems. The anatomy shows, in a compact form, the most crucial dependencies in the system from the perspective of how it 'comes-to-life', hence the concept of an 'anatomy'. The key point in using the anatomy for project planning is to develop and verify the system in the same order as it 'comes-to-life'. The project plan

in made up in three steps. The first step is to define the anatomy itself. This is followed by the group-ing of functions into verifiable integration steps called increments. Finally, regular time and resource plans are made for each increment. Thus, the planning can be characterized as an integration driven procedure. This ap-proach has been used extensively at Ericsson, a leading manufacturer of telecommunication systems world wide. It has proven to be very successful, especially in terms of promoting communication and developing a shared under-standing about the project.

HD-07.2 [R] Methods for Managing Complexity in NPD Projects

Jongbae Kim; Dankook University, Korea, South
David Wilemon; Syracuse University, United States

New product development (NPD) programs are increasingly complex and more difficult to manage. The consequences of poorly managed complexity can be highly visible and even lead to project failure. NPD teams need to be equipped with the capacity to identify development complexity and the knowledge for managing it. Unfortunately, there have been few studies which illuminate the challenges developers face in managing complexity. Our study focuses on the actual experiences product developers face in managing complexity. Our study is based on exploratory field interviews with 32 project leaders and team members. We first focus on identifying the specific complexity issues encountered in NPD. We then identify what NPD teams do to minimize the potential adverse consequences of NPD complexity. We also identify the recommendations our interviewees would offer a newly formed NPD project team about managing complexity. We present our results and then examine the relationships between them. The analysis of relationships among our findings illustrates insights which cannot be identified by separate analysis. We conclude by offering several managerial recommendations for complexity management as well as suggestions for future research.

HD-07.3 [R] An Incentive Cost Saving Method for Product Development Teams

Said Boukendour; Universite du Quebec en Outaouais, Canada

The most fundamental dilemma of management is how to control product development expenditures while promoting freedom and innovation of crossfunctional development teams. This article proposes a systematic and non arbitrary approach to estimate the compensation that should be paid to the development teams as a risk premium that would be required by the market if the product to be developed was a traded security or a commodity. The problem of risk sharing is resolved using call spread strategy. This strategy induces motivation and realism, and it aligns the interests of NPD teams on those of the firm.

HD-08 Innovation Management-9
Thursday, 8/4/2005, 13:30 - 15:00 Room: Council Suite
Chair(s): Antonie Jetter; Aachen University of Technology

HD-08.1 [R] Value Creation Framework of Business Modeling Method for R&D Outputs

Hitoshi Abe; Oki Electric Industry Co.,Ltd., Japan
Yuji Hirabayashi; Shimizu Corporation, Japan
Fumiaki Ishida; Kansai Electric Power Co., Inc., Japan
Yasunari Oku; Kawasaki Heavy Industries, Ltd.,, Japan
Masayuki Kado; Tokyo Gas Co., Ltd, Japan
Hiraku Sakuma; NEC Corporation, Japan

We report here recent results of a study on business modeling method conducted for the purpose of offering a convenient tool for engineers and researchers in order to enhance corporate value from R&D Outputs. "Japanese lost decade" has forced companies to change R&D management and R&D operation style. We propose the value creation framework of business modeling method for R&D outputs and applied a few cases in the real world to show its effectiveness. This study has been done in a group at JATES (Japan Techno-Economics Society) since autumn in 2002.

HD-08.2 [R] Fostering Innovation Activity

Branka Ahlin; University of Maribor, Slovenia
Igor Prodan; Regional Technological Centre Zasavje, Slovenia

It is characteristic for Zasavje region (Slovenia), a traditionally industrial environment, that it did not adjust to new market circumstances. The innovation process is essential to establish and maintain a competitive advantage for all businesses, whether big or small and regardless of the field. Since the firms in Zasavje region are mostly not inventive and innovative, most of their products are in the phase of maturity or degeneration, which causes the uncompetitiveness of the economy. To overcome that it is important to stimulate the creativity of the employees and to ensure the support of the management for the development, creation and implementation of innovation activity. In the article a model of fostering innovation activity in the Zasavje region is presented. The model is based on current theoretical models of fostering innovation activity, and especially on some best practices, with which we identified the concrete activities of fostering innovation activity in real businesses environment. The model includes concrete suggestions for businesses with regards to the innovation process, implementation itself, rewards and monitoring of the innovation activity, as well as potential adaptations of the model to the changes in the company.

HD-09 TUTORIAL: Introduction to Technological Forecasting
Thursday, 8/4/2005, 13:30-15:00 Room: Directors Suite
Speaker(s): Joseph P Martino, Yorktown University

This tutorial will introduce the attendee to basic methods of technological forecasting, including Delphi, growth curves, trend extrapolation, environmental scanning, and probabilistic methods.

HD-10 Telecommunications Industry-5
Thursday, 8/4/2005, 13:30 - 15:00 Room: Studio Suite
Chair(s): Tony Bailetti; Carleton University

HD-10.1 [R] An Economic Value Analysis on the Evolution Path of Portable Internet Service: Is Voice Better than Broadcast as Integrated Service?

Sang Sup Cho; ETRI, Korea, South
Sin-won Kang; ETRI, Korea, South

Measuring the economic value of Portable Internet Service not only helps with the pricing of Portable Internet Service, but also can provide explicitly important information for sketching out its development path for service providers in future. The results of this study indicate that the economic value of a Portable Internet Service according to the current technological standards is in the range of 34,000 won to 75,000 won monthly, depending on the methods of measurement used. The most conservative estimation from the analysis suggests that the appropriate monthly fee for Portable Internet Service must range from 30,000 won to 35,000 won. This, in other words, means that in order to provide economic satisfaction to Portable Internet Service users, the service must be priced in the range of 30,000 won monthly. As for converged Portable Internet Services, bundling Portable Internet Service with voice, or Portable Internet Service with DMB service, the economic value difference between two integrated services is measured at 250 won to 9,000 won monthly. In the meantime, an examination of the development path of Portable Internet Service business in relation to integrated services conducted in the context of this study shows that the perceived economic value potentially felt by service users is higher with the combination of Portable Internet Service bundled with voice service than with the combination of Portable Internet Service and DMB service. Therefore, to better exploit the relevant market potential, the appropriate path to be adopted by Portable Internet Service business would seem to be integrating Portable Internet Service with voice communications service at first, rather than with DMB service.

HD-10.2 [R] Scenario Planning as a Strategic Management Tool: Applied Developing MVNO Market Scenarios and Strategies

Jeong-Seok Park; ETRI, Korea, South
Kyung-Seok Ryu; ETRI, Korea, South

Scenario planning is an effective tool to support strategic decision makers. This paper attempts to develop the possible market scenarios of MVNO (Mobile Virtual Network Operator) in Korean mobile market through a scenario planning approach. Due to versatility of MVNO, its advent is expected to create many new service providers, allowing them to launch their

businesses in emerging mobile market. However, the future business environments for potential MVNOs are very uncertain due to the different interests of the stakeholders. In order to deal with such uncertainties, enterprises must focus on their business strategy to more than on simple and alleged exact prognostic future environments. From this perspective, we discussed various aspects of MVNO and developed three coherent MVNO market scenarios such as 'Liberalized Advanced Market Scenario', 'Predatory Competition Market Scenario' and 'Segmented Niche Market Scenario'. Based on the proposed scenarios, we formulated some implications for market strategy of potential MVNOs.

HE-01 SPECIAL SESSION: Planning session for PICMET '06 and beyond
Thursday, 8/4/2005, 15:30 - 17:00 **Room: Pavilion East**

Please join us in providing feedback on PICMET '05 and developing the plans for upcoming PICMETs. All PICMET attendees are invited to participate in helping make future PICMET meetings as productive as possible.

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