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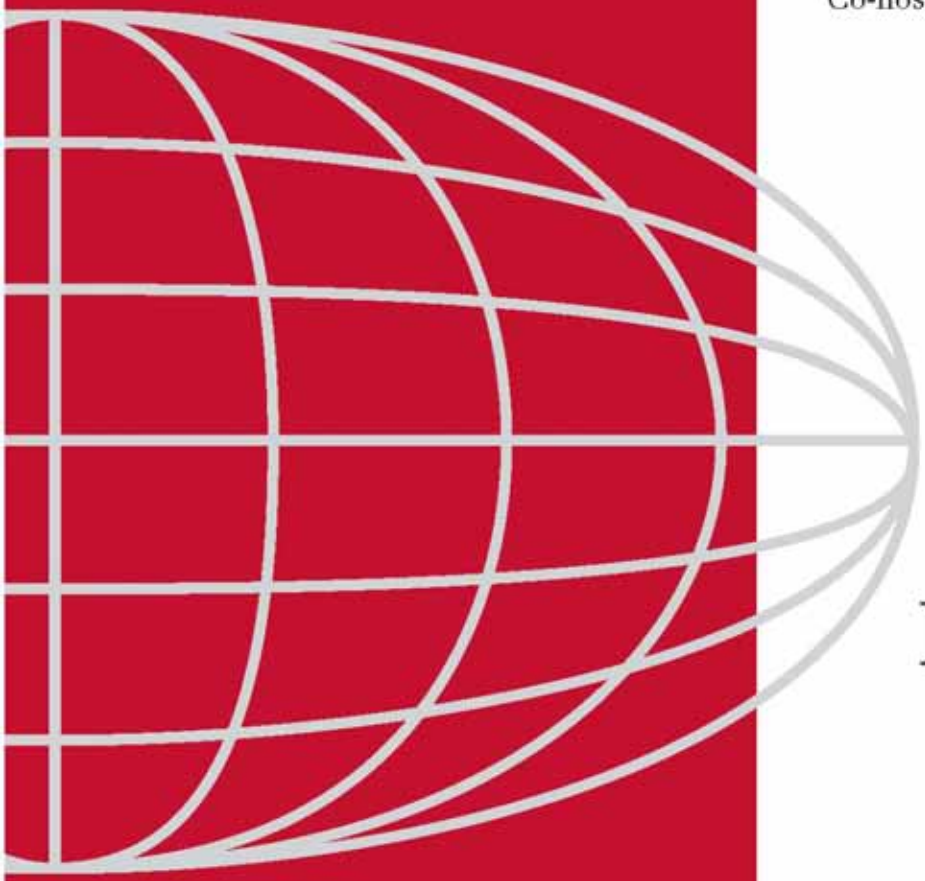
Cooperating Universities:
Seoul National Univ., KAIST, Ajou Univ., Hanbat Univ., Hannam Univ., Sejong Univ.

Organized by:
Portland State University, ETM Dept.



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PICMET

Portland International Conference on Management of Engineering and Technology

PICMET '04 Symposium
July 31 – August 4, 2004

Co-hosted by STEPI 과학기술정책연구원 SCIENCE & TECHNOLOGY POLICY INSTITUTE

Innovation Management in the Technology-Driven World

CONFERENCE BULLETIN

Table of Contents

PICMET ’04

STEPI 과학기술정책연구원
SCIENCE & TECHNOLOGY POLICY INSTITUTE

From the Honorary Chairman of PICMET ’04
Youngrak Choi, Ph.D.
President, Science and Technology Policy Institute

Dear Colleagues,

On behalf of the Science and Technology Policy Institute, I would like to extend a warm courtesy to all of you who came to Seoul for the PICMET ’04 Symposium co-hosted by STEPI.

In response to a world where international boundaries and national borders are beginning to fade, Korea continues to strive to develop more advanced R&D and innovation capabilities. To this extent, it is a milestone event for Korea to have this highly prestigious and high-impact conference, PICMET, in Korea. I have known PICMET from the beginning and have been amazed at how much PICMET contributes to the field of technology and engineering management. It is a true pleasure to co-host PICMET in Seoul, and I am certain that this conference will give Korea a big opportunity to contribute to the international society with highly qualified symposium results as well as an excellent international network. And also I believe having PICMET particularly here in Seoul rings the bell of innovation to the developing countries and gives them a better chance than at any other time to think about technology and management.

I hope that everyone will have both active and productive discussions and that we will each return home with numerous new and innovative ideas for “innovation management in the technology-driven world.” To make the symposium a success, we must not only focus on gathering information but also on trying to exchange insights. Open dialogue and discussion in the conference will be the way to give all of us the most benefit. This is a great opportunity to exchange ideas and create new networks of friends and colleagues. As with most things in life, you will get out of this workshop whatever you are willing to invest in it.

I would like to again express my sincere gratitude to everyone participating in this conference and wish everyone a pleasurable stay in Korea. I look forward to seeing you again in another time and place with this spirit of innovation.

PICMET ’04

PICMET

From the President and CEO of PICMET
Dundar F. Kocaoglu, Ph.D
Professor, Portland State University

Dear PICMET Guests:

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 new and emerging 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 rests in managing 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 ’04 has taken a bold step in examining innovation management in the technology-driven world.

As the name “Portland International Conference on Management of Engineering and Technology” suggests, PICMET conferences have always been held in Portland, Oregon, in the United States. This is the first time that a PICMET symposium has been organized outside of Portland. It is no coincidence that Korea was selected for this inaugural event. Korea’s strategic importance at the center of the new, fast-rising industrial powers of the technology-driven world, including Japan, Taiwan, China, Singapore, India and Southeast Asian countries, made it a natural choice for PICMET ’04.

The initial concept of bringing PICMET to Korea goes back to the year 2000, when Dr. Deok Soon Yim of STEPI (Science and Technology Policy Institute) was a Visiting Scholar in the Department of Engineering and Technology Management at Portland State University, and a member of the PICMET ’01 Program Committee. Soon after Dr. Yim returned to Korea, Dr. Youngrak Choi became the president of STEPI. The combination of Dr. Choi’s dynamic and forward-looking policies and Dr. Yim’s energetic initiatives started to forge a solid partnership between PICMET and STEPI. We are pleased and proud that PICMET ’04 was built on that partnership and became a reality.

PICMET, in its 13th year now, is the largest event in the world that brings together academic researchers, industry executives and government agencies to discuss technology management. The global response to PICMET ’04 has been extremely enthusiastic. There are 129 sessions with about 230 presentations in the symposium. Papers were received from authors in 40 countries and were subjected to a double-blind review process. The papers that were accepted after the review process are scheduled for presentation.

Approximately 70 percent of the presentations are research papers, indicated with an [R] preceding their title in this bulletin, and 30 percent are industry applications, indicated with an [A]. The papers scheduled for presentation at PICMET ’04 are clustered into 29 major tracks, alphabetically listed below.

Collaborations in Technology Management
Competitiveness in Technology Management
Decision Making in Technology Management
Disruptive Technologies
E-Business
Entrepreneurship/Intrapreneurship
Global Technology Management
Information Technology (IT) Management
Innovation Management
Manufacturing Management
New Product Development
Productivity Management
Project/Program Management
R&D Management
Science and Technology Policy
Semiconductor Industry

(continued on next page)

PICMET ’04

(continued from previous page)

Software Process Management
Strategic Management of Technology
Supply Chain Management
Technology Acquisition
Technology Assessment and Evaluation
Technology Diffusion
Technology Management Education
Technology Management Framework
Technology Marketing
Technology Planning and Forecasting
Technology Transfer
Technology-Based Organizations
Telecommunications Industry

Literally hundreds of people participated in planning and organizing PICMET ’04. The Board of Directors, the Advisory Council, the Organizing Committee, and the Core Team took on major responsibilities. The local committee provided excellent support under the able leadership of Dr. Deok Soon Yim and extraordinary capabilities, meticulous coordination and outstanding professionalism of Ms. Ji Hyun “Joanne” Kim and her assistant, Ms. Hana Bae. Representatives of the cooperating universities provided manpower and other resources necessary to make PICMET ’04 a success. Members of the local committee were Seongjae Yu (Professor, KAIST), Seung Koog Lee (Director, ETRI), Se-Jung Yong (Professor, Ajou University), Seongsoo Seol (Professor, Hannam University), Johng-Ihl Lee (Research Fellow, KOTEF), Jeong-Dong Lee (Professor, Seoul National University), Sunyang Chung (Professor, Sejong University), Hyun Hoi Hur (Director, KOITA), Zong Tae Bae (Professor, KAIST), Jang Jae Lee (Research Fellow, KISTEP), Yoo-Sook Kim (Research Fellow, KIGAM), and Jong In Choi (Professor, Hanbat University).

Finally, the symposium sponsors KOSEF (Korea Science and Engineering Foundation), KOTEF (Korea Industrial Technology Foundation) and JoongAng Ilbo; the supporting organizations ETRI, KIGAM, KISTEP, KOITA, KOSTME and SAIT; and the cooperating universities Seoul National University, KAIST, Ajou University, Hanbat University, Hannam University and Sejong University saw the value of PICMET ’04 and supported it. We acknowledge the individuals and organizations which supported this symposium and extend our deep gratitude and thanks to every one of them.

PICMET ’04 has two publications: This *Bulletin* gives a synopsis of the symposium with up to a 200-word abstract of each presentation; the *Proceedings* (on CD-ROM) includes all of the presentations in full length. We believe these two publications contain some of the best knowledge available on innovation management for addressing the challenges and opportunities of the technology-driven world.

We hope PICMET ’04 will have a major impact on the growth of the field and will contribute significantly to research, to education and implementation of Innovation Management, and to the success of technology managers and emerging technology managers throughout the world.

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

ACKNOWLEDGMENTS

PICMET '04 WAS ORGANIZED BY

Portland State University
Department of Engineering and Technology Management

CO-HOSTED BY

PICMET and STEPI

SPONSORING ORGANIZATIONS

- Korea Science and Engineering Foundation
- Korea Industrial Technology Foundation
- JoongAng Ilbo

SUPPORTING ORGANIZATIONS

- ETRI (Electronics and Telecommunications Research Institute)
- KIGAM (Korea Institute of Geology, Mining and Materials)
- KISTEP (Korea Institute of Science and Technology Evaluation & Planning)
- KOITA (Korea Industrial Technology Association)
- KOSTME (Korean Society for Technology Management and Economics)
- SAIT (Samsung Advanced Institute of Technology)

COOPERATING UNIVERSITIES

- Seoul National University
- KAIST (Korea Advanced Institute of Science and Technology)
- Ajou University
- Hanbat University
- Hannam University
- Sejong University

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Jeong-Dong Lee, Professor, Seoul National University
Sunyang Chung, Professor, Sejong University
Hyun Hoi Hur, Director, KOITA
Zong Tae Bae, Professor, KAIST
Jang Jae Lee, Research Fellow, KISTEP
Yoo-Sook Kim, Research Fellow, KIGAM
Jong In Choi, Professor, Hanbat University

PICMET '04

PROGRAM COMMITTEE

The Program Committee consisted of sixty 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 symposium.

Melissa Appleyard
Jean-Claude Balland
Nuri Basoglu
Neil Berglund
Brent A Capps
Elias Carayannis
Hongyi Chen
Michael Cole
Glenn Dietrich
Robert W Eder
William (Ike) Eisenhauer
Alptekin Erkollar
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Asser Fayed
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Arnold Reisman
Martin Rinne
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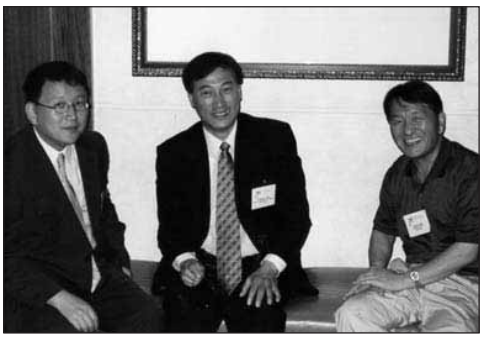
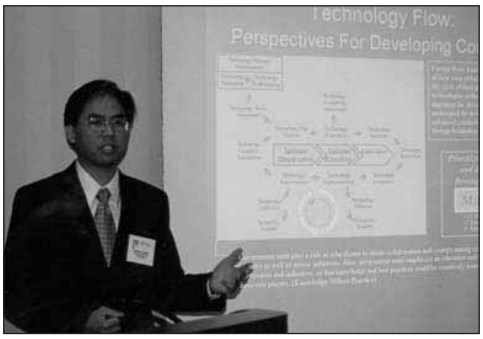
Iwan Sudrajat
Hans J Thamhain
Wayne Wakeland
Charles M Weber
Gerry Williams
Deok Soon Yim
Max von Zedtwitz





PICMET ’04

PICMET ’04 CORE TEAM

An eight-person Core Team implemented a large number of projects involved in the planning and organizing of PICMET ’04. Members of the Core Team are Ph.D. Students in Portland State University’s Department of Engineering and Technology Management (ETM). The Core Team members worked on multiple projects that were being undertaken simultaneously. The Core Team met every week 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. The project managers in the Core Team were:

Audrey Alvear
Hongyi Chen
Nathasit Gerdsri
Jonathan Ho
Boonkiart Iewwongcharoen
Peerasit Patanakul
Sabin Srivannaboon
Iwan Sudrajat

Photo courtesy of Korea National Tourism Organization

ADVISORY COUNCIL

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

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

Dr. Frederick Betz
Professor,
University of Maryland, USA

Dr. Joseph Bordogna
Deputy Director,
NSF, USA

Dr. Chun-Yen Chang
President,
National Chiao Tung University,
Taiwan

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Oregon University System, USA

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Dr. Graham Mitchell,
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Wharton Program in Technological Innovation, University of Pennsylvania, USA

Dr. Kwan Rim
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Samsung Advanced Institute of Technology, Korea

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

Mr. Terry Rost
President,
The Franchise Group, USA

Dr. Seiichi Watanabe
Consultant to Sony Corp., Japan

Dr. Rosalie Zobel
The European Commission,
Belgium

Student Paper Awards

The number of students doing significant research in the area of Engineering and Technology Management was demonstrated by the 18 nominations received. The selection of the award winners was difficult, but two papers stood out for their contributions to the field of Engineering and Technology Management.

AUTHOR

Jiyao Chen

CO-AUTHORS

Richard Reilly, Gary Lynn

ADVISOR

Richard Reilly

UNIVERSITY

Stevens Institute of Technology, Hoboken, New Jersey, USA

PAPER TITLE

"The Role of Uncertainty in Speed-to-Market and New Product Success"

ABSTRACT

Time-based strategy is becoming an important weapon to achieve competitive advantages in the current environment of fast-changing technology and customer requirements. Speed-to-market has become the mantra of both researchers and practitioners in new product development (NPD), but there is limited empirical research and inconsistent or conflicting findings on the relationship between speed-to-market and product performance. A more important question is whether faster is always better. In a study of 692 NPD projects, we examined the relationship between speed-to-market and new product success (NPS) under conditions of different uncertainties. Our results indicate that speed-to-market is generally positively associated with overall project success, but market turbulence moderates the direct effect. Speed-to-market is less important to NPS under conditions of low market turbulence. One important implication is that it is necessary to execute time-based strategy in a fast-changing market but not in an existing and stable marketing. Our results also suggest technological uncertainty does not affect the speed-success relationship. The limitations, and future research related to these results are discussed.

AUTHOR

Jonathan Ho

ADVISOR & CO-AUTHOR

Dundar F. Kocaoglu

UNIVERSITY

Portland State University, Portland, Oregon, USA

PAPER TITLE

"Strategic Evaluation of Emerging Technologies in the Taiwan Semiconductor Foundry Industry"

ABSTRACT

The Integrated Circuit (IC) manufacturing technologies have been evolving continuously since their invention. The semiconductor foundry industry, whose core business is IC manufacturing, is greatly influenced and shaped by the flow of these newly arriving technologies. This research applies the Analytic Hierarchy Process (AHP) model to evaluate the strategic impact of new IC manufacturing technologies in the semiconductor foundry industry in Taiwan, where the industry is in a global leadership position. The model incorporates the levels of overall competitive success, competitive goals, technology strategies and emerging technologies. Relative impacts of elements in one level on its upper level are obtained by utilizing the inputs from experts of Taiwan's semiconductor foundry industry. The results show the relative importance of competitive goals in the semiconductor foundry industry. Each competitive goal is aligned to the technology strategies as well as emerging technologies in the prioritized orders.

LTM AWARDS

LEADERSHIP IN TECHNOLOGY MANAGEMENT AWARDS

PICMET 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.

Dr. Andrew S, Grove, CEO of Intel, was the first recipient of the LTM award at PICMET '91.

Norman Augustine, Chairman of Lockheed-Martin, was the PICMET '97 recipient.

Jack Welch, CEO of General Electric, received the award in the "industry" category; and Dr. Richard M. Cyert, President of Carnegie Mellon University, received it posthumously in the "academic" category at PICMET '99.

Three awards were given at PICMET '01. Dr. Modesto A. Madique, President of Florida International University, was the recipient in the "academic" category; Carleton S. Fiorina, Chairman and CEO of Hewlett-Packard Co., in the "industry" category; and Donna Shirley, former manager of Mars Exploration Program, in the "government" category.

Three awards were again given at PICMET '03: Mr. Jong-Yong Yun, Vice Chairman and CEO of Samsung Electronics, Inc. (Korea), was honored for the industry category; Dr. Joseph Bordogna, Deputy Director of NSF (USA), for the government category; and Dr. Chun-Yen Chang, President of National Chiao Tung University, Taiwan, for the academic category.

Two LTM Awards will be presented at PICMET '04. Dr. Gunnar Hambraeus and Dr. Kwan Rim have been selected as the recipients of the award for their lifetime achievements.

Dr. Gunnar Hambreaus was born in 1919. He received his MSc. from Uppsala University, M.Eng. S from Royal Institute of Technology in Stockholm and Dr.Eng.S, hon. from Chalmers Technical University in Gothenburg. He served as secretary in the Swedish Technical Research Council from 1946 to 1953, as editor in chief of the leading technical periodical in Sweden (*Teknisk Tidskrift*) from 1953 to 1970, as the president of Swedish Technical Press AB and finally as the president and chairman of the Royal Swedish Academy of Engineering Sciences from 1971 to 1985. He worked for Swedish industry as a member and in some cases chairman in the Board of Directors of some 20 leading Swedish companies, e.g Volvo, Bofors, Pharmacia, Hasselblad and others. Presently, Dr. Hambreaus chairs the Scandinavia-Japan Sasakawa Foundation and the Sweden-Algeria Mixed Commission as well as several Price Juries. As a member of the Swedish Royal Academy of Science he 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. He is proud to carry decorations from the Swedish King and his Parliament as well as orders from Sweden, France, Germany, Japan, Spain and Australia.

Dr. Kwan Rim is the Chairman of Samsung Advanced Institute of Technology (SAIT), the central research laboratory of the Samsung Group. He received his M.S. in Mechanical Engineering in 1958 and Ph.D. in Theoretical and Applied Mechanics in 1960, both from Northwestern University in the USA.

In 1960 he joined the Department of Mechanics and Hydraulics of the University of Iowa and was an engineering faculty member there until 1995. At the University of Iowa he was Chairman of the Department of Mechanics and Hydraulics (1971-74), Associate Dean of Engineering (1974-79), Chairman of the Division of Materials Engineering (1978-84), and Chairman of the Department of Biomedical Engineering (1984-90). He is the founder of the Biomedical Engineering Program at Iowa as well as the Iowa Institute of Biomedical Engineering.

Dr. Rim held the U.S. National Science Foundation's SEED (Scientists and Engineers for Economic Development) Professorship in 1976-77, served as the President of the Korea Advanced Institute of Science and Technology (KAIST) from 1982 to 1984, and as a visiting professor in Japan in 1992. He has also served on the boards of directors of numerous educational and research institutes. He was the 1992 recipient of the Outstanding Biomedical Engineering Educator Award from the American Society for Engineering Education. He also served on the President's Council on Science and Technology of the Republic of Korea.

MEDAL OF EXCELLENCE

MEDAL OF EXCELLENCE AWARDS

PICMET is instituting a new award in 2004. The "Medals of Excellence" will be presented for extraordinary achievements of individuals in any discipline for their outstanding contributions to science, engineering and technology management.

There are three recipients of the Medals in 2004. They are Dr. Daeje Chin, Dr. Kiyoshi Niwa and Dr. Rosalie Zobel.

Daeje Chin is the Minister of Information and Communications in Korea. He received his B.S. and M.S. degrees in Electrical Engineering from Seoul National University, in 1970 and 1974, respectively. He continued his studies with another M.S. in Electrical Engineering from MIT in 1979, and a Ph.D. in Electrical Engineering from Stanford University in 1983. After working as a Research Fellow at the H-P IC Lab and the IBM Watson Institute for several years, he joined Samsung Electronics as a Chief Research Fellow in 1985, and held progressively higher positions including Director of Research, Executive Director, Chief Executive Director, Vice President, Chief Technology Officer, Representative Director, and President of various divisions until 2003. He was appointed to his current position as the Minister of Information and Communications in year 2003.

Kiyoshi Niwa is a Professor in the Department of General Systems Studies at the University of Tokyo. Before joining the university, he was with the Advanced Research Laboratory (1985 to 1994) and the Systems Development Laboratory (1972 to 1985), both of Hitachi, Ltd., Japan. Since 1988 he also has been a Senior Research Fellow in the IC2 (Innovation Creativity and Capital) Institute at the University of Texas at Austin, USA. From 1989 to 1991 he was a Visiting Professor of the Engineering Management Program at Portland State University, USA.

His research and teaching interests include technology and research management, knowledge management, and organizational intelligence. He has published many papers in journals such as *IEEE Transactions on Engineering Management; IEEE Transactions on Systems, Man,* and *Cybernetics; AI Magazine; Knowledge Engineering Review;* and the *Journal of the Japan Society for Management Information.* He is the author of the book *Knowledge-Based Risk Management in Engineering* (Wiley Series in Engineering and Technology Management) published by John Wiley in 1989, and is a co-editor of PICMET '91, '97, '99, and '01.

He is also the co-author of the book *Technology Management Strategy* (in Japanese) published by Seisansei-shuppan in Tokyo in 1999, and translated into Korean in 2001.

Dr. Niwa received his BS (1970) and MS (1972) in chemistry (physical chemistry) from Waseda University, Japan. While working as a research scientist at Hitachi, he received his Dr. of Engineering (1986) in systems science (knowledge management) from the Tokyo Institute of Technology, Japan.

He serves as the editor of the *Journal of the Japan Society for Management Information* and on the editorial boards of *IEEE Transactions on Engineering Management, Knowledge Engineering Review,* and *The International Journal of Decision Support Systems.* He is the PICMET Director of International Activities.

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 at 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 to 1999 she was the Head of the 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." She was appointed to her current position as the Director of "Components, Subsystems and Applications" in the Information Society Directorate-General of the European Commission in 2003.

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 '04 takes a bold step and examines innovation management in the technology-driven world.

Ritz Carlton

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 '04 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 '04 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 two publications at PICMET '04

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

Both publications will be available to PICMET '04 attendees at the registration desk.

REGISTRATION POLICY

All PICMET attendees, including speakers and session

General Information

chairs, must register and pay the registration fee to have access to sessions and other events. Refunds requested prior to June 1 will not be subject to a cancellation fee. Refunds requested between June 1 and July 1 will be subjected to a $50 cancellation fee. No refunds will be given after July 1, 2004.

Please visit the PICMET web page and click on "On-line Registration" to register for the symposium. Registration can also be made on-site at the registration desk located on Atrium Level 3 of the Ritz-Carlton starting Saturday, July 31, 2004.

SESSION AND PAPER DESIGNATIONS

Sessions are identified by a four-digit code as follows:

First digit shows the day	S: Sunday M: Monday T: Tuesday W: Wednesday
Second digit shows the time	A: 09:00-10:30 B: 11:00-12:30 C: 12:30-14:00 D: 14:00-15:30 E: 16:00-17:30
Third and fourth digits show the room	01: Ballroom I 02: Ballroom II 03: Sorak II 04: Sorak III 05: KumKang I 06: KumKang II 07: KumKang III 08: KumKang IV

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

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. A room on Atrium Level 3 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 Atrium Level 3 to give you the opportunity to check your e-mail and to send messages.

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.

KOREA GUIDE

TRANSPORTATION FROM INCHEON INTERNATIONAL AIRPORT

Built on an extensive reclaimed tidal land between two islands, Incheon International Airport is 52 km west of downtown Seoul and 15 km off the coast of the port city of Incheon. It operates 24 hours.

LIMOUSINE BUSES

Limousine buses are the best way to travel easily, at minimal expense, to and from various places around Korea, including the Ritz-Carlton and other major hotels. Information and tickets are available at the Transportation Information Counters near exits No. 2, 4, 9, and 13 on the arrival floor of the passenger terminal.

Photo courtesy of Korea National Tourism Organization

TAXIS

Taxis are plentiful, inexpensive, clean and safe. There are taxi stands in most busy city areas, and taxis can also be hailed on the street. Certain taxis can also be requested by phone, although the fare for these special call taxis is somewhat higher than regular taxis. An increasing number of taxi drivers speak some English.

Photo courtesy of Korea National Tourism Organization

REGULAR TAXIS

The fare system is based on both distance and time. Fares are 1,600 won for the first 2 kilometers and 100 won for each additional 168 meters. If the taxi is going less than 15 kilometers per hour, an additional charge of 100 won per 41 seconds is added to the fare. The fare between Incheon International Airport and downtown Seoul is usually about 42,000 won (including toll), although it can be higher if traffic is congested. Fares increase 20 percent between midnight and 04:00.

BRAND TAXIS

The Brand taxis "Kind Call Taxi" and "KT Powertel" are equipped with a simultaneous interpretation machine, a receipt issuance machine and wireless data terminal with automatic vehicle location system. The fare is the same as that of regular taxis and 1,000 won is surcharged for call usage.

DELUXE TAXIS

Deluxe taxis, call mobeom taxi in Korean, are black with a yellow sign on the top and the words "Deluxe Taxi" written on the sides. They offer more passenger space and a high standard of service. Fares are 4,000 won for the fist 3 kilometers and 200 won for each additional 20 meters or each 50 seconds if the speed drops below 15 kilometers per hours. The usual fare between Incheon International Airport and downtown is about 69,000 won (including toll). Receipts are given. There is no late-night surcharge. Deluxe taxis can be taken at stands located at hotels, stations, bus terminals, and on major city streets. They can also be called at 02-558-8000.

KOREA

The Korean peninsula extends southward from the eastern end of the Asian continent. The peninsula is roughly 1,030 km (612 miles) long and 175 km (105 miles) wide at its narrowest point. Mountains cover 70% of Korea's land mass, making it one of the most mountainous regions in the world.

The lifting and folding of Korea's granite and limestone base has created breathtaking landscapes of scenic hills and valleys. The mountain range that stretches the length of the east coast plunges steeply into the East Sea, while along the southern and western coasts, the mountains descend gradually to the coastal plains that produce the bulk of Korea's agricultural crops, especially rice.

The Korean peninsula is divided just slightly north of the 38th parallel. The democratic Republic of Korea in the south and communist North Korea are separated by a demilitarized zone. South Korea's 99,500 sq.km is populated by 47.9 million people (2003).

KOREA GUIDE

CLIMATE

The summer season is warm and humid in Korea. July and August have the heaviest rainfall of the year, so packing an umbrella is advised.

ATM

Foreign issued ATM cards may have limited use at ATMs in different countries. Please refer to your bank for more information.

- "HanNet" ATM: Most foreign cards (VISA/PLUS, MASTER/CIRRUS, DINERS, JCB, AMEX) are accepted 24 hours a day. You may find these ATMs in Seoul Subway Line stations. Sometimes, convenience stores like LG25, Mini Stop, and Buy the Way may also offer ATMs as well. Hotels, bus terminals, highway rest areas and shopping malls are some other places to look for "HanNet" ATMs.
- Some bank branches may be equipped with Global ATMs that allows use of foreign cards.

Photo courtesy of Korea National Tourism Organization

CREDIT CARDS

Most restaurants, hotels and shops accept credit cards. You may not be able use credit cards at small businesses and in rural areas. You may also want to check whether your credit card is accepted or not by looking at door signs. Visa® and MasterCard® are most common ones you can find.

Photo courtesy of Korea National Tourism Organization

VALUE-ADDED TAX

Value-Added Tax (VAT) is levied on most goods and services at a standard rate of 10 percent and is included in the retail price. In tourist hotels, this 10 percent tax applies to rooms, meals and other services and is included in the bill.

TIPPING

Tipping is not customary in Korea. Sometimes, expensive restaurants and luxury hotels may add a service charge of 10%. Thus, you do not necessarily have to prepare for extra charges since it will be included in the bill.

VOLTAGE

In Korea, 220 volt outlets are most common.

The above information is provided by Korea Travel Guide, Korea National Tourism Organization.

TOURING KOREA

While you are in Seoul for PICMET, take advantage of the abundance of sightseeing tours available that will make your visit to Korea complete. Grace Travel Co., Ltd. offers daily tours to places such as Gyeongbok Palace, the main palace of the Joseon Dynasty built in 1394; Changdeok Palace with its secret garden; the Presidential Blue House; the National Museum of Contemporary Art (DeokSu Palace); Icheon Pottery Village, where you will receive instructions for creating your own work of art; the Korean Folk Village, which recreates the lifestyles of the middle to late Joseon Dynasty; and the DMZ Tour to name just a few.

For further information or to book a tour, please visit the Grace Travel Co., Ltd. web page (www.triptokorea.com). You can also make reservations through the Ritz-Carlton's concierge. The tour company will pick you up at the hotel, and reservations must be made 24 hours in advance.

SOCIAL EVENTS

To facilitate the informal interaction of the participants, several social events have been scheduled during PICMET '04.

RECEPTION/BUFFET

DATE: SUNDAY, AUGUST 1

TIME: 19:00 – 22:00

LOCATION: RITZ-CARLTON BALLROOM

DRESS: INFORMAL

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

DINNER AT THE RITZ

DATE: MONDAY, AUGUST 2

TIME: 19:00 – 22:00

LOCATION: RITZ-CARLTON BALLROOM

DRESS: CASUAL

Enjoy a savory buffet of traditional Korean dishes while you mingle and network with colleagues. Included in registration fee.*

AWARDS BANQUET

DATE: TUESDAY, AUGUST 3

TIME: 19:00 – 22:00

LOCATION: RITZ-CARLTON BALLROOM

DRESS: BUSINESS ATTIRE

This is the premier social event of the conference. The PICMET '04 "Leadership in Technology Management," "Medal of Excellence" and "Outstanding Student Paper" awards will be presented at the banquet. Included in registration fee.*

* The student registration fee does not cover Monday or Tuesday evening events. Tickets for these events may be purchased at the registration desk.

TECHNICAL PROGRAM

PROGRAM OVERVIEW

The PICMET '04 technical program consists of 84 sessions including four plenaries, four tutorials, three special sessions and 73 paper sessions

The plenaries are scheduled from 09:00 to 10:30 every morning, Sunday, August 1 through Wednesday, August 4, in the Ballroom on the Atrium 3 level. They are described in the "Plenaries" section of this Bulletin.

Special sessions are included in the regular program for an opportunity to participate in the discussions on PICMET's strategies and the critical issues in technology management education.

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

THE PAPERS

Research papers and applications-oriented papers are explicitly identified in this conference. Separate evaluation criteria were used, and different referees were selected for each category to make sure that appropriate papers were included in the conference for the "Research" and "Application" categories. We emphasized research methodology, the use of the research literature, the theory behind the paper, the sample size, and the impact on the research community for the "Research Papers." The important evaluation criteria for "Industry Applications" were the usefulness of the application, the importance of the case being discussed, the generalizability of the concepts presented, and the impact of the paper on the users of technology management. The "Research Papers" included in PICMET '04 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 75-80 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. It 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 09:00-10:30 time slot. After that, there are up to 8 break-out sessions throughout the day, Sunday through Wednesday.

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 and the presentations under each topic. The topic areas correspond to the 29 tracks included in PICMET '04. The session number, day, time and location of the presentations are shown in the list. Because of scheduling constraints, the papers listed under a topic are not necessarily scheduled in the same sequence shown in the topic list, but you can identify the presentations that fit your areas of interest and attend the sessions in which they are presented.

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 to follow, the events to attend, and the people to meet with.

We hope these will help you to take full advantage of the richness of the technical program at PICMET '04.

Topic List

TECHNOLOGY MANAGEMENT FRAMEWORK

PLENARY: The Technology Revolution and Management: Digital Convergence, Now and the Future
Jong-Yong Yun, Samsung Electronics Co., Ltd./
MA-01 — Monday — 09:00 to 10:30 — Ballroom

PLENARY: Oriental Philosophy, Aesthetics and Scientific and Technological Innovation
Chun-Yen Chang, National Chiao Tung University/
TA-01 — Tuesday — 09:00 to 10:30 — Ballroom

PANEL: PICMET '05 and '06 Planning Session
Timothy Anderson, Portland State University/ Dundar F. Kocaoglu, Portland State University/ Dragan Z. Milosevic, Portland State University/ Kiyoshi Niwa, University of Tokyo/ Liono Setiowijoso, Portland State University/ Charles M. Weber, Portland State University/ Ann White, Portland State University/
WE-02 — Wednesday — 16:00 to 17:30 — Ballroom II

PANEL: Country Representatives Meeting
Kiyoshi Niwa, University of Tokyo/
TB-02 — Tuesday — 11:00 to 12:30 — Ballroom II

Why Managers in Developing Countries do not Implement 'Technology Management' Guidelines: Case of Iran
Kamran Bagheri, Research Institute of Petroleum Industry (RIPI)/ Javad Mahboubi, Ministry of Commerce/
ME-08 — Monday — 16:00 to 17:30 — Kum Kang IV

The Study of Computer Industry Company's Performance: The Roles of Entrepreneurship, Technology Strategy and External Network
Fen-Hui Lin, National Sun Yat-sen University/ Hsing-Ya Chang, Sun Yat-sen University/
MD-08 — Monday — 14:00 to 15:30 — Kum Kang IV

The Application and Characteristics of Technology Management: The Case of Korean Manufacturing Firms
Heeseung Yang, Sejong University/ Yongsang Cho, KISTEP/
ME-08 — Monday — 16:00 to 17:30 — Kum Kang IV

Fuzzy Front End Management Strategies under High Risk, Fast-Changing Environmental Conditions
Yong-Il Song, Korea Institute of Science and Technology/ Dae-Hee Lee, Korea Institute of Science and Technology/ Sung-Bae Park, Korea Institute of Science and Technology/ Yun-Chul Chung, Korea Institute of Science and Technology/
ME-08 — Monday — 16:00 to 17:30 — Kum Kang IV

The Efficiency Improvement of Automated After-Sales Service Information System for Taiwan Personal Computer Industry: A Case Study of MiTAC, Inc.
Min-Jen Tsai, National Chiao Tung University/ Hsiao-Ying Hung , National Chiao Tung University/ Ming-Fong Wu, National Chiao Tung University/
TB-03 — Tuesday — 11:00 to 12:30 — Sorak II

STRATEGIC MANAGEMENT OF TECHNOLOGY

Managing Change - Strategic Innovation
Petteri Laaksonen, Lappeenranta University of Technology/ Jukka-Pekka Bergman, Lappeenranta University of Technology/ Jan Edelmann, Lappeenranta University of Technology/
SD-05 — Sunday — 14:00 to 15:30 — Kum Kang I

Linking the Technological Regime to the Technological Catch-up: An Econometric Analysis Using the US Patent Data
Kyoo-Ho Park , Seoul National University/ Keun Lee, Seoul National University/
MB-05 — Monday — 11:00 to 12:30 — Kum Kang I

A Technology Relation Analysis for the Evaluation of R&D Projects in the Defense Technology Sector
Kwang-Ho Jang, Seoul National University/ Jeong-Dong Lee, Seoul National University/ Young-Hoon Kim, Seoul National University/ Si H. Joo, Seoul National University/
MB-05 — Monday — 11:00 to 12:30 — Kum Kang I

Intellectual Capital Management in R&D Centers
José Luis Solleiro, National University of Mexico/ Rosario Castañòn, National University of Mexico/
SE-05 — Sunday — 16:00 to 17:30 — Kum Kang I

Transformation of Corporate R&D Center in Samsung
Youngjoon Gil, Samsung Advanced Institute of Technology/ Sangmoon Park, Samsung Advanced Institute of Technology/
SE-05 — Sunday — 16:00 to 17:30 — Kum Kang I

Public Research Lab Strategies for Development of Technological Competencies in LDC's: Managing External Pressures and Internal Tensions
Ricardo Arechavala-Vargas, Universidad de Guadalajara/ Claudia Díaz Pérez, Universidad de Guadalajara/
SE-05 — Sunday — 16:00 to 17:30 — Kum Kang I

Intellectual Capital Management in R&D Centers
José Luis Solleiro, National University of Mexico/ Rosario Castañòn, National University of Mexico/
SE-05 — Sunday — 16:00 to 17:30 — Kum Kang I

Current Situation of Chinese FDI and the Analysis of its Positive Effect on Economy Growth
Lanlan Xie, Beijing University of Technology/ Guangya Xie, Beijing University of Technology/ Feng Zhang, Beijing University of Technology/
MD-05 — Monday — 14:00 to 15:30 — Kum Kang I

The Anti-Piracy Strategy for Optical Disc and its Relationship with Technology Development in Taiwan
Wen-hsiang Lu, Intellectual Property Office/ Paul C. B. Liu, National Chengchi University/
SD-05 — Sunday — 14:00 to 15:30 — Kum Kang I

Business Concept Innovation for a Mobile Multiplayer Game
Mikko Pynnönen, TeliaSonera Finland Oyj / LUT/ Petteri Laaksonen, Telecom Business Research Center Lappeenranta/ Kimmo Suojapelto, Telecom Business Research Center Lappeenranta/
SD-05 — Sunday — 14:00 to 15:30 — Kum Kang I

Topic List

Assessing the Potential for Technology Based Enterprises and Regional Innovation Systems in Emergent Economies: The Case of Jalisco, Mexico
Ricardo Arechavala-Vargas, Universidad de Guadalajara/ Lilia Arechavala-Vargas, Fundación México Estados Unidos para la Ciencia/
MD-05 — Monday — 14:00 to 15:30 — Kum Kang I

The Strategy of Technology Innovation in Chinese SMEs
Gongmin Bao, Zhejiang University/ Zhirong Yang, Zhejiang University/ Zhangshu Xie, Zhejiang University/ Jing Yang, School of Management, Zhejiang University/
WD-01 — Wednesday — 14:00 to 15:30 — Ballroom I

SCIENCE AND TECHNOLOGY POLICY

PLENARY: From Fast Follower to Innovation Leader: Next Generation Innovation Model of Korea
Youngrak Choi, STEPI/
SA-01 — Sunday — 09:00 to 10:30 — Ballroom

PLENARY: Positive Relationship Between Public and Private R&D Expenditures of Korean Manufacturing
Hwan-Eik Cho, KOTEF/
SA-01 — Sunday — 09:00 to 10:30 — Ballroom

PLENARY: Key European Policies for Innovation in the Knowledge Economy: An Overview
Rosalie Zobel, European Commission/
TA-02 — Tuesday — 09:00 to 10:30 — Ballroom

Technology Policy in Financing Innovations
Jarunee Wonglimpiyarat, Ministry of Science and Technology/
SB-04 — Sunday — 11:00 to 12:30 — Sorak III

The Route of Technological Spillovers in Intermediate-Goods Industries : A Bibliometric Approach
Young-Hoon Kim, Seoul National University/ Jung-Dong Lee, Seoul National University/ Si H. Joo, Seoul National University/
SB-04 — Sunday — 11:00 to 12:30 — Sorak III

A New Measurement of the Level of S&T and Some Econometric Applications
Yang-Taek Lim, Hanyang University/
SB-04 — Sunday — 11:00 to 12:30 — Sorak III

National R&D Policy in Korea : Focusing on the CDMA Commercialization R&D Project
Saeeok Han, Dong-A University/ Joong Ick Ryu, Ministry of Science and Technology/
SD-04 — Sunday — 14:00 to 15:30 — Sorak III

A Korean Regional Innovation System: A Case of Gyeonggi-Province
Hyuna Park, Sejong University/ Doohee Hwang, Sejong University/ Sunyang Chung, Sejong University/ Jeonghwa Kim, Korea Research Council of Fundamental S&T/
TD-02 — Tuesday — 14:00 to 15:30 — Ballroom II

Evaluation and Pre-Budget Review of Government R&D Programs: A New Initiative in Korea
Heeseung Yang, Sejong University/ Byoung Ho Son, KISTEP/
SD-04 — Sunday — 14:00 to 15:30 — Sorak III

Leverage Strategy to National R&D Investment in Korea: A System Dynamics Approach
Seahong Oh, KISTEP/ Hunjoon Park, Yonsei University/ Sangjoon Kim, Yonsei University/
MB-04 — Monday — 11:00 to 12:30 — Sorak III

Role of Technology in Korea's Economic Development
Doohee Hwang, Sejong University/ Hyuna Park, Sejong University/ Sunyang Chung, Sejong University/
TD-02 — Tuesday — 11:00 to 12:30 — Ballroom II

An Analysis of the Role of Government with Respect to Promoting Domestic Innovations in the Manufacturing Sector of Iran
Mohammad Halimi, Department for Hi-Tech Industries/
MB-04 — Monday — 11:00 to 12:30 — Sorak III

Is the Japanese Small Business Innovation Research Program Effective for Innovation?
Miyako Ogura, Keio University/
SE-04 — Sunday — 16:00 to 17:30 — Sorak III

Building a Smart Regional Innovation System: Guiding Cluster Strategies in Less Advantaged Industrial Clusters of the Southern Region of Taiwan
Ting Lin Lee, National University of Kaohsiung/
SE-04 — Sunday — 16:00 to 17:30 — Sorak III

The Technology Development Path of Research Institutes in Taiwan
Hsueh-Chiao Chiang, National Science Council/
SD-04 — Sunday — 14:00 to 15:30 — Sorak III

Managing Innovation at Higher Education Institutions in Taiwan: Towards a 'Scientific-Economic' Framework
Yuan-Chieh Chang, National Tsing Hua University/ Ming-Huei Chen, Yuan-Ze University/ Mingshu Hua, National Chi Nan University/ Phil Y. Yang, National Chi Nan University/
TD-02 — Tuesday — 14:00 to 15:30 — Ballroom II

The Evaluation of Daedeok Science Town and its Implication for the National Innovation Policy - in the Perspective of Innovation Cluster
Deok S. Yim, STEPI/ Wang D. Kim, STEPI/ Jung H. Yu, Seoul National University/
TD-02 — Tuesday — 14:00 to 15:30 — Ballroom II

Designing a Technology and Innovation Observatory for the State of São Paulo, Brazil
Abraham Oih S. Yu, University of Sao Paulo/ Conceição Vedovello, FINEP/ Marcos Avó, IPT - Instituto de Pesquisas Tecnológicas/
SE-04 — Sunday — 16:00 to 17:30 — Sorak III

Topic List

GLOBAL TECHNOLOGY MANAGEMENT

Absorptive Capacity of Multinational Companies: How Japanese and European Companies Absorb New Technologies from the US
Seiko Arai, University of Oxford/
ME-03 — Monday — 16:00 to 17:30 — Sorak II

From Confrontation to Colla-petition in the Globalized Semiconductor Industry
Ad J. van de Gevel, Tilburg University/
SD-02 — Sunday — 14:00 to 15:30 — Ballroom II

Managing Knowledge in the Global New Product Development Process
Edward F. McDonough III, Northeastern University/ Nicholas Athanassiou, Northeastern University/ Francis Spital, Northeastern University/
TE-04 — Tuesday — 16:00 to 17:30 — Sorak III

S&T Globalization and Korea's Response
Myung-Jin Lee, STEPI/
ME-03 — Monday — 16:00 to 17:30 — Sorak II

Differences in R&D Patterns between MNEs and Domestically Owned Firms in Korea
Hyun-Dae Cho, STEPI/ Jooyoung Kwak, MIT/
ME-03 — Monday — 16:00 to 17:30 — Sorak II

Secondary Innovation in Globalization: The Case of the Technological Evolution of Haier Refrigerator
Xiaobo Wu, Zhejiang University/ Guannan Xu, Zhejiang University/ Su-li Zheng, Zhejiang University/
MD-03 — Monday — 14:00 to 15:30 — Sorak II

Success Factors for MNCs' Inducement Strategies Based on IT Regional Cluster
Yong-Wook Jun, Chung-Ang University/ Jung-Hwa Lee, Chung-Ang University/
MD-03 — Monday — 14:00 to 15:30 — Sorak II

Multinational Companies in Clusters: Case Studies in Malaysia's Multimedia Super Corridor
Mohan V. Avvari, Multimedia University/ Hui Ching Long, Malaysian Communications and Multimedia Commission/
MD-03 — Monday — 14:00 to 15:30 — Sorak II

R&D MANAGEMENT

Patent Claim Map Using Text Mining and Network Analysis
Juneseuk Shin, Seoul National University/ Yongtae Park, Seoul National University/
WD-07 — Wednesday — 14:00 to 15:30 — Kum Kang III

R&D Project Portfolio Allocations in an Engineering Research Center Planning Process
Zbigniew J. Pasek, University of Michigan/
WB-07 — Wednesday — 11:00 to 12:30 — Kum Kang III

Identifying Critical Resources in Simultaneous R&D Projects
Yongyi Shou, Zhejiang University/
WB-07 — Wednesday — 11:00 to 12:30 — Kum Kang III

Volume vs. Efficiency: R&D Management Capabilities of Korean Electronics Part Firms
Jeonghwa Kim, Korea Research Council of Fundamental S&T/ Sungwoo Lee, Korea Research Council of Fundamental S&T/ Sungbok Cho, Korea Research Council of Fundamental S&T/ Hyuna Park, Sejong University/ Sunyang Chung, Sejong University/
WB-07 — Wednesday — 11:00 to 12:30 — Kum Kang III

Evolution & Development Directions of the Planning & Management Systems of the National R&D Programs in Korea - A comparative Analysis Based on Research Types
Young-Il Park, Ministry of Science and Technology/
WD-07 — Wednesday — 14:00 to 15:30 — Kum Kang III

INNOVATION MANAGEMENT

PLENARY: Technology Driven Business Creation - From the Study at JATES and the Cases at Sony
Seiichi Watanabe, Sony Corporation/
MA-02 — Monday — 09:00 to 10:30 — Ballroom

TUTORIAL: Measurement Tools for Creativity Capabilities of Organizations
Yong-In Shin, Samsung Electronics Co./
ME-01 — Monday — 16:00 to 17:30 — Ballroom I

Total Innovation Management (TIM): Strategy-Oriented Innovation Management
Zhangshu Xie, Zhejiang University/ Zhirong Yang, Zhejiang University/ Gongmin Bao, Zhejiang University/
WB-01 — Wednesday — 11:00 to 12:30 — Ballroom I

Innovation through Technology Fusion: Perception and Possibility
Kongrae Lee, STEPI/
WB-01 — Wednesday — 11:00 to 12:30 — Ballroom I

Innovation Intensive Service as Actors of Platform Strategy Adapted to Emerging Industry Development
Hsiao-Chi Chen, National Chiao Tung University/ Joseph Z. Shyu, National Chiao Tung University/
WB-01 — Wednesday — 11:00 to 12:30 — Ballroom I

The Study of Gatekeeping Mechanisms of Creative and Innovative Products
Wei-Hsin Hsiang, National Chengchi University/ Se-Hwa Wu, National Chengchi University/
SD-01 — Sunday — 14:00 to 15:30 — Ballroom I

The Innovation Process for Complex Product System in Heavy Industry: The Experience from China
Jin Chen, Zhejiang University/ Jian-Yuan Song, ZheJiang University/ Bin-wang Gui, Zhejiang University/ Xin-wei Mo, Zhejiang University/
SD-01 — Sunday — 14:00 to 15:30 — Ballroom I

Product Efficiency and the Speed of Product Innovation: An Application to the German PC Market
SeogWon Hwang, STEPI/ Jeong-Dong Lee, Seoul National University/
SE-01 — Sunday — 16:00 to 17:30 — Ballroom I

Topic List

Anatomy of the Front End of Innovation: Contents, Shortcomings and Trends
Jouni Koivuniemi, Lappeenranta University of Technology/
MB-01 — Monday — 11:00 to 12:30 — Ballroom I

Implementing Management Technology in a University: A Case Study
Jay L. Tontz, California State University, Hayward/ Sam Basu, California State University, Hayward/
MB-01 — Monday — 11:00 to 12:30 — Ballroom I

Innovation in Product Development Organizations: A Case Study of Agilent Technologies
Robert P. McGowan, University of Denver/
SE-01 — Sunday — 16:00 to 17:30 — Ballroom I

Innovations in Telecommunication Industry: Is There an End?
Jing Zhang, Beijing University of Posts and Telecommunications/ Xiongjian Liang, Beijing University of Posts and Telecommunications/
SE-01 — Sunday — 16:00 to 17:30 — Ballroom I

A Study on the Shift of Innovation Paradigms Based on the Habitual Domains Theory
Lei Ma, Zhejiang University/ Jin Chen, Zhejiang University/ Liang Tong, Zhejiang University/ Ying X. Wang, Zhejiang University/
MB-01 — Monday — 11:00 to 12:30 — Ballroom I

Difficulties Encountered in National Innovation Surveys
Mary Mathew, Indian Institute of Science/
TB-01 — Tuesday — 11:00 to 12:30 — Ballroom I

Innovation Management in the Australian Government: Cost and Benefit of R&D Tax Concession Program
Joseph Yoon, Department of Industry, Tourism and Resources/ Yong-Eun Moon, Silla University/
MD-01 — Monday — 14:00 to 15:30 — Ballroom I

Searching for a New Legal and Institutional Fix: Changing Korean Techno-Park Policies towards a Regional Innovative Hub
Johng-Ihl Lee, Korea Industrial Technology Foundation/ Sung-Hoon Jung, Korea Industrial Technology Foundation/ Chan-Jun Kim, Korea Industrial Technology Foundation/
MD-01 — Monday — 14:00 to 15:30 — Ballroom I

Role of New Stock Market; Kosdaq in Creating and Growing Korean Innovative New High-tech Start–up: In the Center of Financial Innovation Network Analysis
Youngseok Yang, ETRI/ Hoyoung Hwang, ETRI/
MD-01 — Monday — 14:00 to 15:30 — Ballroom I

The Role of Technological Management in Technological Innovation in Chinese Enterprises
Gongmin Bao, Zhejiang University/ Jing Yang, Zhejiang University/ Zhirong Yang, Zhejiang University/
WD-01 — Wednesday — 14:00 to 15:30 — Ballroom I

The Concept of Innovation Engineering to Expand the Horizon of Japanese Engineers
Chie Sato, Biztech Inc./ Satoshi Kumagai, Musashi Institute of Technology/ Junsei Tsukuda, Musashi Institute of Technology/ Jun Numata, Musashi Institute of Technology/
TB-01 — Tuesday — 11:00 to 12:30 — Ballroom I

Technological Innovation in Brazilian's Firms
Marisalvo Silva, Bank of Brazil/ José Joaquim Ferreira, University of Sao Paulo/
WD-01 — Wednesday — 14:00 to 15:30 — Ballroom I

Management Innovation in Small and Medium Business Exporters in Mexico
Maria del Carmen Domínguez Rios, Benemérita Universidad Autónoma de Puebla/
WD-01 — Wednesday — 14:00 to 15:30 — Ballroom I

DISRUPTIVE TECHNOLOGIES

Anticipating Technological Discontinuities
Gaston A. Trauffler, ETH Zurich/ Tim Sauber, ETH Zurich/ Shoko Okutsu, ETH Zurich/ Hugo Tschirky, ETH Zurich/ Masaharu Kinoshita, Nitta Corporation/ Kazu Otsuka, Nitta Corporation/
ME-04 — Monday — 16:00 to 17:30 — Sorak III

Disruptive Technologies and the Competitive Dynamics of Firms
Akkanad M. Isaac, Governors State University/
ME-04 — Monday — 16:00 to 17:30 — Sorak III

Capturing Opportunity from Disruptive Innovation: HTT's and Their Impact on the Organization – A Case Study
David W. Birchall, Henley Management College/ George Tovstiga, Arthur D. Little/
ME-04 — Monday — 16:00 to 17:30 — Sorak III

An Uncertainty and Risk Reducing Process for the Strategic Management of Discontinuous and Disruptive Technology
Gaston A. Trauffler, ETH Zurich/ Hugo Tschirky, ETH Zurich/ Mischa Czendes, ETH Zurich/ Andreas Biedermann, ETH Zurich/
ME-04 — Monday — 16:00 to 17:30 — Sorak III

Industry Cluster Effect Influence on Enterprise Operation: Precision Machinery Case Study in Taiwan
Benjamin J. C. Yuan, National Chiao Tung University/ James k. Chen, National Chiao Tung University/ Peter Y. C. Peng, National Chiao Tung University/ Tsai-Hua Kang, National Chiao Tung University/
MD-08 — Monday — 14:00 to 15:30 — Kum Kang IV

E-BUSINESS

Optimal Return Policy for e-Business
Samar Mukhopadhyay, University of Wisconsin Milwaukee/ Robert Setoputro, University of Wisconsin Milwaukee/
ME-05 — Monday — 16:00 to 17:30 — Kum Kang I

Topic List

Repurchase Intentions Analysis and Customer Segmentation in the Internet Shopping Mall
Jung-Hwan Lee, ETRI/ MunKee Choi, ICU/ eok-soo Han, ETRI/
ME-05 — Monday — 16:00 to 17:30 — Kum Kang I

Business Creation in the Era of the Fourth Generation Innovation
Yasuyuki Suzuki, Matsushita Electric Industrial Co., Ltd./ Akio Kameoka, Japan Advanced Institute of Science and Technology/
TE-02 — Tuesday — 16:00 to 17:30 — Ballroom II

Self Regulatory Behavior for Consumer Privacy Protection in e-Business: Comparing between US and Taiwan
JJ,Jou-Juan Pan, National Chengchi University/ Paul C. B. Liu, National Chengchi University/
ME-05 — Monday — 16:00 to 17:30 — Kum Kang I

Development of e-Business in China
Hongyi Chen, Portland State University/ Dundar F. Kocaoglu, Portland State University/
ME-05 — Monday — 16:00 to 17:30 — Kum Kang I

INFORMATION/KNOWLEDGE MANAGEMENT

Managing Knowledge and Innovation through a Centre of Excellence System
K. C. Ko, Johnson Electric Group/ W. B. Lee, Hong Kong Polytechnic University/ Benny Cheung, Hong Kong Polytechnic University/
SB-06 — Sunday — 11:00 to 12:30 — Kum Kang II

Intellectual Capital and Innovation Performance: A Conceptual Framework
Dongqin Li, Zhejiang University/ Xiaobo Wu, Zhejiang University/ Jian Du, Zhejiang University/
SB-06 — Sunday — 11:00 to 12:30 — Kum Kang II

Implementing and Integrating NPD and Sales Forecasting System Based on Knowledge Perspective
Yiche Chen, Yuan-Ze University/ Yan Ru Li, Yuan-Ze University/
SB-06 — Sunday — 11:00 to 12:30 — Kum Kang II

Design and Development of New Information Infrastructure: Case Studies of Broadband Public Network and Digital City
Dong-Hee Shin, Penn State University/
SD-06 — Sunday — 14:00 to 15:30 — Kum Kang II

Individual Learning Motivation and its Implication on Team Learning
Hing-Wih Foong, National University of Singapore/ Kah-Hin Chai, National University of Singapore/ Chee-Meng Yap, ISE, National University of Singapore/
SE-06 — Sunday — 16:00 to 17:30 — Kum Kang II

The Effects of Information Technology on Organization's Competitiveness Regarding Innovation Characteristics
Sitki Gozlu, Istanbul Technical University/ Ferhan Cebi, Istanbul Technical University/
SE-06 — Sunday — 16:00 to 17:30 — Kum Kang II

Yin-Yang Knowledge Management Model: A Unified Conceptual Model
Jiangdian Wang, Nanyang Technological University/ Tien Hua Yim-Teo, Nanyang Technological University/
SE-06 — Sunday — 16:00 to 17:30 — Kum Kang II

The ICTs Distributor's Perspective on the Assessment of Information Quality for the Automated Information Systems
Athakorn Kengpol, King Mongkut's Institute of Technology North Bangk/ Markku Tuominen, Lappeenranta University of Technology/
MB-06 — Monday — 11:00 to 12:30 — Kum Kang II

The ICTs User's Perspective on the Assessment of Information Quality for the Automated Information Systems
Athakorn Kengpol, King Mongkut's Institute of Technology North Bangk/ Markku Tuominen, Lappeenranta University of Technology/
MB-06 — Monday — 11:00 to 12:30 — Kum Kang II

A Framework for Designing ICT Systems that Enhance Innovative Clusters Performance
Gilson D. Santos, Federal Center for Technological Education (CEFET)/ Fernando José A. Schenatto, CEFET-PR (Centro Federal Tecnológico do Paraná)/ Beatriz T. Borsoi, CEFET-PR (Centro Federal Tecnológico do Paraná)/
MB-06 — Monday — 11:00 to 12:30 — Kum Kang II

Knowledge Management in Pharmaceutical Industry in Mexico
Rocío Cassaigne, National Autonomous University of Mexico/
WD-07 — Wednesday — 14:00 to 15:30 — Kum Kang III

Website Information Architecture for Chinese Enterprises' Competitive Advantage
Yihong Rong, Capital Normal University/ Zhanping Liang, Institute of Sci. & Tech. Information of China/ Zhe Wang, Harbin Institute of Technology/ Guang Yu, Harbin Institute of Technology/ Hongxing Wu, Harbin Institute of Technology/
SD-06 — Sunday — 14:00 to 15:30 — Kum Kang II

Competitive Technological Intelligence to Identify Opportunities and Road Maps: A Mexican Case
Rosario Castañòn, National University of Mexico/ José Luis Solleiro, National University of Mexico/ Isabel Saad, National University of Mexico/ P. Ortega, CamBiotec/
SD-02 — Sunday — 14:00 to 15:30 — Ballroom II

Evaluation of a Software Tool for Knowledge Management in Software Process Improvement
Ilmari Saastamoinen, University of Joensuu/ Markku Tukiainen, University of Joensuu/ Timo K. Mäkinen, Tampere University of Technology/ Timo K. Varkoi, Tampere University of Technology/
SD-06 — Sunday — 14:00 to 15:30 — Kum Kang II

TECHNOLOGY PLANNING AND FORECASTING

PLENARY: Technology Roadmapping - Linking Technology Resources to Business
Robert Phaal, University of Cambridge/
WA-02 — Wednesday — 09:00 to 10:30 — Ballroom

Topic List

A Planning Methodology Proposal for Integrated Product and Process Technology
Tufan V. Koc, Istanbul Technical University/ Seckin Polat, Istanbul Technical University/ Verda Yunusoglu, BEKO Co./
TD-03 — Tuesday — 14:00 to 15:30 — Sorak II

TV-based VOD Deployment Strategies among Telcos and Market Outlook: A Study of Digital Convergence
Byung-sun Cho, ETRI/ Hoyoung Hwang, ETRI/
TE-03 — Tuesday — 16:00 to 17:30 — Sorak II

Turkish Technology Foresight Project: Vision 2023 and Machinery and Materials Panel Methodology
Verda Yunusoglu, BEKO Co./ Seckin Polat, Istanbul Technical University/ Tufan V. Koc, Istanbul Technical University/
TE-03 — Tuesday — 16:00 to 17:30 — Sorak II

A Prospective on the Evolution of Mobile Communications in Korea
Seok Ji Park, ETRI/ Joo Seong Park, ETRI/
TE-03 — Tuesday — 16:00 to 17:30 — Sorak II

Technology Roadmapping in Strategic Research Areas: An R&D Planning Example of Korea Institute of Science and Technology
Yong-Gil Lee, Korea Institute of Science and Technology/ Se-Jun Lee, Korea Institute of Science and Technology/ Yun-Chul Chung, Korea Institute of Science and Technology/
TD-03 — Tuesday — 14:00 to 15:30 — Sorak II

Technology Roadmapping as a National R&D Planning-Korea's Experience
Byeongwon Park, KISTEP/ Doyoung Byun, Konkuk University/ Seokho Son, KISTEP/ Keunha Chung, KISTEP/ Pyengmu Bark, KISTEP/
TD-03 — Tuesday — 14:00 to 15:30 — Sorak II

Technology Forecasting using Patent Searches and Growth Curves
Tugrul U. Daim, Intel Corporation/
TD-03 — Tuesday — 14:00 to 15:30 — Sorak II

TECHNOLOGY ASSESSMENT AND EVALUATION

TUTORIAL: Technology Development Envelope – A New Approach to Managing Emerging Technologies
Dundar F. Kocaoglu, Portland State University/ Nathasit Gerdsri, Portland State University/
WD-08 — Wednesday — 14:00 to 15:30 — Kum Kang IV

A Quantitative Model for the Strategic Evaluation of Emerging Technologies
Dundar F. Kocaoglu, Portland State University/ Nathasit Gerdsri, Portland State University/
MB-03.2 — Monday — 10:00 to 11:30 — Sorak II

A Classification of Methods for Technology Auditing
Mohammad R. Arasti, Sharif University of Technology/
TD-08 — Tuesday — 14:00 to 15:30 — Kum Kang IV

The Development of a Contingent Valuation Model Integrating Technology Strategies and Valuation: The Application of Patent Analysis
Yiche Chen, Yuan-Ze University/ Yan Ru Li, Yuan-Ze University/
TB-08 — Tuesday — 11:00 to 12:30 — Kum Kang IV

Risk Assessment Modeling for Information Technology Management
Leonid B. Preiser, National University/
TE-08 — Tuesday — 16:00 to 17:30 — Kum Kang IV

Science and Technology Indicators in Emerging Economy Country
Kazuo Hatakeyama, CEFET-PR (Centro Federal Tecnológico do Paraná)/
TD-08 — Tuesday — 14:00 to 15:30 — Kum Kang IV

A Technology Assessment for Reducing the Digital Divide
Audrey M. Alvear Báez, Portland State University/ Dundar F. Kocaoglu, Portland State University/
TE-08 — Tuesday — 16:00 to 17:30 — Kum Kang IV

The Assessment of Technology Level in Korea
MoonJung Choi, KISTEP/ Sang-Youb Lee, KISTEP/
TD-08 — Tuesday — 14:00 to 15:30 — Kum Kang IV

A Model of Defense Offset Technology Valuation: The Option Approach
Won Joon Jang, Seoul National University/ Jeong-Dong Lee, Seoul National University/ Tae Ho Lyoo, Seoul National University/
TB-08 — Tuesday — 11:00 to 12:30 — Kum Kang IV

Improved Technology Scoring Model for Credit Guarantee Fund
So Young Sohn, Yonsei University/ Taehee Moon, Yonsei University/
TB-08 — Tuesday — 11:00 to 12:30 — Kum Kang IV

An Evaluation Model for a Strategic Innovation and Technology Management: The Case of Competitiveness Improvement of a Mexican Decentralized Public Institute of Research
Adriana Zavala, Buro Ambiental/ Enrique Martinez, Buro Ambiental/ Sixto Moya, Buro Ambiental/ Julio Sida, Buro Ambiental/
TB-08 — Tuesday — 11:00 to 12:30 — Kum Kang IV

Technology Shock, Non-technology Shock and Employment Effect in the Korean Economy
Sang Sup Cho, ETRI/ Chun Mo Ahn, ETRI/ Myung-Hwan Rim, ETRI/
TD-08 — Tuesday — 14:00 to 15:30 — Kum Kang IV

Alternative Technologies for Wired Home Environment
Bassam Abu-khater, Portland State University/ Samir Said, Portland State University/ Turki Alsudiri, Portland State University/
TE-08 — Tuesday — 16:00 to 17:30 — Kum Kang IV

Topic List

TECHNOLOGY ACQUISITION

An Effective Method on Targets Selection of Merger & Acquisition for Technology-oriented Businesses
Chih-Chiang Fan, United Microelectronics Corporation (UMC)/ Shing-Ko Liang, National Chiao Tung University/ Chia-Nan Wang, Newfancy Technology Inc./
SB-07 — Sunday — 11:00 to 12:30 — Kum Kang III

The Relationships between Technology Investment Decision, Advanced Technology Implementation and Facility Location in the Turkish Small Manufacturing Enterprises
Sitki Gozlu, Istanbul Technical University/ Hasan Gules, Selcuk University/
SB-07 — Sunday — 11:00 to 12:30 — Kum Kang III

Organizational Strategy in IP Service Industry: Comparison among US, Europe, Asia and Lessons for Taiwan
FengShang Wu, National Chengchi University/ JJ,Jou-Juan Pan, National Chengchi University/
SB-07 — Sunday — 11:00 to 12:30 — Kum Kang III

Technological Catching-up of IT Start-ups with External Learning in Eastern China
Jiang Wei, Zhejiang University/ Jianghua Zhou, Zhejiang University/
SD-07 — Sunday — 14:00 to 15:30 — Kum Kang III

Technology Imports and Marginalization Risk of Manufacturing in China
Xiaobo Wu, Zhejiang University/ Jian Du, Zhejiang University/ Ying Wei, Zhejiang University/
SD-07 — Sunday — 14:00 to 15:30 — Kum Kang III

Why Tsubame-Sanjo Area has been Sustaining Cluster of Industries for the Past 400 Years in Japan: Regional Innovation System for Sustaining Cluster
Tomomichi Yoshikawa, Waseda University/
SD-07 — Sunday — 14:00 to 15:30 — Kum Kang III

TECHNOLOGY DIFFUSION

Social Capital Promoting Technology Innovation Dissemination
Hongyan Li, University of Science and Technology of China/ Xuelin Chu, University of Science and Technology of China/ Bao Chang, University of Science and Technology of China/ Li Xiong, University of Science and Technology of China/
TE-01 — Tuesday — 16:00 to 17:30 — Ballroom I

Key Success Factors Affecting 3G Wireless Diffusion in Japan
Kumiko Miyazaki, Tokyo Institute of Technology/ Kjartan Jonsson, Tokyo Institute of Technology/
TD-01 — Tuesday — 14:00 to 15:30 — Ballroom I

e-Learning Technology Adaptation: Cases of Universities in Thailand
Sawai Siritongthaworn, Asian Institute of Technology/ Donyaprueth Krairit, Asian Institute of Technology/
SB-03 — Sunday — 11:00 to 12:30 — Sorak II

A Technology Diffusion Model of Business Method: An Integration of Patent Citation and Bass Model
Kuei-Kuei Lai, National Yunlin University of Science and Tech./ Shann-Bin Chang, Nan-Kai College, Shu-Min Chang, Nan-Kai College/
TE-01 — Tuesday — 16:00 to 17:30 — Ballroom I

Modeling Stochastic Diffusion and Defining Parameters for Substitutable Technological Innovation
Baomin Hu, Hebei University of Technology/ Lili Wang, Hebei University of Technology/ Ad J. W. van de Gevel, Tilburg University/ Xiuxin Liu, Hebei University of Technology/
TE-01 — Tuesday — 16:00 to 17:30 — Ballroom I

Assuming Parameter Patterns on the Diffusion of Successive Generations of Technology
Choonmo Ahn, ETRI/ IlSoo Rho, ETRI/
TE-01 — Tuesday — 16:00 to 17:30 — Ballroom I

More Perspective towards Infusion of Mobile Phones
Jukka Mäkinen, Tampere University of Technology/ Hannu Jaakkola, Tampere University of Technology/
TD-01 — Tuesday — 14:00 to 15:30 — Ballroom I

Innovation Diffusion in a Context of Radical Industry Restructuring: A Case from China's Telecommunication Industry
Jiang Yu, University of Cambridge/ Yongjiang Shi, University of Cambridge/ Xin Fang, Chinese Academy of Science/
TD-01 — Tuesday — 14:00 to 15:30 — Ballroom I

TECHNOLOGY MARKETING

Decision Making Process of Licensees: How to Evaluate the Invisible Value
Michi Fukushima, Tohoku University/ Toshiya Watanabe, University of Tokyo/ Shigemi Yoneyama, Musashi University/ Dai Senoo, Tokyo Institute of Technology/
SE-08 — Sunday — 16:00 to 17:30 — Kum Kang IV

Value-Based Pricing For New Software Products: Strategy Insights for Developers
Robert Harmon, Portland State University/ David Raffo, Portland State University/ Stuart Faulk, University of Oregon/
SE-08 — Sunday — 16:00 to 17:30 — Kum Kang IV

E-Service Value: Effects of Consumer Knowledge and Risk Perceptions
Chien-hsin Lin, National Chi Nan University/ Hsin-Yu Shih, National Chi Nan University/ Peter J. Sher, National Chung Hsing University/
SE-08 — Sunday — 16:00 to 17:30 — Kum Kang IV

Fuzzy Multivariate Approach to Corporate Brand Evaluation
Kunio Shibata, Waseda University/ Junzo Watada, Waseda University/ Shotaro Uehara, Waseda University/ Yoshiyuki Yabuuchi, Shimonoseki City University/
SB-08 — Sunday — 11:00 to 12:30 — Kum Kang IV

Topic List

Application of Prospect Theory and Agency Theory in Technology Commercialization Process
Peter J. Sher, National Chung Hsing University/ Joseph Y. Leu, National Taiwan University/
SB-08 — Sunday — 11:00 to 12:30 — Kum Kang IV

Customer Response Analysis and Business Strategy Direction for Telematics Service in Korea
Kyoung-yong Jee, ETRI/ Jane J. Kang, ETRI/ Bong-jun Kim, ETRI/ Sang-min Lim, ETRI/
SD-08 — Sunday — 14:00 to 15:30 — Kum Kang IV

Knowledge Creation, Innovation and Strategic Commercial Relationships: Dupont and Festo Cases in Mexico
Celso Garrido , Universidad Autónoma Metropolitana/ Enrique Martinez, Universidad Autónoma Metropolitana/
SD-08 — Sunday — 14:00 to 15:30 — Kum Kang IV

Surviving the Death Valley through Strategic Marketing Alliance: A New Business Model for Japanese High-tech Start-ups
Miho Moritake, Kobe University/
SD-08 — Sunday — 14:00 to 15:30 — Kum Kang IV

TECHNOLOGY TRANSFER

Revisiting the Concept of Technology Transfer
Frederick W. Betz, University of Maryland University College/
TD-05 — Tuesday — 14:00 to 15:30 — Kum Kang I

The Structure of Licensing Contract for Optimal Risk Sharing
Tae-Kyu Ryu, Seoul National University/ Jeong-Dong Lee, Seoul National University/ seong-sang Lee, Seoul National University/
TD-05 — Tuesday — 14:00 to 15:30 — Kum Kang I

RIKEN: A Research Institute that Lead a Large Industrial Group in Japan
Masayuki Kondo, Yokohama National University/
WB-05 — Wednesday — 11:00 to 12:30 — Kum Kang I

Integrated Collaborative Research Program at RIKEN
Eiichi Maruyama, RIKEN/
WB-05 — Wednesday — 11:00 to 12:30 — Kum Kang I

Codified-Tacit Knowledge Transfer in Cooperative Agreements: A Study of the e-Commerce Software Industry
Kung Wang, Industrial Technology Research Institute/ Shu-Yu Yeh, Ming Chuan University/
TD-05 — Tuesday — 14:00 to 15:30 — Kum Kang I

Viable Technologies for Sustainability and Local Integrated Development, Tech/SUDIL
Miguel A. Briceño, Unversidad Central de Venezuela/
SB-03 — Sunday — 11:00 to 12:30 — Sorak II

Technology Transfer: A SENAI-RS, SEBRAE-RS and Laboratory for Machine Tools and Production Engineering – WZL / Aachen University Case
Alexandre V. Barros, SENAI RS/ Marta F. Pastorino, SEBRAE/
TE-05 — Tuesday — 16:00 to 17:30 — Kum Kang I

Technology Licensing Practices of Government-funded Research Institutes in Korea: Present and Change
Jong-Bok Park, Korea Institute of Science and Technology/ Jeong-Kyu Park, Korea Institute of Science and Technology/ Young-Bo Shim, Institute of Information Technology Assessment/ Kil-Choo Moon, Korea Institute of Science and Technology/ Eunnyeong Heo, Seoul National University/
TB-05 — Tuesday — 11:00 to 12:30 — Kum Kang I

Compensation Structures in Korean Technology Licensing from Abroad
Hyun-Woo Park, KISTI/
TB-05 — Tuesday — 11:00 to 12:30 — Kum Kang I

Software Companies' Expectations for Regional Co-operation with an Academic Institute
Jari Leppäniemi, Tampere University of Technology/ Timo Varkoi, Tampere University of Technology/ Timo Mäkinen, Tampere University of Technology/ Hannu Jaakkola, Tampere University of Technology/
TE-05 — Tuesday — 16:00 to 17:30 — Kum Kang I

An Agency Explanation for Determinants of International Technology Licensing Contracts
Peter J. Sher, National Chung Hsing University/ Joseph Y. Lu, National Taiwan University/
TB-05 — Tuesday — 11:00 to 12:30 — Kum Kang I

Making Use of Offset Program to Promote Industrial Development— A Case of Technology Transfer by ITRI
Hsin-Hann Tsai, National Chiao Tung University/ Hsiao-Cheng Yu, National Chiao Tung University/
WB-05 — Wednesday — 11:00 to 12:30 — Kum Kang I

TECHNOLOGY MANAGEMENT EDUCATION

TUTORIAL: Technology Management Education and Research – Current Status and Strategic Directions
Dundar F. Kocaoglu, Portland State University/
SE-07 — Sunday — 16:00 to 17:30 — Kum Kang III

PANEL: ETMERC
John O. Aje, University of Maryland/ Tony Bailetti, Carleton University/ Antonie de Klerk, University of Pretoria/ William T. Flannery, University of Texas - San Antonio/ Dundar F. Kocaoglu, Portland State University/ Marthinus W. Pretorius, University of Pretoria/
MD-07 — Monday — 14:00 to 15:30 — Kum Kang III

An Analysis of the Development of Successful Engineers: The Structure and Cultivating Factors of Engineer Competence
Midori Kato, Tokyo Kiezai University/ Yoshiya Teramoto, Waseda University/ Makoto Kanda, Meiji Gakuin University/ Toru Takai, Nihon University/ Caroline Benton, University of Wales Validated MBA Programme/ Toru Uchida, Waseda University/
MB-07 — Monday — 11:00 to 12:30 — Kum Kang III

R&D Management Literacy
Hiroyuki Yamasaki, Renesas Technology Corp./ Takeo Matsubara, Innovation Promotion Association-Japan/ Shin'ichi Otsuki, Hannan University/
MB-07 — Monday — 11:00 to 12:30 — Kum Kang III

Topic List

Not Just Technologists: A Delphi Study on the Future Skills Needs of UK Engineering
Nigel Spinks, Henley Management College/ Jean-Noel Ezingeard, Henley Management College/ David W. Birchall, Henley Management College/
MB-07 — Monday — 11:00 to 12:30 — Kum Kang III

Technology Management Education & Training in Japan
Kiyoshi Niwa, University of Tokyo/
ME-07 — Monday — 16:00 to 17:30 — Kum Kang III

MOT Education and the Revitalization of Japanese Industry: An Assessment of the New Policy Framework
Steven W. Collins, University of Washington, Bothell/ Akio Kameoka, Japan Advanced Institute of Science and Technology/ Meng Li, Japan Advanced Institute of Science and Technology/
ME-07 — Monday — 16:00 to 17:30 — Kum Kang III

A Study of Developing Educational Program to Foster Entrepreneurship in Japan
Yoshiki Nakamura, Aoyama Gakuin University/ Yuichiro Mitsuhashi, NEC Corporation/ Masashige Tsuji, Aoyama Gakuin University/
ME-07 — Monday — 16:00 to 17:30 — Kum Kang III

DECISION MAKING IN TECHNOLOGY MANAGEMENT

A Quantitative Model for the Strategic Evaluation of Emerging Technologies
Nathasit Gerdsri, Portland State University/ Dundar Kocaoglu, Portland State University/
MB-03 — Monday — 11:00 to 12:30 — Sorak II

A New Framework of Business Modeling Method for R&D Outputs: Valuation and Communication Tool for Engineers, Managers and Investors
Hitoshi Abe, Oki Electric Industry Co.,Ltd./ Yuji Hirabayashi, Shimizu Corporation/ Toshihiko Horiuchi, Hitachi , Ltd/ Masayuki Kado, Tokyo Gas Co., Ltd/ Hiraku Sakuma, NEC Corporation/
SE-03 — Sunday — 16:00 to 17:30 — Sorak II

Requirements for Modeling Approach in R&D Decision-making
Yasuo Kusaka, Dokkyo University/
SE-03 — Sunday — 16:00 to 17:30 — Sorak II

The Cause and Influence of Accidents in Corporations
Junzo Watada, Waseda University/ Yoshiyuki Yabuuchi, Shimonoseki City University/ Maojun Li, Waseda University/ Kunio Shibata, Waseda University/
SD-03 — Sunday — 14:00 to 15:30 — Sorak II

FMCDM Approach for Evaluating the Strategies of Fuel Cell Development in Taiwan
Benjamin J. C. Yuan, National Chiao Tung University/ Gwo-Hshiung Tzeng, Industrial Technology Research Institute/ Chien Pin Wang, Industrial Technology Research Institute/
MB-03 — Monday — 11:00 to 12:30 — Sorak II

MADM Approach for Selection the Performance of Outsourced ERP Systems in the Data-Communication IC Design Industry in Taiwan
Tsai-Hua Kang, National Chiao Tung University/ Benjamin J. C. Yuan, National Chiao Tung University/ James K. C. Chen, National Chiao-Tung University/ Yuan-Hsin Wang, MA in Finance and Investment of Exeter University/ Jan-Mou Li, National Chiao Tung University/
MB-03 — Monday — 11:00 to 12:30 — Sorak II

Simulation Modelling: Tool for Performance Enhancement in Industrial Systems
Edward Szczerbicki, University of Newcastle/
SD-03 — Sunday — 14:00 to 15:30 — Sorak II

Forecasting Demand for Vehicles using Alternative Fuel
Youngsang Cho, Seoul National University/ Jongsoo Lee, Seoul National University/ Jeong-Dong Lee, Seoul National University/
SD-03 — Sunday — 14:00 to 15:30 — Sorak II

Innovative Strategic IT-System Investment Case in Finnish Paper Industry: Real Options Perspective
Jan Edelmann, TBRC / Lappeenranta University of Technology/
SE-03 — Sunday — 16:00 to 17:30 — Sorak II

Comparing Concurrent Engineering Approaches: Set-Based versus Point-Based
Alceu S. Camargo Jr., Universidade de São Paulo/ Abraham Oih S. Yu, University of Sao Paulo/
SD-03 — Sunday — 14:00 to 15:30 — Sorak II

Innovation Management of Intellectual Capital: Measurement and Optimization Through Multicriteria Method
Ricardo G. DaSilva, Universidade Catolica de Brasilia - UCB/ Feruccio Bilich, Universidade de Brasília - UnB/
SE-03 — Sunday — 16:00 to 17:30 — Sorak II

COLLABORATIONS IN TECHNOLOGY MANAGEMENT

TUTORIAL: Collaborative Technology Roadmapping
Robert Phaal, University of Cambridge/
WD-02 — Wednesday — 16:00 to 17:30 — Ballroom II

Managing Collaborative Work in Networked Enterprise
W. B. Lee, Hong Kong Polytechnic University/
SD-02 — Sunday — 14:00 to 15:30 — Ballroom II

Success Determinants of Industry-University Collaboration Projects: An Empirical Analysis in Chinese Technology-Based Firms
Bin Guo, School of Management, Zhejiang University/ Zhiyu Xie, School of Management, Zhejiang University/ Yongyi Shou, School of Management, Zhejiang University/ Huifang Wu, Zhejiang University/
MB-08 — Monday — 11:00 to 12:30 — Kum Kang IV

Topic List

Innovational Corporations between The Academy and The Industry: The Views from inner China (Nanjing, Wuhan, Xian, Chengdu) and The Lessons for Taiwan
JJ,Jou-Juan Pan, National Chengchi University/
MB-08 — Monday — 11:00 to 12:30 — Kum Kang IV

The Locating Analysis of Technological Innovation for Chinese Pharmaceutical Firms: Based on the View of Strategic Networks
Xiaobo Wu, Zhejiang University/ Ying Wei, Zhejiang University/ Dongqin Li, Management School, Zhejiang University/
MB-08 — Monday — 11:00 to 12:30 — Kum Kang IV

COMPETITIVENESS IN TECHNOLOGY MANAGEMENT

Sustainable Competitive Advantage and Marketing Innovation of Firms: Towards a Model Development
Peijuan Shen, Beijing University of Technology/ Guangya Xie, Beijing University of Technology/ Liqin Ren, University of Twente/
SD-02 — Sunday — 14:00 to 15:30 — Ballroom II

The Competitive Behaviour of Governments: A Case Study of Successful IT in Great Britain
Ikenna S. Uzuegbunam, University of Sussex/
SE-02 — Sunday — 16:00 to 17:30 — Ballroom II

New Scope of Japanese Industrial Technological Competitiveness
Takeshi Shimada, Japan Advanced Institute of Science and Technology/ Akio Kameoka, Japan Advanced Institute of Science and Technology/
SE-02 — Sunday — 16:00 to 17:30 — Ballroom II

An Empirical Study on Corporate 'Comprehensive' Competitiveness Evaluation Model : Korean Manufacturing Sector
Chae-Suk Lim, Hanyang University/
SE-02 — Sunday — 16:00 to 17:30 — Ballroom II

Strategic Analysis of the Brazilian Aeronautical Cluster
Jose Henrique S. Damiani, Institute of Aeronautical Technology (ITA)/ Arnoldo S. Cabral, Institute of Aeronautical Technology (ITA)/ Ligia Maria S. Urbina, Institute of Aeronautical Technology (ITA)/
MB-05 — Monday — 11:00 to 12:30 — Kum Kang I

PROJECT/PROGRAM MANAGEMENT

New Procedures for Projects Deadline Adjust and Its Application for Determining Premium and Penalty Between the Contractor and the Contracted
Michitoshi Oishi, UPIS - Integrated Faculties/ Israel Brunstein, POLI/USP/ Miriam C. Oishi, FECAP University / UNISA University/
WB-02 — Wednesday — 11:00 to 12:30 — Ballroom II

Challenges in Global Software Projects Management
Nazmun Nahar, University of Jyväskylä/ Najmul Huda, Tallinn Technical University/ Jaak Tepandi, Tallinn Technical University/
MB-02 — Monday — 11:00 to 12:30 — Ballroom II

Project-Based Organizations as Complex Adaptive Systems
Carlos E. Sato, PM21 Solutions in Projects/ Dario E. Dergint, CEFET-PR (Centro Federal Tecnológico do Paraná)/ Kazuo Hatakeyama, CEFET-PR (Centro Federal Tecnológico do Paraná)/
MD-02 — Monday — 14:00 to 15:30 — Ballroom II

The Impact of Project Organizational Structures on Project Success - Revisited
Thomas G. Lechler, Stevens Institute of Technology/ Dov Dvir, Ben-Gurion University of the Negev/
MD-02 — Monday — 14:00 to 15:30 — Ballroom II

Antecedences of Decision Quality in Early NPD Project Termination
Thomas G. Lechler, Stevens Institute of Technology/ Holger Ernst, WHU – Otto Beisheim Graduate School of Management/
WB-02 — Wednesday — 11:00 to 12:30 — Ballroom II

An Integer-Programming Model for Assigning Projects to Project Managers
Peerasit Patanakul, Portland State University/ Dragan Milosevic, Portland State University/ Timothy Anderson, Portland State University/
WB-02 — Wednesday — 11:00 to 12:30 — Ballroom II

Evaluating the Performance of R&D Project in Taiwan Using Data Envelopment Analysis with Imprecise Data
Hua-Kai Chiou, National Defense University/ Gwo-Hshiung Tzeng, National Chiao Tung University/ Benjamin J. C. Yuan, National Chiao Tung University/
ME-02 — Monday — 16:00 to 17:30 — Ballroom II

Upper Management: A Scarce Project Resource?
Thomas G. Lechler, Stevens Institute of Technology/ Maik Fuerstenberg, Stevens Institute of Technology/
MD-02 — Monday — 14:00 to 15:30 — Ballroom II

Managing Risks in High-Tech R&D Projects
Hans J. Thamhain, Bentley College/
ME-02 — Monday — 16:00 to 17:30 — Ballroom II

The Effect of the Manager and Team Profiles on Projects of Organizations with Different Project Management Maturity Levels
Isak Kruglianskas, University of Sao Paulo/ Renato Moraes, University of Sao Paulo/
WB-02 — Wednesday — 11:00 to 12:30 — Ballroom II

Adaptive Project Management Model for Wireless Technologies
Leonid B. Preiser, National University/
MB-02 — Monday — 11:00 to 12:30 — Ballroom II

Topic List

Korea-MOST Independent R&D Management Program Operation Case
Kwon-Joong Sohn, Tera-level Nanodevices/
ME-02 — Monday — 16:00 to 17:30 — Ballroom II

PRODUCTIVITY MANAGEMENT

Measuring the Performance of Venture Companies with DEA
Seogwon Hwang, STEPI/ Jeong-Dong Lee, Seoul National University/ Eui-seong Kim, Seoul National University/ Yunyoung Kim, Seoul national university/
WD-03 — Wednesday — 14:00 to 15:30 — Sorak II

IDEA with FMOP Method for Evaluating the Performance of Budget-Accounting & Statistics Departments of ROC Air Force
Yu-Yuan Tsou, National Defense University/ Hua-Kai Chiou, National Chiao Tung University/ Gwo-Hshiung Tzeng, National Chiao Tung University/
WD-03 — Wednesday — 14:00 to 15:30 — Sorak II

The Measurement Model for Sustaining Strength of Regional Innovation System to Regional Economy
Baomin Hu, Hebei University of Technology/ Xinkai Yu, Hebei University of Technology/ Lili Wang, Hebei University of Technology/
WD-03 — Wednesday — 14:00 to 15:30 — Sorak II

Externality Effect of IT Capital Stock
Myung-Hwan Rim, ETRI/ Chun-geol Mun, ETRI/ Sang Sup Cho, ETRI/
WD-03 — Wednesday — 14:00 to 15:30 — Sorak II

MANUFACTURING MANAGEMENT

Keeping the Essence of the Manufacturing Spirit
Kazuo Hatakeyama, CEFET-PR (Centro Federal Tecnológico do Paraná)/ Edson N. Shigueoka, CEFET-PR (Centro Federal Tecnológico do Paraná)/
TB-03 — Tuesday — 11:00 to 12:30 — Sorak II

The Failure of the Korean Numerical Controller Industry and the Characteristics of the Technology
Chaisung Lim, Korea Christian University/
TB-03 — Tuesday — 11:00 to 12:30 — Sorak II

Identifying Objects to Build an Object-Oriented Business Model Using Group Technology
Jinho Kim, University of Texas at Arlington/ Jamie Rogers, University of Texas at Arlington/
MD-05 — Monday — 14:00 to 15:30 — Kum Kang I

Enterprise Risk Management Strategy Based on Phase-wise Cost Control
Kun Zhu, Tsinghua University/ Yueting Chai, Tsinghua University/ Jiaben Yang, Tsinghua University/
TB-03 — Tuesday — 11:00 to 12:30 — Sorak II

Industry – Science Relationships for Innovation and Technology Development Process in Iran
Jafar Bagherinejad, University of Azzahra/
TB-01 — Tuesday — 11:00 to 12:30 — Ballroom I

NEW PRODUCT DEVELOPMENT

PLENARY: Development of Large Complex Systems Based on Axiomatic Design and Complexity Theory
Nam P. Suh, MIT/
WA-01 — Wednesday — 09:00 to 10:30 — Ballroom

Optimization Models for Quality Function Deployment
Ixin Lai, National University of Singapore/ Min Xie, National University of Singapore/ Kay Chuan Tan, National University of Singapore/
TD-04 — Tuesday — 14:00 to 15:30 — Sorak III

Modularizing the New Product Design Process
Hyeonju Seol, Seoul National University/ Yongtae Park, Seoul National University/
TD-04 — Tuesday — 14:00 to 15:30 — Sorak III

Intelligent Design Advisor for Manufacturing Process Knowledge
Carl A. Reidsema, University of New South Wales/ Tim Jones, University of New South Wales/ Adrian Smith, GKN-Aerospace/ Don Kelly, University of New South Wales/ Yang Quangang, University of New South Wales/
TB-04 — Tuesday — 11:00 to 12:30 — Sorak III

Approaches to Overcoming the Technology-Related Barriers to Innovation and Successful Product Development: The Micro-Company Perspective
Alan Lewis, University of Wales Institute, Cardiff/ Povl Larsen, University of Wales Institute, Cardiff/
TE-04 — Tuesday — 16:00 to 17:30 — Sorak III

The Role of the Complexity of Platform Projects on the Capacity to Launch New Products
Paulo S. Figueiredo, University of Sao Paulo/ Abraham Oih S. Yu, University of Sao Paulo/
TE-04 — Tuesday — 16:00 to 17:30 — Sorak III

The Role of Uncertainty in Speed-to-Market and New Product Success
Jiyao Chen, Stevens Institute of Technology/ Richard R. Reilly, Stevens Institute of Technology/ Gary S. Lynn, Stevens Institute of Technology/
TE-04 — Tuesday — 16:00 to 17:30 — Sorak III

Firm Leveraging of "User Collaboration Communities" for Product Innovation and Development
Tzu-Ying Chan, National Chengchi University/ Jen-Feng Lee, National Chengchi University/
TB-04 — Tuesday — 11:00 to 12:30 — Sorak III

A New Approach for Technology Forecasting of New Product Development Targets
Lane Inman, Veritas, Inc./ Timothy R. Anderson, Portland State University/
TD-04 — Tuesday — 14:00 to 15:30 — Sorak III

Topic List

SUPPLY CHAIN MANAGEMENT

Detecting Changes and Avoiding Unwanted Behavior in Supply Chains
Luis C. Rabelo, University of Central Florida/ Magdy Helal, University of Central Florida/ Chalermmon lertpattarapong, MIT/
ME-06 — Monday — 16:00 to 17:30 — Kum Kang II

Influences of Aggregate Production Planning on Bullwhip Effect in the Supply Chain
Lan Xiao, Tsinghua University/ Dacheng Liu, Tsinghua University/ Li Zheng, Tsinghua University/
ME-06 — Monday — 16:00 to 17:30 — Kum Kang II

A Study on the Design of Supply Chain Management via Workflow Management System
Xiaobo Wu, Zhejiang University/ Jun Lin, Zhejiang University/ Zhuoyong Chen, Zhejiang University/
ME-06 — Monday — 16:00 to 17:30 — Kum Kang II

Product Modularity in Supply Chain Coordination: Experiences on Pearl River Delta
Antonio Lau, City University of Hong Kong/ Richard Yam, City University of Hong Kong/
MD-06 — Monday — 14:00 to 15:30 — Kum Kang II

Information Technology and Logistics: A Case Study in Road Transportation Companies
Claudemir Gimenez, Renato Archer Research Center/ Luiz M. Aguilera, Renato Archer Research Center/ Miguel J. Bacic, State University of Campinas/ Oscar S. Silva Filho, Renato Archer Research Center/ Tatiana B. Belizário, State University of Campinas/
MD-06 — Monday — 14:00 to 15:30 — Kum Kang II

Gray Prediction Model for Forecasting the Planning Material of Equipment Spare Parts in Navy of Taiwan
Hua-Kai Chiou, National Chiao Tung University/ Gwo-Hshiung Tzeng, National Chiao Tung University/ Gia-Shie Liu, National Defense University/ Chih-Kang Cheng, National Defense University/
MD-06 — Monday — 14:00 to 15:30 — Kum Kang II

Market Analysis in the Brazilian Telecommunications Supply Chain
Claudemir Gimenez, Renato Archer Research Center/ Oscar S. Silva Filho, Renato Archer Research Center/
MD-06 — Monday — 14:00 to 15:30 — Kum Kang II

SOFTWARE PROCESS MANAGEMENT

A process for Sourcing Software for Embedding in Products
Francis H. Hunt, University of Cambridge/ Noordin Shehabuddeen, University of Cambridge/ Clare Farrukh, University of Cambridge/ David R. Probert, University of Cambridge/ Scott Wilson, University of Cambridge/
WB-04 — Wednesday — 11:00 to 12:30 — Sorak III

Knowledge Diffusion Model: An Empirical Study of Software Development
Atsushi Inuzuka, Japan Advanced Institute of Science and Technology/
WB-04 — Wednesday — 11:00 to 12:30 — Sorak III

Determination and Accounting of Software Cost
A. Seetharaman, Multimedia University/ Manivannan Senthilvelmurugan, Multimedia University/ Rajan Periyanayagam, Multimedia University/
WB-04 — Wednesday — 11:00 to 12:30 — Sorak III

Software Platform Policy and IT Education
Hannu Jaakkola, Tampere University of Technology/ Timo Mäkinen, Tampere University of Technology/ Timo Varkoi, Tampere University of Technology/
WD-04 — Wednesday — 14:00 to 15:30 — Sorak III

Communication Model of a Software Process Improvement Network
Timo K. Varkoi, Tampere University of Technology/ Timo K. Mäkinen, Tampere University of Technology/ Hannu Jaakkola, Tampere University of Technology/
WD-04 — Wednesday — 14:00 to 15:30 — Sorak III

The Development Processes of Global Software Products and Information Systems: A Comparative Analysis
Nazmun Nahar, University of Jyväskylä/ Najmul Huda, Tallinn Technical University/ Prosenjit S. Deo, S.N. Bose National Centre for Basic Sciences/
WD-04 — Wednesday — 14:00 to 15:30 — Sorak III

ENTREPRENEURSHIP/INTRAPRENEURSHIP

Lessons Learned about Spin-offs from University Research Center
Eungkyu Kim, Hanbat National University/ Junbyung Park, Hanbat National University/ Jongin Choi, Hanbat National University/
TE-02 — Tuesday — 16:00 to 17:30 — Ballroom II

A Study of the Effect of Related Governmental Measures on Small and Medium Enterprises in Taiwan
Hsueh-Chiao Chiang, National Science Council/
TE-02 — Tuesday — 16:00 to 17:30 — Ballroom II

Modeling Innovative Project Teams: Entrepreneurial Leadership, Team Development, and Conflict
Ming-Huei Chen, Yuan-Ze University/ Yuan-Chieh Chang, Yuan-Ze University/ Tzu-Ming Chen, Yuan-Ze University/
TE-02 — Tuesday — 16:00 to 17:30 — Ballroom IIt

TECHNOLOGY-BASED ORGANIZATIONS

Opportunities to Add Value to Technology-Based Organizations
C. M. Chang, University of Buffalo/
SB-05 — Sunday — 11:00 to 12:30 — Kum Kang I

Topic List

Organizational Innovation of Research Institutes
Shyhnan Liou, National Chung Cheng University/ Ta-hsien Lo, National Chiao Tung University/
SB-05 — Sunday — 11:00 to 12:30 — Kum Kang I

The Benefits of Global Delivery Models to Enterprises in Technology-Based Organizations
Salvatore Savino, Cap Gemini Ernst & Young/
MB-02 — Monday — 11:00 to 12:30 — Ballroom II

TELECOMMUNICATIONS INDUSTRY

The Key Success Factors and Business Strategies for Market Diffusion of 3G Mobile Telecommunication Service
Jong-Hyun Park, ETRI/ Moon-Koo Kim, ETRI/ Jong-Hyun Paik, ETRI/
TD-06 — Tuesday — 14:00 to 15:30 — Kum Kang II

The Third Generation 3G of Mobile Telecommunication System: Lessons Learned from Ghana Secondary Case Study
M. A. M. Al-Saud, University of Bradford/ A M. Ahmed, University of Bradford/ M E. Woodward, University of Bradford/
TD-06 — Tuesday — 14:00 to 15:30 — Kum Kang II

Regulating VoIP: The challenges and the Opportunities
Chaiho Kim, Santa Clara University/ Manoj Parameswaran, Santa Clara University/
TD-06 — Tuesday — 14:00 to 15:30 — Kum Kang II

Analyzing the Performance of Broadband Communication Network Industry Using BSC Model: Focused on Information & Communication Industry
Ryu K. Seok, ETRI/
MD-04 — Monday — 14:00 to 15:30 — Sorak III

A Study on the Criterions and Methods for Determining Access Costs in Mobile Network Costing Models
Eunjin Cho, ETRI/ Jaeho Byun, ETRI/
WB-06 — Wednesday — 11:00 to 12:30 — Kum Kang II

The Direction of Price Controls by Regulators in Telecommunication Industry
Sun A Kang, ETRI/
MD-04 — Monday — 14:00 to 15:30 — Sorak III

A Comparative Study on Information Competitiveness among APEC Countries
Shinwon Kang, ETRI/
MD-04 — Monday — 14:00 to 15:30 — Sorak III

Evaluation of Technology Related Market Regulation with Real-Option's Approach: The Case of MVNO (Mobile Virtual Network Operator)
Junseok Hwang, Seoul National University/ Jong-Eun Oh, Seoul National University/
WB-06 — Wednesday — 11:00 to 12:30 — Kum Kang II

Technology Convergence under a Nonlinear Specification
Kwang-Sun Lim, ETRI/ Sang Sup Cho, ETRI/ Hoe-Kyung Lee, Graduate School of Management, KAIST/
TE-06 — Tuesday — 16:00 to 17:30 — Kum Kang II

Review on the Convergence Trend and Services of Telecommunications and Broadcasting: Focused on Korean Satellite Digital Multimedia Broadcasting Services
Yeong Wha Sawng, ETRI/ Sung-sik Shin , ETRI/ John David Kim, OVUM/
TE-06 — Tuesday — 16:00 to 17:30 — Kum Kang II

Regenerating Breakthrough Product Innovation in the UK Telecoms Sector: A Resource-Based Perspective
Scott Wilson, University of Cambridge/ David R. Probert, Cambridge University/
TE-06 — Tuesday — 16:00 to 17:30 — Kum Kang II

Empirical Analysis on Marketing Strategy Factors for the Development of Korea's Portable Internet Service Market
Kyoung-yong Jee, ETRI/ Moon-koo Kim, ETRI/ Sang-min Lim, ETRI/ Jane J. Kang, ETRI/
WB-06 — Wednesday — 11:00 to 12:30 — Kum Kang II

SEMICONDUCTOR INDUSTRY

Economies of Scope: A Major Challenge to High Technology Manufacturing
Charles M. Weber, Portland State University/ C. Neil Berglund, Portland State University/
WB-03 — Wednesday — 11:00 to 12:30 — Sorak II

Business Process Automation for Semiconductor Yield Engineering
Manu Rehani, LSI Logic/ Nathan Strader, LSI Logic/ Jeff Hanson, LSI Logic/ Ian Johnson, Oregon State University/
WB-03 — Wednesday — 11:00 to 12:30 — Sorak II

Sources of Innovation in the Semiconductor Manufacturing Industry in Taiwan
Tzung-wen Chen, IEP de Paris & National Chengchi University/
WB-03 — Wednesday — 11:00 to 12:30 — Sorak II

Strategic Evaluation of Emerging Technologies in the Taiwan Semiconductor Foundry Industry
Jonathan C. Ho, Portland State University/ Dundar F. Kocaoglu, Portland State University/
WB-03 — Wednesday — 11:00 to 12:30 — Sorak II

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We define "**PICMET Experience**" as

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

SUNDAY, AUGUST 1

	01 BALLROOM I	02 BALLROOM II	03 SORAK II	04 SORAK III	05 KUM KANG I	06 KUM KANG II	07 KUM KANG III	08 KUM KANG IV
SA 9:00 – 10:30	PLENARY: From Fast Follower to Innovation Leader: Next Generation Innovation Model of Korea	PLENARY: Positive Relationship Between Public and Private R&D Expenditures of Korean Manufacturing						
SB 11:00 – 12:30			Technology Management Education: 1	Science and Technology Policy: 1	Technology-Based Organizations: 1	Information/ Knowledge Management: 1	Technology Acquisition: 1	Technology Marketing: 1
SC 12:30 – 2:00								
SD 2:00 – 3:30	Innovation Management: 1	Competitiveness in Technology Management: 1	Decision Making in Technology Management: 1	Science and Technology Policy: 2	Strategic Management of Technology: 1	Information/ Knowledge Management: 2	Technology Acquisition: 2	Technology Marketing: 2
SE 4:00 – 5:30	Innovation Management: 2	Competitiveness in Technology Management: 2	Decision Making in Technology Management: 2	Science and Technology Policy: 3	Strategic Management of Technology: 2	Information/ Knowledge Management: 3	Technology Management Education and Research: Current Status and Strategic Directions	Technology Marketing: 3

MONDAY, AUGUST 2

	01 BALLROOM I	02 BALLROOM II	03 SORAK II	04 SORAK III	05 KUM KANG I	06 KUM KANG II	07 KUM KANG III	08 KUM KANG IV
MA 9:00 – 10:30	PLENARY: The Technology Revolution and Management: Digital Convergence, Now and the Future	PLENARY: Technology Driven Business Creation - From the Study at JATES and the Cases at Sony						
MB 11:00 – 12:30	Innovation Management: 3	Project/Program Management: 1	Decision Making in Technology Management: 3	Science and Technology Policy: 4	Strategic Management of Technology: 3	Information/ Knowledge Management: 2	Technology Management Education: 2	Collaborations in Technology Management: 1
MC 12:30 – 2:00								
MD 2:00 – 3:30	Innovation Management: 4	Project/Program Management: 2	Global Technology Management: 1	Telecommunica-tions Industry: 1	Strategic Management of Technology: 4	Supply Chain Management: 1	ETMERC	Technology Management Framework: 1
ME 4:00 – 5:30	Measurement Tools for Creativity Capabilities of Organizations	Project/Program Management: 3	Global Technology Management: 2	Disruptive Technologies: 1	E-Business: 1	Supply Chain Management: 2	Technology Management Education: 3	Technology Management Framework: 2

TUESDAY, AUGUST 3

	01 BALLROOM I	02 BALLROOM II	03 SORAK II	04 SORAK III	05 KUM KANG I	06 KUM KANG II	07 KUM KANG III	08 KUM KANG IV
TA 9:00 – 10:30	PLENARY: Oriental Philosophy, Aesthetics and Scientific and Technological Innovation	PLENARY: Key European Policies for Innovation in the Knowledge Economy: An Overview						
TB 11:00 – 12:30	Innovation Management: 5	PICMET Country Representatives Meeting	Manufacturing Management: 1	New Product Development: 1	Technology Transfer: 1			Technology Assessment and Evaluation: 1
TC 12:30 – 2:00								
TD 2:00 – 3:30	Technology Diffusion: 1	Science and Technology Policy: 4	Technology Planning and Forecasting: 1	New Product Development: 2	Technology Transfer: 2	Telecommunications Industry: 2	Case Studies in Education in the Area of Technology Management	Technology Assessment and Evaluation: 2
TE 4:00 – 5:30	Technology Diffusion: 2	Entrepreneurship/ Intrapreneurship: 1	Technology Planning and Forecasting: 2	New Product Development: 3	Technology Transfer: 3	Telecommunications Industry: 3	MOT as an Interdisciplinary Education Field	Technology Assessment and Evaluation: 3

WEDNESDAY, AUGUST 4

	01 BALLROOM I	02 BALLROOM II	03 SORAK II	04 SORAK III	05 KUM KANG I	06 KUM KANG II	07 KUM KANG III	08 KUM KANG IV
WA 9:00 – 10:30	PLENARY: Development of Large Complex Systems Based on Axiomatic Design and Complexity Theory	PLENARY: Technology Roadmapping - Linking Technology Resources to Business						
WB 11:00 – 12:30	Innovation Management: 6	Project/Program Management: 4	Semiconductor Industry: 1	Software Process Management: 1	Technology Transfer: 4	Telecommunications Industry: 4	R&D Management: 1	Collaborative Technology Roadmapping
WC 12:30 – 2:00								
WD 2:00 – 3:30	Innovation Management: 7		Productivity Management: 1	Software Process Management: 2			R&D Management: 2	Technology Development Envelope – a New Approach to Managing Emerging Technologies
WE 4:00 – 5:30		PICMET '05 and '06 Planning Session						

SCHEDULE OF SESSIONS

SCHEDULE OF SESSION BY ROOM

Session	Number	Date	Time	Room	Session Title
SD	01	Sunday	14:00 - 15:30	Ballroom I	"Innovation Management: 1"
SE	01	Sunday	16:00 - 17:30	Ballroom I	"Innovation Management: 2"
MA	01	Monday	09:00 - 10:30	Ballroom	PLENARY: "Technology Driven Business Creation - From the Study at JATES and the Cases at Sony"
MA	01	Monday	09:00 - 10:30	Ballroom	PLENARY: "The Technology Revolution and Management: Digital Convergence, Now and the Future"
MB	01	Monday	11:00 - 12:30	Ballroom I	"Innovation Management: 3"
MD	01	Monday	14:00 - 15:30	Ballroom I	"Innovation Management: 4"
ME	01	Monday	16:00 - 17:30	Ballroom I	TUTORIAL: "Measurement Tools for Creativity Capabilities of Organizations"
TA	01	Tuesday	09:00 - 10:30	Ballroom	PLENARY: "Key European Policies for Innovation in the Knowledge Economy: An Overview"
TA	01	Tuesday	09:00 - 10:30	Ballroom	PLENARY: "Oriental Philosophy, Aesthetics and Scientific and Technological Innovation"
TB	01	Tuesday	11:00 - 12:30	Ballroom I	"Innovation Management: 5"
TD	01	Tuesday	14:00 - 15:30	Ballroom I	"Technology Diffusion: 1"
TE	01	Tuesday	16:00 - 17:30	Ballroom I	"Technology Diffusion: 2"
WA	01	Wednesday	09:00 - 10:30	Ballroom	PLENARY: "Development of Large Complex Systems Based on Axiomatic Design and Complexity Theory"
WA	01	Wednesday	09:00 - 10:30	Ballroom	PLENARY: "Technology Roadmapping - Linking Technology Resources to Business"
WB	01	Wednesday	11:00 - 12:30	Ballroom I	"Innovation Management: 6"
WD	01	Wednesday	14:00 - 15:30	Ballroom I	"Innovation Management: 7"
SD	02	Sunday	14:00 - 15:30	Ballroom II	"Competitiveness in Technology Management: 1"
SE	02	Sunday	16:00 - 17:30	Ballroom II	"Competitiveness in Technology Management: 2"
MB	02	Monday	11:00 - 12:30	Ballroom II	"Project/Program Management: 1"
MD	02	Monday	14:00 - 15:30	Ballroom II	"Project/Program Management: 2"
ME	02	Monday	16:00 - 17:30	Ballroom II	"Project/Program Management: 3"
TD	02	Tuesday	14:00 - 15:30	Ballroom II	"Science and Technology Policy: 4"
TE	02	Tuesday	16:00 - 17:30	Ballroom II	"Entrepreneurship/ Intrapreneurship: 1"
WB	02	Wednesday	11:00 - 12:30	Ballroom II	"Project/Program Management: 4"
WE	02	Wednesday	16:00 - 17:30	Ballroom II	PANEL: "PICMET '05 and '06 Planning Session"
SB	03	Sunday	11:00 - 12:30	Sorak II	"Technology Management Education: 1"
SD	03	Sunday	14:00 - 15:30	Sorak II	"Decision Making in Technology Management: 1"
SE	03	Sunday	16:00 - 17:30	Sorak II	"Decision Making in Technology Management: 2"
MB	03	Monday	11:00 - 12:30	Sorak II	"Decision Making in Technology Management: 3"
MD	03	Monday	14:00 - 15:30	Sorak II	"Global Technology Management: 1"
ME	03	Monday	16:00 - 17:30	Sorak II	"Global Technology Management: 2"
TB	03	Tuesday	11:00 - 12:30	Sorak II	"Manufacturing Management: 1"
TD	03	Tuesday	14:00 - 15:30	Sorak II	"Technology Planning and Forecasting: 1"
TE	03	Tuesday	16:00 - 17:30	Sorak II	"Technology Planning and Forecasting: 2"
WB	03	Wednesday	11:00 - 12:30	Sorak II	"Semiconductor Industry: 1"
WD	03	Wednesday	14:00 - 15:30	Sorak II	"Productivity Management: 1"
SB	04	Sunday	11:00 - 12:30	Sorak III	"Science and Technology Policy: 1"

Schedule of Sessions

SD	04	Sunday	14:00 - 15:30	Sorak III	“Science and Technology Policy: 2”
SE	04	Sunday	16:00 - 17:30	Sorak III	“Science and Technology Policy: 3”
MB	04	Monday	11:00 - 12:30	Sorak III	“Science and Technology Policy: 4”
MD	04	Monday	14:00 - 15:30	Sorak III	“Telecommunications Industry: 1”
ME	04	Monday	16:00 - 17:30	Sorak III	“Disruptive Technologies: 1”
TB	04	Tuesday	11:00 - 12:30	Sorak III	“New Product Development: 1”
TD	04	Tuesday	14:00 - 15:30	Sorak III	“New Product Development: 2”
TE	04	Tuesday	16:00 - 17:30	Sorak III	“New Product Development: 3”
WB	04	Wednesday	11:00 - 12:30	Sorak III	“Software Process Management: 1”
WD	04	Wednesday	14:00 - 15:30	Sorak III	“Software Process Management: 2”
SB	05	Sunday	11:00 - 12:30	Kum Kang I	“Technology-Based Organizations: 1”
SD	05	Sunday	14:00 - 15:30	Kum Kang I	“Strategic Management of Technology: 1”
SE	05	Sunday	16:00 - 17:30	Kum Kang I	“Strategic Management of Technology: 2”
MB	05	Monday	11:00 - 12:30	Kum Kang I	“Strategic Management of Technology: 3”
MD	05	Monday	14:00 - 15:30	Kum Kang I	“Strategic Management of Technology: 4”
ME	05	Monday	16:00 - 17:30	Kum Kang I	“E-Business: 1”
TB	05	Tuesday	11:00 - 12:30	Kum Kang I	“Technology Transfer: 2”
TD	05	Tuesday	14:00 - 15:30	Kum Kang I	“Technology Transfer: 1”
TE	05	Tuesday	16:00 - 17:30	Kum Kang I	“Technology Transfer: 4”
WB	05	Wednesday	11:00 - 12:30	Kum Kang I	“Technology Transfer: 3”
SB	06	Sunday	11:00 - 12:30	Kum Kang II	“Information/Knowledge Management: 1”
SD	06	Sunday	14:00 - 15:30	Kum Kang II	“Information/Knowledge Management: 2”
SE	06	Sunday	16:00 - 17:30	Kum Kang II	“Information/Knowledge Management: 3”
MB	06	Monday	11:00 - 12:30	Kum Kang II	“Information/Knowledge Management: 4”
MD	06	Monday	14:00 - 15:30	Kum Kang II	“Supply Chain Management: 1”
ME	06	Monday	16:00 - 17:30	Kum Kang II	“Supply Chain Management: 2”
TD	06	Tuesday	14:00 - 15:30	Kum Kang II	“Telecommunications Industry: 2”
TE	06	Tuesday	16:00 - 17:30	Kum Kang II	“Telecommunications Industry: 3”
WB	06	Wednesday	11:00 - 12:30	Kum Kang II	“Telecommunications Industry: 4”
SB	07	Sunday	11:00 - 12:30	Kum Kang III	“Technology Acquisition: 1”
SD	07	Sunday	14:00 - 15:30	Kum Kang III	“Technology Acquisition: 2”
MB	07	Monday	11:00 - 12:30	Kum Kang III	“Technology Management Education: 2”
MD	07	Monday	14:00 - 15:30	Kum Kang III	PANEL: “ETMERC”
ME	07	Monday	16:00 - 17:30	Kum Kang III	“Technology Management Education: 3”
WB	07	Wednesday	11:00 - 12:30	Kum Kang III	“R&D Management: 1”
WD	07	Wednesday	14:00 - 15:30	Kum Kang III	“R&D Management: 2”
SB	08	Sunday	11:00 - 12:30	Kum Kang IV	“Technology Marketing: 1”
SD	08	Sunday	14:00 - 15:30	Kum Kang IV	“Technology Marketing: 2”
SE	08	Sunday	16:00 - 17:30	Kum Kang IV	“Technology Marketing: 3”
MB	08	Monday	11:00 - 12:30	Kum Kang IV	“Collaborations in Technology Management: 1”
MD	08	Monday	14:00 - 15:30	Kum Kang IV	“Technology Management Framework: 1”
ME	08	Monday	16:00 - 17:30	Kum Kang IV	“Technology Management Framework: 2”
TB	08	Tuesday	11:00 - 12:30	Kum Kang IV	“Technology Assessment and Evaluation: 1”
TD	08	Tuesday	14:00 - 15:30	Kum Kang IV	“Technology Assessment and Evaluation: 2”

SCHEDULE OF SESSIONS

TE	08	Tuesday	16:00 - 17:30	Kum Kang IV	"Technology Assessment and Evaluation: 3"
WB	08	Wednesday	11:00 - 12:30	Kum Kang IV	TUTORIAL: "Collaborative Technology Roadmapping"
WD	08	Wednesday	14:00 - 15:30	Kum Kang IV	TUTORIAL: "Technology Development Envelope – A New Approach to Managing Emerging Technologies "

SCHEDULE OF SESSIONS BY DATE
SUNDAY, AUGUST 1, 2004

Session	Number	Date	Time	Room	Session Title
SA	01	Sunday	9:00 - 10:30	Ballroom	PLENARY: "From Fast Follower to Innovation Leader: Next Generation Innovation Model of Korea"
SA	01	Sunday	9:00 - 10:30	Ballroom	PLENARY: "Positive Relationship Between Public and Private R&D Expenditures of Korean Manufacturing"
SB	03	Sunday	11:00 - 12:30	Sorak II	"Technology Management Education: 1"
SB	04	Sunday	11:00 - 12:30	Sorak III	"Science and Technology Policy: 1"
SB	06	Sunday	11:00 - 12:30	Kum Kang II	"Information/Knowledge Management: 1"
SB	07	Sunday	11:00 - 12:30	Kum Kang III	"Technology Acquisition: 1"
SB	08	Sunday	11:00 - 12:30	Kum Kang IV	"Technology Marketing: 1"
SB	05	Sunday	11:00 - 12:30	Kum Kang I	"Technology-Based Organizations: 1"
SD	05	Sunday	14:00 - 15:30	Kum Kang I	"Strategic Management of Technology: 1"
SD	04	Sunday	14:00 - 15:30	Sorak III	"Science and Technology Policy: 2"
SD	01	Sunday	14:00 - 15:30	Ballroom I	"Innovation Management: 1"
SD	06	Sunday	14:00 - 15:30	Kum Kang II	"Information/Knowledge Management: 2"
SD	07	Sunday	14:00 - 15:30	Kum Kang III	"Technology Acquisition: 2"
SD	08	Sunday	14:00 - 15:30	Kum Kang IV	"Technology Marketing: 2"
SD	03	Sunday	14:00 - 15:30	Sorak II	"Decision Making in Technology Management: 1"
SD	02	Sunday	14:00 - 15:30	Ballroom II	"Competitiveness in Technology Management: 1"
SE	05	Sunday	16:00 - 17:30	Kum Kang I	"Strategic Management of Technology: 2"
SE	04	Sunday	16:00 - 17:30	Sorak III	"Science and Technology Policy: 3"
SE	01	Sunday	16:00 - 17:30	Ballroom I	"Innovation Management: 2"
SE	06	Sunday	16:00 - 17:30	Kum Kang II	"Information/Knowledge Management: 3"
SE	08	Sunday	16:00 - 17:30	Kum Kang IV	"Technology Marketing: 3"
SE	03	Sunday	16:00 - 17:30	Sorak II	"Decision Making in Technology Management: 2"
SE	02	Sunday	16:00 - 17:30	Ballroom II	"Competitiveness in Technology Management: 2"
SE	07	Sunday	16:00 - 17:30	Kum Kang III	TUTORIAL: "Technology Management Education and Research – Current Status and Strategic Directions"

MONDAY, AUGUST 2, 2004

MA	01	Monday	09:00 - 10:30	Ballroom	PLENARY: "Technology Driven Business Creation - From the Study at JATES and the Cases at Sony"
MA	01	Monday	09:00 - 10:30	Ballroom	PLENARY: "The Technology Revolution and Management: Digital Convergence, Now and the Future"
MB	05	Monday	11:00 - 12:30	Kum Kang I	"Strategic Management of Technology: 3"
MB	04	Monday	11:00 - 12:30	Sorak III	"Science and Technology Policy: 4"
MB	01	Monday	11:00 - 12:30	Ballroom I	"Innovation Management: 3"

SCHEDULE OF SESSIONS

MB	06	Monday	11:00 - 12:30	Kum Kang II	"Information/Knowledge Management: 4"
MB	07	Monday	11:00 - 12:30	Kum Kang III	"Technology Management Education: 2"
MB	03	Monday	11:00 - 12:30	Sorak II	"Decision Making in Technology Management: 3"
MB	08	Monday	11:00 - 12:30	Kum Kang IV	"Collaborations in Technology Management: 1"
MB	02	Monday	11:00 - 12:30	Ballroom II	"Project/Program Management: 1"
MD	07	Monday	14:00 - 15:30	Kum Kang III	PANEL: "ETMERC"
MD	08	Monday	14:00 - 15:30	Kum Kang IV	"Technology Management Framework: 1"
MD	05	Monday	14:00 - 15:30	Kum Kang I	"Strategic Management of Technology: 4"
MD	03	Monday	14:00 - 15:30	Sorak II	"Global Technology Management: 1"
MD	01	Monday	14:00 - 15:30	Ballroom I	"Innovation Management: 4"
MD	02	Monday	14:00 - 15:30	Ballroom II	"Project/Program Management: 2"
MD	06	Monday	14:00 - 15:30	Kum Kang II	"Supply Chain Management: 1"
MD	04	Monday	14:00 - 15:30	Sorak III	"Telecommunications Industry: 1"
ME	08	Monday	16:00 - 17:30	Kum Kang IV	"Technology Management Framework: 2"
ME	03	Monday	16:00 - 17:30	Sorak II	"Global Technology Management: 2"
ME	04	Monday	16:00 - 17:30	Sorak III	"Disruptive Technologies: 1"
ME	05	Monday	16:00 - 17:30	Kum Kang I	"E-Business: 1"
ME	07	Monday	16:00 - 17:30	Kum Kang III	"Technology Management Education: 3"
ME	02	Monday	16:00 - 17:30	Ballroom II	"Project/Program Management: 3"
ME	06	Monday	16:00 - 17:30	Kum Kang II	"Supply Chain Management: 2"
ME	01	Monday	16:00 - 17:30	Ballroom I	TUTORIAL: "Measurement Tools for Creativity Capabilities of Organizations"

TUESDAY, AUGUST 3, 2004

TA	01	Tuesday	09:00 - 10:30	Ballroom	PLENARY: "Key European Policies for Innovation in the Knowledge Economy: An Overview"
TA	01	Tuesday	09:00 - 10:30	Ballroom	PLENARY: "Oriental Philosophy, Aesthetics and Scientific and Technological Innovation"
TB	01	Tuesday	11:00 - 12:30	Ballroom I	"Innovation Management: 5"
TB	02	Tuesday	11:00 - 12:30	Ballroom II	PANEL: "Country Representatives Meeting"
TB	08	Tuesday	11:00 - 12:30	Kum Kang IV	"Technology Assessment and Evaluation: 1"
TB	05	Tuesday	11:00 - 12:30	Kum Kang I	"Technology Transfer: 2"
TB	03	Tuesday	11:00 - 12:30	Sorak II	"Manufacturing Management: 1"
TB	04	Tuesday	11:00 - 12:30	Sorak III	"New Product Development: 1"
TD	02	Tuesday	14:00 - 15:30	Ballroom II	"Science and Technology Policy: 4"
TD	03	Tuesday	14:00 - 15:30	Sorak II	"Technology Planning and Forecasting: 1"
TD	08	Tuesday	14:00 - 15:30	Kum Kang IV	"Technology Assessment and Evaluation: 2"
TD	07	Tuesday	14:00 - 15:30	Kum Kang III	"Case Studies in Education in the Area of Technology Managment"
TD	01	Tuesday	14:00 - 15:30	Ballroom I	"Technology Diffusion: 1"
TD	05	Tuesday	14:00 - 15:30	Kum Kang I	"Technology Transfer: 1"
TD	04	Tuesday	14:00 - 15:30	Sorak III	"New Product Development: 2"
TD	06	Tuesday	14:00 - 15:30	Kum Kang II	"Telecommunications Industry: 2"
TE	03	Tuesday	16:00 - 17:30	Sorak II	"Technology Planning and Forecasting: 2"

SCHEDULE OF SESSIONS

TE	07	Tuesday	16:00 - 17:30	Kum Kang III	PANEL: “MOT as an Interdisciplinary Education Field”
TE	08	Tuesday	16:00 - 17:30	Kum Kang IV	“Technology Assessment and Evaluation: 3”
TE	01	Tuesday	16:00 - 17:30	Ballroom I	“Technology Diffusion: 2”
TE	05	Tuesday	16:00 - 17:30	Kum Kang I	“Technology Transfer: 4”
TE	04	Tuesday	16:00 - 17:30	Sorak III	“New Product Development: 3”
TE	02	Tuesday	16:00 - 17:30	Ballroom II	“Entrepreneurship/ Intrapreneurship: 1”
TE	06	Tuesday	16:00 - 17:30	Kum Kang II	“Telecommunications Industry: 3”

WEDNESDAY, AUGUST 4, 2004

WA	01	Wednesday	09:00 - 10:30	Ballroom	PLENARY: “Development of Large Complex Systems Based on Axiomatic Design and Complexity Theory”
WA	01	Wednesday	09:00 - 10:30	Ballroom	PLENARY: “Technology Roadmapping - Linking Technology Resources to Business”
WB	07	Wednesday	11:00 - 12:30	Kum Kang III	“R&D Management: 1”
WB	01	Wednesday	11:00 - 12:30	Ballroom I	“Innovation Management: 6”
WB	05	Wednesday	11:00 - 12:30	Kum Kang I	“Technology Transfer: 3”
WB	02	Wednesday	11:00 - 12:30	Ballroom II	“Project/Program Management: 4”
WB	04	Wednesday	11:00 - 12:30	Sorak III	“Software Process Management: 1”
WB	06	Wednesday	11:00 - 12:30	Kum Kang II	“Telecommunications Industry: 4”
WB	03	Wednesday	11:00 - 12:30	Sorak II	“Semiconductor Industry: 1”
WD	02	Wednesday	11:00 - 12:30	Kum Kang IV	“ TUTORIAL: Collaborative Technology Roadmapping “
WD	07	Wednesday	14:00 - 15:30	Kum Kang III	“R&D Management: 2”
WD	01	Wednesday	14:00 - 15:30	Ballroom I	“Innovation Management: 7”
WD	03	Wednesday	14:00 - 15:30	Sorak II	“Productivity Management: 1”
WD	04	Wednesday	14:00 - 15:30	Sorak III	“Software Process Management: 2”
WD	08	Wednesday	14:00 - 15:30	Kum Kang IV	TUTORIAL: “A Technology Development Envelope – A New Approach to Managing Emerging Technologies “
WE	02	Wednesday	16:00 - 17:30	Ballroom II	PANEL: “PICMET '05 and '06 Planning Session”

PERSONAL SCHEDULE

	Sunday	Monday	Tuesday	Wednesday
9:00 – 10:30 (A)	Plenary (Ballroom)	Plenary (Ballroom)	Plenary (Ballroom)	Plenary (Ballroom)
10:30 – 11:00 Coffee Break				
11:00 – 12:30 (B)				
12:30 – 14:00 Lunch Break				
14:00 – 15:30 (D)				
15:30 – 16:00 Coffee Break				
16:00 – 17:30 (E)				PICMET '05 and '06 Planning Session (Ballroom II)
19:00 – 22:00	Sunday Reception International Buffet (Ballroom)	Monday Korean Dinner (Ballroom)	Tuesday Banquet (Ballroom)	

Notes:

PLENARIES

PLENARY SESSION — 1

DATE: SUNDAY, AUGUST 1

TIME: 09:00 – 10:30

ROOM: BALLROOM (ATRIUM-3)

Session Chair: Timothy R. Anderson, Portland State University, USA

Dr. Tim Anderson is an Associate Professor of Engineering and Technology Management at Portland State University. He received an Electrical Engineering degree from the University of Minnesota, and both an M.S. and Ph.D. degree in Industrial and Systems Engineering from the Georgia Institute of Technology. He has been the Program Chair for PICMET, the Portland International Conference on Management of Engineering and Technology, in 1999, 2001, and 2003. Currently he is PICMET's Director of Technical Activities and Program Chair for the PICMET '04 Symposium in Seoul as well as serving as Portland State's Faculty in Residence for Teaching and Learning with Technology. Dr. Anderson's current research focuses on applications of productivity analysis, technology forecasting, quantitative benchmarking, and new product development in diverse areas including construction projects, telecommunications, enterprise database systems, microprocessors, and the electric utility industry. He has consulted and worked for a variety of companies including Oki Electric, Honeywell, Menlo Logistics, and the US Postal Service.

KEYNOTE-1

Dr. Youngrak Choi, President, STEPI, Korea

"From Fast Follower to Innovation Leader: Next Generation Innovation Model of Korea"

There is no doubt that Korea has been successful with its fast follower strategy based on learning skills and manufacturing technology. Korea has shown remarkable successes in the areas such as automobiles, memory chips, CDMA and so on. However, the follower strategy would not work well where the capability of architecture-design is the most critical competitive factor in the world market. Now, the important sources of value are fundamental technologies, parts and materials, and S/W. As Korea wants to move forward, it seeks to establish a next-generation innovation model for the new growth. To realize the innovation-driven growth, it is essential for Korea to lead the world market by creating and utilizing fundamental technologies, leading global standards, making high value-added products, and participating in global sourcing systems. In order to make these things happen in the current Korean innovation environment, it has to develop world-class manpower, to have more innovative SMEs, and to establish innovative cross-teams among industry, academia, and research institutes. The emphases of the new model will be: from production/process technology to architecture-design capability, from skilled manpower to creative manpower, and from the promotion of R&D actors to innovative cross-teams. After all, it has to have self-changing dynamics and adapt itself for the changing global innovation system.

Dr. Youngrak Choi is 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

Hwan-Eik Cho, President, KOTEF, Korea

"Positive Relationship Between Public and Private R&D Expenditures of Korean Manufacturing"

The recent trend in Korean R&D is that both the private and public sector have extended their R&D investments to achieve a national income of $20,000. The Korean manufacturing industry has invested 2.51 percent of its sales in R&D and made innovation of the product and process. According to the latest survey of KOTEF, about 16.1 percent of the total R&D expenditures among surveyed firms are covered with the public R&D fund, which has various positive effects on the private sector: I) it has induced an increase in the R&D investment of the private sector; II) the government R&D expenditure is analyzed to have the positive effect on the private R&D expenditure, rather than the crowding-out effect; III) furthermore, public R&D expenditure has a positive effect on the technology accumulation, employment, and reduction of R&D process.

PLENARIES

In 2002, **Mr. Cho**, as the President, began representing Korea Industrial Technology Foundation (KOTEF), which is a public service organization to help in establishing networks and upgrading the existing relationship among industrial, economic and technological organizations throughout Korea. He had been working at the Ministry of Commerce, Industry and Energy (MOCIE) for 28 years. Throughout his government career as Deputy Minister of Industry and Technology of MOCIE, he planned and implemented various industrial technology policies at the national level and contributed to the development of modern Korean industries. He also maintains a wide international human network in the field of industrial technology policy. Currently, he is working to utilize his past experiences in forging and strengthening international cooperation with overseas organizations in S&T field.

PLENARY SESSION — 2

DATE: MONDAY, AUGUST 2

TIME: 09:00 – 10:30

ROOM: BALLROOM (ATRIUM-3)

Session Chair: Dr. Kwan Rim, Chairman, SAIT (Samsung Advanced Institute of Technology, Korea)

Dr. Kwan Rim is the Chairman of Samsung Advanced Institute of Technology (SAIT), the central research laboratory of the Samsung Group. He received his M.S. in Mechanical Engineering in 1958 and Ph.D. in Theoretical and Applied Mechanics in 1960, both from Northwestern University in the USA.

In 1960 he joined the Department of Mechanics and Hydraulics of the University of Iowa and was an engineering faculty member there until 1995. At the University of Iowa he was Chairman of the Department of Mechanics and Hydraulics (1971-74), Associate Dean of Engineering (1974-79), Chairman of the Division of Materials Engineering (1978-84), and Chairman of the Department of Biomedical Engineering (1984-90). He is the founder of the Biomedical Engineering Program at Iowa as well as the Iowa Institute of Biomedical Engineering.

Dr. Rim held the U.S. National Science Foundation's SEED (Scientists and Engineers for Economic Development) Professorship in 1976-77, served as the President of the Korea Advanced Institute of Science and Technology (KAIST) from 1982 to 1984, and as a visiting professor in Japan in 1992. He has also served on the boards of directors of numerous educational and research institutes. He was the 1992 recipient of the Outstanding Biomedical Engineering Educator Award from the American Society for Engineering Education. He also served on the President's Council on Science and Technology of the Republic of Korea.

KEYNOTE-1

Jong-Yong Yun, Vice Chairman, Samsung Electronics Co., Ltd., Korea

"The Technology Revolution and Management: Digital Convergence, Now and the Future"

Mr. Yun joined the Samsung Group in 1966 and has worked in Samsung Electronics Co., Ltd since 1969. He has served in key managerial positions in various departments from the TV Business Division to Research & Development. He became Vice President of the Electronics Group in 1988 and has also held the positions of President and CEO of Samsung Electro-Mechanics, Samsung Display Devices and Samsung Japan Headquarters. He assumed his current position of Vice Chairman and CEO of Samsung Electronics in 1996. Mr. Yun is aiming to accomplish the vision of becoming "The Leader in Digital Convergence Revolution." His focus is on implementing structural reform, management innovation and improving supply chain management and quality. The many reforms already implemented have made Samsung financially stronger, more competitive and the company was able to maintain its profit levels and share price even during the recent Asian economic downturn. For his efforts Mr. Yun was named Asia's 1999 Businessman of the Year by *Fortune Magazine* and The Top 17 Managers of the year by *Business Week* in 2004. Mr. Yun has received numerous managerial awards including the 1992 Gold Medal for Contribution to Industry from the Korean government and the Korean Management Association's Most Successful Manager of the Year award in 1999. In 1998 he received the Outstanding Achievement in Management Award from the Institute of Industrial Engineers in Atlanta, USA. Mr. Yun holds

a Bachelor of Arts in Electronics from Seoul National University and is a graduate of the Sloan School Senior Executive Course from Massachusetts Institute of Technology in the USA. He is also Chairman of the National Academy of Engineering of Korea and Chairman of The Federation of Korean Information Industries.

KEYNOTE-2

Dr. Seiichi Watanabe, Executive Vice President, Sony Corporation, Japan

"Technology Driven Business Creation - From the Study at JATES and the Cases at Sony"

The prevailing Internet with the broadband accessibility is opening up great opportunities in the consumer industry as well as in business. In this revolutionary transformation, the traditional operating functions such as production, sales, distribution, etc. seem to become increasingly commoditized owing to the speedy information access and sharing. Under such an environment, the R&D side would be expected to take initiatives in creating major corporate values and thus opening the promising future for the corporation.

The joint study at JATES (Japan Techno-Economics Society) has aimed for discovering formulas to apply to those who wish to take advantage of such a change and let their R&D teams revitalize the company. The conclusion of the study includes proposals to the top management to allow strong autonomy to R&D for taking initiatives.

Many of the new business creations and resulting growth at Sony have been driven by technological innovation. How such innovation has been managed to create revolutionary success for the company would be informative to those who wish to turn R&D value to major corporate values in this rapidly changing business environment.

Seiichi Watanabe is Executive Vice President at Sony and has been responsible for Environmental Affairs since 2001. He also holds the position of President of Institute for Environmental Research (IER) at Sony Corporation. His focuses on improvement of environmental aspects of the products and the business operations of the company so that they can be kept at the expectation of stakeholders and promote the high brand value. As President of IER, he searches for and invests in new technological developments to fundamentally resolve the environmental concerns associated with products and business activities. He and his researchers also aim for creating environmentally effective new businesses through development of new business models.

At JATES (Japan Techno-Economics Society) he has represented Sony Corporation since 1990 and now serves as Chairman of the Committee for the Study on R&D Initiated Transformation of Investment Structure and Corporate Value Creation. The study group consists of representatives of major companies located in Japan and work for generating formulas to be applied to member companies who wish to take advantage of the rapidly changing business environment by effectively managing technology under R&D initiatives.

His major 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 experiences included discrete devices, MOS LSI and compound semiconductor devices. Later he served as President of Semiconductor Company at Sony from 1994 to 1998. Through the development of semiconductor devices and LSI, he was involved in a number of business creations, which have made major contributions to the growth of the company. The products he was involved in include Compact Disc, Mini-disc, PlayStation 2, portable video tape recorders, etc.

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. He promoted many innovative research works, which again have become key technologies for major businesses of the company. Such works included materials and devices for various semiconductor lasers, lithium ion rechargeable batteries, magnetic recording technologies, etc. In 1990, he organized a group dedicated to environmental research, which triggered his involvement in environmental affairs.

He hopes that the management of technology will serve for turning technological innovations into businesses successful economically as well as environmentally. He stayed in Minnesota, U.S.A. from 1959 to 1960 as an American Field Service high school exchange student where he experienced the importance of mutual understanding to overcome the culture gaps.

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PLENARY SESSION — 3

DATE: TUESDAY, AUGUST 3

TIME: 09:00 – 10:30

ROOM: BALLROOM (ATRIUM-3)

Dr. Gunnar Hambraeus, Chairman Scandinavia-Japan Sasakawa Foundation, and former chairman, Royal Swedish Academy of Engineering Sciences, Sweden

Dr. Gunnar Hambreaus was born in 1919. He received the MSc. from Uppsala University, M.Eng. S from Royal Institute of Technology in Stockholm and Dr.Eng.S, hon. from Chalmers Technical University in Gothenburg. He served as secretary in the Swedish Technical Research Council from 1946 to 1953, as editor in chief of the leading technical periodical in Sweden (*Teknisk Tidskrift*) from 1953 to 1970 and later as the president of Swedish Technical Press AB and finally as president and later chairman of the Royal Swedish Academy of Engineering Sciences from 1971 to 1985. He worked for Swedish industry as a member and in some cases chairman on the Board of Directors of some 20 leading Swedish companies, e.g. Volvo, Bofors, Pharmacia, Hasselblad and others. Presently, Dr. Hambreaus 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 Sciences he takes part in the election of Nobel Laureates in Physics, Chemistry and Economics. He is member of many learned societies and academies inside and outside Sweden. He is proud to carry decorations from the Swedish King and his Parliament as well as orders from Sweden, France, Germany, Japan, Spain and Australia.

KEYNOTE-1

Dr. Chun-Yen Chang, President, National Chiao Tung University, Taiwan

"Oriental Philosophy, Aesthetics and Science and Technological Innovation"

There is a huge cultural divide between the East and the West. However, around 500 B.C., both regions created many brilliant works of philosophy, art and literature.

Now, after more than 2500 years, the developments of science and technology in the East and the West are also deeply divided. In this presentation, the cultural factors accounting for the different paths of scientific and technological development in the two regions will be explained. Greater emphasis will be given to the cultural context of the East.

Looking ahead, we can see that a Renaissance made possible by merging Eastern and Western cultures is essential for the future of the 21st Century. To create an open, liberal, innovative university environment is therefore indispensable for building a unique culture conducive to scientific and technological innovation, a new kind of oriental society cultivated by an aesthetic, creative education system in the universities.

Finally, using NCTU as a prime example, this presentation will demonstrate how our universities can effectively promote such a new culture and help advance science and technology in the 21st century.

Dr. Chun-Yen Chang is the President of National Chiao Tung University in Taiwan. He received his BSEE degree from the National Chenk Kung University (NCKU), and MS and Ph.D. degrees from the National Chiao Tung University (NCTU). Prior to his current position, he served as a research fellow at Bell Labs, a professor at NCKU, the Dean of Research, Dean of Engineering and Dean of Electrical Engineering and Computer Science at NCTU. He also was the founding Director of National Nano-Device Labs in Taiwan. In addition to his presidency at NCTU, Dr. Chang holds several other positions and affiliations including Foreign Associate of the U.S. National Academy of Engineering, member of Academia Sinica of the Republic of China, National Chair Professor, National Policy Advisor to the Office of the President of the Republic of China, and Science and Technology Advisor to the Executive Yuan of the Republic of China. Dr. Chang started his research on semiconductors in 1960, and established the first Semiconductor Research Center in the R.O.C. in 1964. Later, he also established the National Nano-Device Research Laboratory for leading-edge research on nano devices. His research in semiconductor devices and key inventions have made significant contributions to the field. Among his major inventions are the method of low pressure MOCVD using triethyl Gallium, Zn incorporation, boron penetration and nitridation in silicon dioxide, and modulation doped-based transistor. Dr. Chang has received 26 patents in the U.S. and in Taiwan and has published over 300 papers. He is the author of the book *Made by Taiwan*, promoting

PLENARIES

the idea of innovation and creativity for the future of Taiwan as a world leader in technology.

KEYNOTE-2

Rosalie Zobel, Director, Information Society Directorate-General, European Commission, Belgium

"Key European Policies for Innovation in the Knowledge Economy: An Overview"

Innovation is the cornerstone of the Lisbon strategy, which was formulated by Europe's leaders in March 2000. Since then the European Commission has launched its 6th Framework Programme for research with an ambitious goal to create a single market for research in Europe. It has published a Green Paper on entrepreneurship and has also launched a debate on ways and means to increase research spending in Europe to 3% of GDP from its current level of near 2%.

The recent Commission proposal for innovation policy is based on the "multidimensional view" of innovation. Besides research as a key driver for innovation and the need for higher spending on R&D, new ways of organising work and new concepts in design and marketing are key factors. Innovation policy must also provide the skills and develop the motivation for entrepreneurialism. And it needs to have an impact on the immediate operating environments of businesses. The large size of the public sector in Europe's economy is a further distinguishing feature. Under its eEurope policy framework, the EU aims to help public authorities provide services online. The enlarged Union with ten new member countries joining in May 2004 is a major and quite unique challenge. The acceding countries have shown a remarkable capacity to transform their economies, and this is a good sign that they will contribute to a more innovative European Union.

The paper analyses what innovation could mean in the context of the knowledge economy and society, it draws attention to several factors that have an influence on innovation, in addition to research. And it also maps out the "new deal" for innovation policy, including concrete proposals made so far, to turn Europe's diversity into a powerful impetus for innovation and economic growth.

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, Subsystems and Applications" in the Information Society Directorate-General of the European Commission.

PLENARY SESSION — 4

DATE: WEDNESDAY, AUGUST 4, 2004

TIME: 09:00 – 10:30

ROOM: BALLROOM (ATRIUM-3)

Session Chair: Dr. Kiyoshi Niwa, Professor, University of Tokyo, Japan

Kiyoshi Niwa is a Professor in the Department of General Systems Studies at the University of Tokyo. Before joining the university, he was with the Advanced Research Laboratory (1985 to 1994) and the Systems Development Laboratory (1972 to 1985), both of Hitachi, Ltd., Japan. Since 1988 he also has been a Senior Research Fellow in the IC2 (Innovation Creativity and Capital) Institute at the University of Texas at Austin, USA. From 1989 to 1991 he was a Visiting Professor in the Engineering Management Program at Portland State University, USA. His

research and teaching interests include technology & research management, knowledge management, and organizational intelligence. He has published many papers in journals such as *IEEE Transactions on Engineering Management*; *IEEE Transactions on Systems, Man, and Cybernetics*; *AI Magazine*; *Knowledge Engineering Review*; and the *Journal of the Japan Society for Management Information*. He is the author of the book *Knowledge-Based Risk Management in Engineering* (Wiley Series in Engineering and Technology Management) published by John Wiley in 1989, and is a co-editor of PICMET '91, '97, '99, and '01. He is also the co-author of the book *Technology Management Strategy* (in Japanese), published by Seisansei-shuppan in Tokyo in 1999, which was translated into Korean in 2001. Dr. Niwa received his BS (1970) and MS (1972) in chemistry (physical chemistry) from Waseda University, Japan. While working as a research scientist at Hitachi, he received his Dr. of Engineering (1986) in systems science (knowledge management) from the Tokyo Institute of Technology, Japan. He serves as the editor of the *Journal of the Japan Society for Management Information* and on the editorial boards of *IEEE Transactions on Engineering Management*, *Knowledge Engineering Review*, and *The International Journal of Decision Support Systems*. He is the PICMET Director of International Activities.

KEYNOTE-1

Dr. Nam Suh, Professor, MIT, USA

"Development of Large Complex Systems Based on Axiomatic Design and Complexity Theory"

In industry, it is well known that it is extremely difficult to predict the cost and the schedule of complex product development, the reliability and performance of resulting engineering systems, and the economic impact of making major changes to complex systems. All of these difficulties may be attributed to the ad hoc nature of current engineering and development practice, which often involves a lengthy recursive "design/build/test" cycle until the product satisfies its functional requirements. The unpredictability and unreliability of the product development process erodes the competitiveness of industrial firms, especially when a product is being developed for the first time.

In this keynote paper, a strategy for the systematic development of new complex products will be presented. This strategy, which is based on axiomatic design theory and complexity theory, provides a structured way of developing new products and processes that significantly reduces the cost and time necessary for product development. It also increases the reliability of products developed and allows systematic modifications of products and processes. The theoretical framework for the strategy will be briefly introduced, followed by examples of innovative product development.

Dr. Suh's positions at MIT include 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; and Department Head, 1991-2001. His non-MIT positions include the National Science Foundation, 1984-1988 (Assistant Director for Engineering, Presidential Appointee); University of South Carolina, 1965-69 (Assist./Assoc. Professor); USM Corporation, 1961-65; and Guild Plastics, 1958-60. Dr. Suh's honors and awards include 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; and The Hills Millennium Award of the Institution of Engineering Designers of the United Kingdom (first recipient), June 4, 2001.

PLENARIES

KEYNOTE-2

Dr. Robert Phaal, Professor, University of Cambridge, UK

"Technology Roadmapping - Linking Technology Resources to Business"

The technology roadmapping technique is used widely in industry to support strategic technology planning. Roadmaps can take various forms, but the most flexible and generic type comprises a multi-layered time-based chart that links technology and product developments to market needs. In recent years the approach has been used in sector-level foresight programmes in North America, Asia and Europe.

This presentation will provide an overview of the technology roadmapping approach, focusing on the development and application of a process for supporting the rapid initiation of the technique in organisations. The application of the method will be illustrated by means of an automotive sector-level case study (the UK Foresight Vehicle technology roadmapping initiative), which highlights issues associated with customisation of the roadmapping approach, and the related communication and network development benefits.

Robert Phaal joined the Centre for Technology Management at Cambridge University in 1997 and is currently engaged in a research programme to investigate strategic technology management issues in business. The particular focus of the research project is how to link technology resources to company objectives in order to develop a set of practical and well-founded tools to support technology strategy and planning initiatives in the firm. Outputs include a guide for supporting 'fast-start' technology roadmapping, supported by a tool catalogue. Professor Phaal has a background in mechanical engineering, consulting and contract research.

SPECIAL SESSIONS

ETMERC MEETING

DATE: MONDAY, AUGUST 2

TIME: 14:00 – 15:30

ROOM: KUMKANG III

Chair: Antonie de Klerk, University of Pretoria, South Africa, President of ETMERC

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 special meeting 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.

COUNTRY REPRESENTATIVES MEETING

DATE: TUESDAY, AUGUST 3

TIME: 11:00 – 12:30

ROOM: BALLROOM II

Chair: Kiyoshi Niwa, University of Tokyo, Japan, PICMET Director of International Activities

PICMET has more than 80 Country Representatives from 52 countries. They provide news items for the PICMET Newsletter, *TMN* (*Technology Management News*), about developments in technology management; disseminate PICMET information; identify authors and session chairs; recommend nominees for PICMET awards; submit proposals for the location of future PICMET conferences; and represent PICMET in their countries.

All current country representatives and those who want to join the Country Representatives organization are invited to attend this special session to discuss the roles of the country representatives and the future strategies that are being developed for making PICMET information and activities readily available throughout the globe.

PICMET '05 AND '06 PLANNING SESSION

DATE: WEDNESDAY, AUGUST 4

TIME: 16:00 – 17:30

ROOM: BALLROOM II

Moderators:

Timothy Anderson, Portland State University, United States

Dundar F. Kocaoglu, Portland State University, United States

Dragan Z. Milosevic, Portland State University, United States

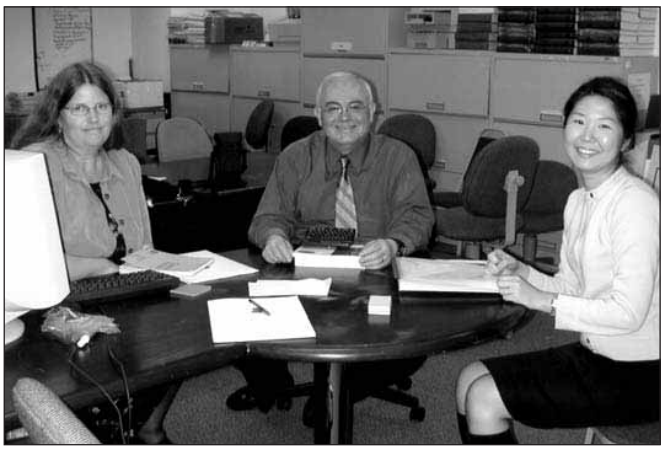
Kiyoshi Niwa, University of Tokyo, Japan

Liono Setiowijoso, Portland State University, United States

Charles M. Weber, Portland State University, United States

Ann White, Portland State University, United States

Please join us in providing feedback on PICMET '04 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

TECHNOLOGY MANAGEMENT EDUCATION AND RESEARCH – CURRENT STATUS AND STRATEGIC DIRECTIONS

DATE: SUNDAY, AUGUST 1

TIME: 16:00 – 17:30

ROOM: KUMKANG III

SPEAKER: DUNDAR F. KOCAOGLU, PROFESSOR, PORTLAND STATE UNIVERSITY

The status of Engineering and Technology Management education and research is described, and critical questions are raised about the key issues evolving in this growing discipline. The results of a worldwide study are presented as the focal point of the tutorial.

MEASUREMENT TOOLS FOR CREATIVITY CAPABILITIES OF ORGANIZATIONS

DATE: MONDAY, AUGUST 2

TIME: 16:00 – 17:30

ROOM: BALLROOM I

SPEAKER: YONG-IN SHIN, PH.D., SAMSUNG ELECTRONICS CO.

It is not an easy task to measure the creativity capability of organizations. In most cases, the number of submitted patents has traditionally been a barometer for the innovation capability of organizations. This certainly is an indicator for innovations but does not fully represent the creativity capability of organizations. For a more accurate representation, multiple indicators are necessary such as a motivation level for creativity, the innovative intelligence level of the group, innovative culture, an innovative knowledge sharing level, resource support level for creativity, management's commitment level for creativity and others. In this article, the author will discuss these new indicators for creativity and innovation capability of organizations in practical ways.

COLLABORATIVE TECHNOLOGY ROADMAPPING

DATE: WEDNESDAY, AUGUST 4

TIME: 11:00 – 12:30

ROOM: KUMKANG IV

SPEAKER: ROBERT PHAAL, PROFESSOR, UNIVERSITY OF CAMBRIDGE

Technology roadmapping is widely used to align technology and application development with market requirements, at the firm and sector levels. This tutorial describes a process for the rapid initiation of roadmapping within a workshop environment, based on more than 50 industrial applications. The workshop format supports communication, consensus building and network development. Design and facilitation of such workshops is described, supported by case examples at both firm and sector levels.

TECHNOLOGY DEVELOPMENT ENVELOPE – A NEW APPROACH TO MANAGING EMERGING TECHNOLOGIES

DATE: WEDNESDAY, AUGUST 4

TIME: 14:00 – 15:30

ROOM: KUMKANG IV

SPEAKER: DUNDAR KOCAOGLU, PROFESSOR, PORTLAND STATE UNIVERSITY
NATHASIT GERDSRI, PH.D., PORTLAND STATE UNIVERSITY

Technology Development Envelope (TDE) is a new concept and methodology for identifying the optimum path in developing technology strategies and combining them with business strategies. 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 method combines the judgments of technology developers and technology implementers to assure that the technology strategies are in full support of corporate goals and objectives. This tutorial explains the methodology and processes used in the formation of TDE. An example is presented for a detailed application of the TDE concept to emerging technologies in the computer industry.

DOCTORAL COLLOQUIUM

COLLOQUIUM FOR DOCTORAL STUDENTS AND JUNIOR FACULTY

"GOVERNMENT, INDUSTRY OR ACADEMIA? CAREER CHOICES FOR THE PH.D. GRADUATE IN ENGINEERING AND TECHNOLOGY MANAGEMENT"

DATE: SATURDAY, JULY 31, 2004

TIME: 13:00 – 17:00

LOCATION: SORAK III ROOM (ATRIUM LEVEL 3), RITZ-CARLTON, SEOUL, KOREA

REGISTRATION: THE COLLOQUIUM IS INCLUDED IN THE REGISTRATION FOR PICMET

As the topic for 2004 suggests, the goal of this colloquium is to inform doctoral students in engineering and technology management about the career options that they have when they graduate. During the first 90 minutes, Ph.D. graduates will make presentations regarding their experience and their career plans. For the remainder of the colloquium, participants will work in small groups to identify and make suggestions for the resolution of key issues involving career choice.

The colloquium will consist of the following three focus groups, each representing a career choice.

Career in Government: This could potentially cover issues such as preparing for civil service, or exerting influence through networks or within hierarchical structures. Monetary rewards, social status, individual gratification and other motivating factors could also be discussed in this focus group.

Career in Industry: This group will focus on the industrial job market. Key issues may be the value of a Ph.D. in industry. Monetary rewards, social status, individual gratification and other motivating factors could be discussed in this focus group.

Career in Academia: This group will look at issues such as the academic job market, networking with the right people in your field, defining your field of research, and the tenure process (or the international equivalent).

The focus groups will discuss issues related to each career for about one hour, followed by a 20-minute presentation. Each focus group will present its recommendations and act as a panel for a general discussion with the other participants. The recommendations of each focus group and key points of the discussion will be documented and sent to the participants after the conference.

Ideally, each focus group should consist of some participants who are respectively interested in a career in government, industry and academia. Both junior faculty and recent graduates of doctoral programs who work in industry or government are also encouraged to join the colloquium because a Ph.D. can have a major impact on a career in all these areas.

The perspective of students and graduates from outside the United States is especially welcome because it may teach the participants how to approach an international career.

THE AGENDA:

13:00 – 13:15	Introductions
13:15 – 13:30	Description of the agenda, Prof. Charles Weber (Dept. of Engineering and Technology Management, Portland State University, USA)
13:30 – 14:00	Presentation #1, Dr. Deok Soon Yim, (STEPI, Korea)
14:00 – 14:30	Presentation #2, Prof. Robert Harmon (School of Business Administration, Portland State University, USA)
14:30 – 15:00	Presentation #3, Dr. Nathasit Gerdsri (Dept. of Engineering and Technology Management, Portland State University, USA)
15:00 – 15:15	Break
15:15 – 16:00	Break out into three focus groups
16:00 – 16:15	Group 1 (Government) presentation and questions
16:15 – 16:30	Group 2 (Industry) presentation and questions
16:30 – 16:45	Group 3 (Academia) presentation and questions
16:45	Rejoin into one plenary session
16:45 – 16:55	Open discussion
16:55 – 17:00	Feedback on process
17:00	Adjourn

WORKSHOPS

Workshop - 1

Saturday, July 31, 2004. 09:00 - 13:00

SCANNING NEW TECHNOLOGIES FOR STRATEGIC OPPORTUNITIES

Speaker: Rias J. van Wyk, Center for the Development of Technological Leader, USA

New technologies represent new opportunities - to improve products, enhance processes, refine decision support systems and create new industries. This workshop shows participants how to map and track new technological developments as a basis for reshaping corporate strategy. The seminar demonstrates the use of Technoscan®, a global map of technology trends.

Rias van Wyk holds the William R. Sweatt Chair in the Management of Technology at the University of Minnesota. Van Wyk has been called the leading authority on strategic technology analysis (STA). He has over twenty five years of experience in this field; providing professional support to technology executives, teaching executive and academic programs and doing research. He has advised companies like American Medical Systems, Entegris, Keithley Instruments, Minnesota Technology Inc., Rosemount and Seagate. In addition to his consulting work he has twenty five years of board level experience. He has degrees from three universities including a Master's degree from Harvard focusing on science, technology and public policy. He is a Founding Member of the International Assocaition for Management of Technology (IAMOT) and serves on its Executive Committee. He is a member of the National Assocation of Corporate Directors.

Workshop - 2

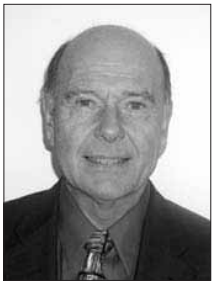
Saturday, July 31, 2004. 14:00 - 18:00

MANAGING R&D AND TECHNOLOGY-INTENSIVE PROJECTS

Speaker: Hans J. Thamhain, Bentley College, USA

This intensive, workshop-style seminar addresses the daunting challenges of stimulating innovation and dealing with risk, uncertainty, time and resource pressures. The seminar provides seasoned managers and project leaders in R&D and technology-intensive environments with a forum for discussing contemporary management concepts, tools and techniques suitable for these dynamic and often non-linear processes.

The emphasis is on best practices. Working interactively in small groups, participants will analyze complex project scenarios, discuss challenging problems, share experiences and work out potential solutions. Participants will also apply the latest techniques for planning, tracking and controlling technical projects, compressing the time-to-market cycles, managing innovation under cost and time constraints, establishing early warning systems, leading self-directed project teams, and dealing with interruptions, risks, conflict and commitment.



Hans J. Thamhain specializes in technology-based project management. Hans Thamhain is a Professor of Management, and Director of MOT and Project Management Programs at Bentley College, Boston. His industrial experience includes twenty years of management positions with high-technology companies: GTE/Verizon, General Electric and ITT. Hans Thamhain has PhD, MBA, MSEE and BSEE degrees, and has written over seventy research papers and five professional reference books in project and technology management. Dr. Thamhain is the recipient of 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 New Product Development Professional, NPDP, and Project Management Professional, PMP. Additional Profile: Marquis Who's Who in America.

SESSIONS

SA-01 PLENARY SESSION – 1

DATE: SUNDAY, AUGUST 1
TIME: 09:00 – 10:30
ROOM: BALLROOM

Session Chair: Timothy R. Anderson, Portland State University, USA

KEYNOTE – 1
Dr. Youngrak Choi, President, STEPI, Korea

"From Fast Follower to Innovation Leader: Next Generation Innovation Model of Korea"

There is no doubt that Korea has been successful with its fast follower strategy based on learning skills and manufacturing technology. Korea has shown remarkable successes in the areas such as automobiles, memory chips, CDMA and so on. However, the follower strategy would not work well where the capability of architecture-design is the most critical competitive factor in the world market. Now, the important sources of value are fundamental technologies, parts and materials, and S/W. As Korea wants to move forward, it seeks to establish a next-generation innovation model for the new growth. To realize the innovation-driven growth, it is essential for Korea to lead the world market by creating and utilizing fundamental technologies, leading global standards, making high value-added products, and participating in global sourcing systems. In order to make these things happen in the current Korean innovation environment, it has to develop world-class manpower, to have more innovative SMEs, and to establish innovative cross-teams among industry, academia, and research institutes. The emphases of the new model will be: from production/process technology to architecture-design capability, from skilled manpower to creative manpower, and from the promotion of R&D actors to innovative cross-teams. After all, it has to have self-changing dynamics and adapt itself for the changing global innovation system.

KEYNOTE – 2
Hwan-Eik Cho, President, KOTEF, Korea

"Positive Relationship Between Public and Private R&D Expenditures of Korean Manufacturing"

The recent trend in Korean R&D is that both the private and public sector have extended their R&D investments to achieve a national income of $20,000. The Korean manufacturing industry has invested 2.51 percent of its sales in R&D and made innovation of the product and process. According to the latest survey of KOTEF, about 16.1 percent of the total R&D expenditures among surveyed firms are covered with the public R&D fund, which has various positive effects on the private sector: i) it has induced an increase in the R&D investment of the private sector; ii) the government R&D expenditure is analyzed to have the positive effect on the private R&D expenditure, rather than the crowding-out effect; iii) furthermore, public R&D expenditure has a positive effect on the technology accumulation, employment, and reduction of R&D process.

SB-03 Technology Management Education: 1
Sunday, 8/1/2004, 11:00 - 12:30 **Room: Sorak II**
Chair(s): Alexandre Repkine; Seoul National University

SB-03.1 [A] e-Learning Technology Adaptation: Cases of Universities in Thailand

Sawai Siritongthaworn; Asian Institute of Technology, Thailand
Donyaprueth Krairit; Asian Institute of Technology, Thailand

Nowadays e-learning has become a buzzword in education and training sectors. Like other kinds of new technologies, e-learning has been used to facilitate information and communication technology to enhance the instruction of the instructors and learning of the learners. Educating users on how to use e-learning is not easy, but adapting user's behavior to adopt and utilize it is more difficult. Moreover, the adoption of e-learning is varied from country to country. E-learning embarkation in Thailand is quite different from that in more developed countries. It could be explained by two main reasons. One is that Thailand has a limited budget for e-learning compared to those countries. The other is that it takes a certain amount of time to adjust the related behaviors of stakeholders to this new technology. This paper presents the current status of this emerging technology in the instruction of some undergraduate courses in universities in Thailand. Interviews with people in charge of e-learning units, instructors participating in e-learning initiatives, and students in the courses enhanced by e-learning were conducted. The results and recommendations on how e-learning should be introduced and implemented as well as how learners could make effective use of it are presented.

SB-03.2 [A] Viable Technologies for Sustainability and Local Integrated Development, Tech/SUDIL

Miguel A Briceño; Unversidad Central de Venezuela, Venezuela

This paper is aimed at presenting the project of the creation of a Virtual Group made up of highly-qualified technology specialists of different national and foreign universities. The task to be performed by the group would be the creation of the framework necessary for the university to perform its new role within the knowledge society. The creation of technologies applicable in a framework of sustainability and local integrated development will pave the way for the participation of the Venezuelan university in the solving of problematic situations at the local level with a global perspective and the implementation of the following strategy: • Interaction among universities, local governments and communities aimed at fostering competitiveness and higher life-quality standards. • Interaction among the different universities, as a group, which should in turn interact with the local government and the communities, in order to achieve sustainable development. • Generation of new appropriate technologies adapted to the increment of the local productivity and the economic diversification of the areas of the Venezuelan Andean Highlands and Northeastern Coast of the Caribbean, respecting the ecological balance and the local cultural identity.

SB-03.3 [R] MOT Education for TLO Staffs in Universities and Local Governments in Japan

Kazuo Yanagishita, Nihon University

SB-04 Science and Technology Policy: 1
Sunday, 8/1/2004, 11:00 - 12:30 **Room: Sorak III**
Chair(s): Sunyang Chung; Sejong University

SB-04.1 [R] The Route of Technological Spillovers in Intermediate-Goods Industries: A Bibliometric Approach

Young-Hoon Kim; Seoul National University, Korea, South
Jung-Dong Lee; Seoul National University, Korea, South
Si H Joo; Seoul National University, Korea, South

The importance of technological innovation for economic growth has received widespread recognition in the knowledge-based society. Market failure, which frequently arises when R&D decisions are left for the private sector to make, calls for public intervention. Economic and technological spillovers are the major rationale for public R&D support policies. Careful analysis of the structure of inter-industry technological spillovers should underlie any type of public R&D support since it serves as a benchmark for accountability. In this study, a bibliometric approach using intellectual property data is utilized in order to identify the objective structure of technological spillovers in the Korean intermediate-goods industries. A new mechanism based on product keywords in the abstract of an intellectual property document is proposed to improve conventional manual methodology. By identifying the route of the technological spillovers between industries, the government can infer which industries are the likely sources of technological knowledge and thus make informed R&D decisions to promote industrial R&D efficiently and effectively.

SB-04.2 [A] A New Measurement of the Level of S&T and Some Econometric Applications

Yang-Taek Lim; Hanyang University, Korea, South

This paper presents a new measurement technique to derive the level of S&T (the technology index) by using factor analysis which is extended with the assumption of the standard normal probability distribution of the selected explanatory variables. The new measurement method is used to forecast the technology gap and make its international comparison, based on the assumption that technological progress function takes the form of the logistic curve.

SB-04.3 [R] Technology Policy in Financing Innovations

Jarunee Wonglimpiyarat; Ministry of Science and Technology, Thailand

There is a clear implication of conceptualising the problems in managing innovations that firms which have limited finance may not be able to invest in research and development (R&D) activities. As a result, there is a growing search for capital among entrepreneurial ventures. This paper reviews the financial system of financing innovations in Thailand. The study draws on successful implementation of venture capital (VC) funding mechanisms of Technologie-Beteiligungs-Gesellschaft (tbg) in Germany and the French Agency for Innovation (ANVAR) in France for application to the case of Thailand. The paper seeks to identify and model the policy measures that the Innovation Development Fund (IDF) in Thailand should implement in order to assist technology-based entrepreneurial firms progress towards the stage of commercialisation. The paper argues that the Thai government should take up a more risky role to draw venture capital investment to the economy.

SB-05 Technology-Based Organizations: 1
Sunday, 8/1/2004, 11:00 - 12:30 **Room: Kum Kang I**
Chair(s): William T. Flannery; University of Texas, San Antonio

SB-05.2 [A] Opportunities to Add Value to Technology-Based Organizations

C. M Chang; University of Buffalo, United States

The new millennium is uniquely characterized by the rapid advancement in technologies and tectonic change in global markets. A large number of opportunities exist for engineering managers to add value to technology-based organizations. Value represents a realizable outcome, which is beneficial to the stakeholders of these organizations. This paper reviews what is new about the new millennium and then enumerates on value-addition opportunities such as e-transformation, web-based tools, product development, innovations, and management of global supply chains. These opportunities entail challenges in six dimensions, namely inside, outside, present, future, local and global. The linkages between these opportunities and stakeholders' value are diagrammatically illustrated. The success factors that affect engineering managers' efforts of value addition are elucidated. As many employers in the new millennium may take the position, "You own your own career, we provide you with opportunity," engineering managers need to emulate specific personal strategies in order to seize these value-addition opportunities and convert them into business profitability for their technology-based organizations. Engineering managers are particularly qualified to add value. They have a vital role to play in helping technology-based organizations confronting the challenges of the new millennium.

SB-05.3 [R] Organizational Innovation of Research Institutes

Shyhnan Liou; National Chung Cheng University, Taiwan
Ta-hsien Lo; National Chiao Tung University, Taiwan

Since its establishment, the Industrial Technology Research Institute (ITRI) underwent several transformations to keep pace with the industrial growth and progress of Taiwan, the improvements in the research competency of private enterprises, and the urgent demands of the traditional industry upgrade transformation. ITRI's organization structure and role underwent continuous transitions and changes to cope with the internal and external environmental changes as well as changes in international trends. This study mainly analyzed the organizational development of national class research institutions to delve into the adjustments in ITRI's visions and goals, organizational development strategies, and the designs and functions of the institute organization under these strategies, as dictated by the contemporary environment of the period. Mintzberg's theory of organizational configuration was used to understand the ITRI organizational design, and historical analysis was used to interpret the longitudinal study of its organizational development during the past three decades. In the final analysis, the study delved into the development strategies and plans of the recent organizational reform in an attempt to understand the organizational development of national class research institutions in response to the advent of the knowledge economy and in promotion of national innovation capability.

SB-06 Information/Knowledge Management: 1
Sunday, 8/1/2004, 11:00 - 12:30 **Room: Kum Kang II**
Chair(s): John O Aje; University of Maryland

SB-06.1 [R] Managing Knowledge and Innovation through a Centre of Excellence System

K. C Ko; Johnson Electric Group, Hong Kong
W. B Lee; Hong Kong Polytechnic University, Hong Kong
Benny Cheung; Hong Kong Polytechnic University, Hong Kong

This paper presents the development of a Centre of Excellence (COE) system to sustain the business growth for a renowned motor manufacturer. The COE system provides a strong linkage not only for inter-enterprise activities but also for suppliers and customers who are able to share their experience, knowledge, and marketing information, and access competing vendors and ideas and shape the content they receive. The role of the COE system is to share and exchange knowledge at company foundation, and members should learn how to create competencies through COE collaboration. A prototype COE system is successfully trial implemented in a prestigious company. Preliminary results indicate that the COE system can facilitate effective management of knowledge and innovation of motor design and manufacturing. Potential benefits of the implementation of the COE system are also discussed.

SB-06.2 [R] Intellectual Capital and Innovation Performance: A Conceptual Framework

Dongqin Li; Zhejiang University, China
Xiaobo Wu; Zhejiang University, China
Jian Du; Zhejiang University, China

Intellectual capital (IC) has recently emerged as a popular concept among managers as well as researchers. This paper presents a conceptual framework analyzing the relationship between intellectual capital and innovation performance. Two kinds of impact are taken into account in this framework: the first is the individual effects of the components of the intellectual capital on innovation performance; the second is the interaction effect between the IC components on innovation performance.

SB-06.3 [A] Implementing and Integrating NPD and Sales Forecasting System Based on Knowledge Perspective

Yiche Chen; Yuan-Ze University, Taiwan
Yan Ru Li; Yuan-Ze University, Taiwan

In the knowledge economics era, more and more enterprises understand the importance of knowledge with a handful of approaches toward its management. But practical experience shows that the few cases about knowledge management are not sufficient, and the software in the market only provides a narrow perspective based on messages or documents into managemen, so we need a better guiding tool especially based on knowledge units to assist our analysis and planning. This paper proposes an instance to use the perspective combining strategic and engineering views, through van der Spek's knowledge management cycle, to be a strategic plan and using some models of CommonKADS's to conduct an adaptable knowledge management analysis process. Quantitative and qualitative methods are used to extract organizational knowledge and connect important working flow between different departments. We then create the inference rules and decision/forecasting models. This paper not only establishes a knowledge-perspective decision support system but also improves the business processes based on knowledge analyzing. In the end, this paper builds up a prototype system of new product development and sales forecasting for the biggest channel and software publishing company as our case at Taiwan in 2000. The solu-

tion provides a complete designing process from knowledge extracting and creating to implementing, and then enhances the value of the knowledge system.

SB-07 Technology Acquisition: 1
Sunday, 8/1/2004, 11:00 - 12:30 **Room: Kum Kang III**
Chair(s): Tugrul U Daim; Intel Corporation

SB-07.1 [A] Organizational Strategy in IP Service Industry: Comparison among US, Europe, Asia and Lessons for Taiwan

FengShang Wu; National Chengchi University, Taiwan
JJ,Jou-Juan Pan; National Chengchi University, Taiwan

Service organizations in technology or IP trading industry are critical to their successful commercialization. This article compares the cross-regional organizations in the US, Europe and Asia. Through interviewing the key persons in each international organization and a local expert panel in Taiwan, the findings include defining business scope, value chain and critical success factors of serving the IP trading industry. This article also suggests ways of positioning a service organization in the IP trading and commercializing industry.

SB-07.2 [R] An Effective Method on Targets Selection of Merger & Acquisition for Technology-oriented Businesses

Chih-Chiang Fan; United Microelectronics Corporation (UMC), Taiwan
Shing-Ko Liang; National Chiao Tung University, Taiwan
Chia-Nan Wang; Newfancy Technology Inc., Taiwan

In this era of dramatic change and globalization, merger & acquisition (M & A) has become a very common way for enterprise expansion. For high-tech businesses, companies usually use M & A to acquire technology and realize their business strategic plan. However, the M & A evaluation for traditional industries, focusing primarily on the value of tangible assets, is not appropriate for technology-oriented businesses, which mainly take the value of intangible assets into consideration. This paper proposes a feasible evaluation method of selecting the M & A targets for technology-oriented businesses. Its focus is on the realization of the strategic plan and efficiency that is evaluated by Data Envelopment Analysis (DEA). Five major steps are developed: (1) analyzing the key success factors of businesses, (2) developing M & A strategy, (3) analyzing the candidates' efficiency, (4) selecting the targets from the viewpoints of both strategy and efficiency, and (5) analyzing the estimated running efficiency of new company after M & A. A start-up fabless IC design house, focusing on wireless LAN chipset, is exercised to verify the model under realistic data. The results are sound after verification by some managers of IC design houses. This method is very useful for the M & A evaluation of technology-oriented businesses.

SB-07.3 [R] The Relationships between Technology Investment Decision, Advanced Technology Implementation and Facility Location in the Turkish Small Manufacturing Enterprises

Sitki Gozlu; Istanbul Technical University, Turkey
Hasan Gules; Selcuk University, Turkey

A survey was conducted to study the relationships between technology investments, advanced technology utilisation and facility location in the Turkish small manufacturing enterprises (SMEs). The survey involved 300 Turkish SMEs from various sectors and regions of the country. The facility location factors, technology investment criteria, and advanced manufacturing technologies (AMTs) were determined through a literature search and contributions of researchers. The relationships between AMT implementation and facility location were studied by conducting a Mann-Whitney U test. The results of the Mann-Whitney U tests have shown that as companies increase the level of technology implementation, they also reconsider the relative importance of individual factory location criterion. The Turkish SMEs are generally motivated and driven by the market forces (market pull), and "technology push" has comparatively little effect on company growth.

SB-08 Technology Marketing: 1
Sunday, 8/1/2004, 11:00 - 12:30 **Room: Kum Kang IV**
Chair(s): Robert Harmon; Portland State University

SB-08.1 [R] Application of Prospect Theory and Agency Theory in Technology Commercialization Process

Peter J Sher; National Chung Hsing University, Taiwan
Joseph Y Leu; National Taiwan University, Taiwan

R&D is the source of continuous innovation, which is aiming at improving product performance, increasing delivery efficiency, and broadening product portfolios. All these endeavors are examined by commercialization effectiveness. It is well accepted that firms control technological advantage and competitiveness as long as they invest in R&D heavily. However, technological development does not guarantee profitability, especially when a technology has to overcome developing risks in its embryonic (development) stage and survive market examination at the commercialization stage. When the global economy is gradually driven by technological innovation, effective technology commercialization becomes more critical to a firm's performance. What is uncertain along technology commercialization is intrinsic risk. Risk used to be perceived as being equivalently distributed along the commercialization process, yet this research tries to introduce a "Technology Commercialization Cycle" (TCC) model to demonstrate that there are varieties of risk level along the TCC. The model consists of three stages: Development Stage, Commercialization Stage and Competition Stage. On the basis of agency theory and prospect theory, we address risk characteristics and correspondent solutions to these intrinsic risks of technology commercialization. Strategies for effective technology commercialization and managerial implications are addressed to risk management at different stages.

SB-08.2 [R] Fuzzy Multivariate Approach to Corporate Brand Evaluation

Kunio Shibata; Waseda University, Japan
Junzo Watada; Waseda University, Japan
Shotaro Uehara; Waseda University, Japan
Yoshiyuki Yabuuchi; Shimonoseki City University, Japan

In the IT industry, severe competition has occured among companies all over the world. In Japan some companies have accelerated their sales and production, but unfortunately many companies lost their power to push themselves forward. There are several reasons. We can blame the recession in Japan as well as in the world. And we have to understand the reasons why some corporations have successfully accelerated their production even in the recession. In this paper, we analyze the detailed data of many representative companies of the IT industry in Japan. These days, a balance sheet cannot illustrate the corporate performance without the values of brand and customer, employee, patent and so on. We analyzed IT corporations in Japan on the basis of measurement of intangible assets. We especially stressed the MOT and brand image in a corporation's value. The result of our analysis explains why some corporations can be successful.

SD-01 Innovation Management: 1
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Ballroom I**
Chair(s): Robert P McGowan; University of Denver

SD-01.1 [R] The Innovation Process for Complex Product System in Heavy Industry: The Experience from China

Jin Chen; Zhejiang University, China
Jian-Yuan Song; ZheJiang University, China
Bin-wang Gui; Zhejiang University, China
Xin-wei Mo; Zhejiang University, China

Complex Product System (CoPS) is the product, subsystem or establishment, which is high-cost, large-scale, high-tech and engineering-extensive. Based on the research on technological innovation and CoPS by scholars, this paper introduces the definition and the scope of CoPS, figures out the relationship and the distinction between CoPS and classical technological innovation theories, and establishes a new framework for an innovation process

model for CoPS, which combines the flow of innovation and the innovation system together. According to this framework, the innovation process of CoPS is elaborated on by the case of watercraft of Chinese Jiangnan Shipyard.

SD-01.2 [R] The Study of Gatekeeping Mechanisms of Creative and Innovative Products

Wei-Hsin Hsiang; National Chengchi University, Taiwan
Se-Hwa Wu; National Chengchi University, Taiwan

The sustained and successful introduction of new products is crucial to the profitability and survival of today's organizations. Yet, it is hard for these organizations to select good creative or innovative products and then introduce them to the market successfully. Even worse, in the initial stages of knowledge-based products, these ideas or products are blurred. How these decision makers at organizations carry out evaluation of such creative and innovative but less stable and predictable areas such as research and development, new ventures, or culture and entertainment ideas is unclear. In this study, we use Csikszentmihalyi's system model and evolution to approach the gate-keeping mechanisms of creative/innovative products. The attribution of this perspective is an integral part of the creative process. Along the evolution process, the stages of mutation, selection, and retention, we propose there are four key factors divided equally between the stages of mutation and selection that affect gatekeeping mechanisms of creative or innovative products by extracting from the related literatures. These four key factors are first, in the mutation stage, extrinsic/intrinsic motivations and social capital which gate-keeping groups have, and second, in the selection stage, the professional abilities and gate-keeping mechanisms of gate-keeping groups. Next, we propose that there are several gate-keeping stages for creative/innovative products. In different gate-keeping stages, the gatekeepers' characteristics are different. Moreover, a good gate-keeping mechanism will attract more and more creative people or groups to join this selection system. Then, the network of this creative community will become stronger and bigger, the efficiency of innovative diffusion will become better, and the production of good creative products will increase. Thus, setting up good gatekeeping/selecting mechanisms is important for organizations in creative industries.

SD-02 Competitiveness in Technology Management: 1
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Ballroom II**
Chair(s): Kazuo Yanagishita; Nihon University, Japan

SD-02.1 [A] From Confrontation to Colla-petition in the Globalized Semiconductor Industry

Ad J van de Gevel; Tilburg University, Netherlands

The purpose of this paper is to explain the reversals in competitiveness in the semiconductor industry between the USA and Japan in the last 20 years and to show that this industry has moved from being highly confrontational in terms of strategic trade policy to being much more collaborative in terms of strategic alliances. Much of the international trade dispute centered on DRAMs (Dynamic Random Access Memories). The position of Europe will be highlighted as well as the situation in Asia. Finally, current developments and expectations for the future of this sector will be discussed. Nowadays the industry is geographically dispersed, and the top-10 chip sales leaders include three US firms, three Japanese, one South Korean and three European companies. That may be called a leveled playing field. The emergence of successful global alliances has the potential to shift competition away from a predominantly nationalistic focus to a struggle among competing global partnerships. Companies compete on actual products and collaborate on setting technical standards, sacrificing a degree of independence to increase the odds of success of a given technology. Networks from the USA, Europe and Asia may form the basis for a series of global semiconductor camps each centered on the process-technology capabilities of two or three global firms linked to a multitude of smaller allied producers. In the future the model for the semiconductor companies will be competition with collaboration: "colla-petition".

SD-02.2 [A] Managing Collaborative Work in Networked Enterprise

W. B Lee; Hong Kong Polytechnic University, Hong Kong

Competition among individual firms has been shifted to that among supply chains. The building of collaborative advantage among business partners is thus crucial for the success of all networked enterprises. In the field of technology management, there are different approaches as to how collaboration should be carried out. Practitioners may choose to develop a methodology for the identification and selection of suitable partners, to build a collaborative culture, or to design appropriate infrastructure, technologies and tools for a particular business solution. In this paper, an implementation approach is proposed to launch collaborative work among business team partners. Firstly, it is essential to identify the elements of the tasks in the business process that require multiple inputs and simultaneous sharing of data, information or knowledge that will result in faster and better business decisions. Secondly, the necessary technologies and tools that facilitate the sharing and exchange are then designed and built. The benefit that can be derived must be clearly addressed to get the support of management. Eventually, a collaborative culture should then be able to be built and sustained. Cases are drawn from the watch manufacturing industry in product co-development and from the airline business in supply chain logistics to illustrate how collaboration is realized in different industries.

SD-02.3 [A] Competitive Technological Intelligence to Identify Opportunities and Road Maps: A Mexican Case

Rosario Castañòn; National University of Mexico, Mexico
José Luis Solleiro; National University of Mexico, Mexico
Isabel Saad; National University of Mexico, Mexico
P. Ortega; CamBiotec, Mexico

Biotechnology is one of the most influential enabling technologies for the pharmaceutical industry. Investments in research are growing very rapidly along with control of innovations and new entry barriers. Under these conditions, participation of medium-sized firms from emerging economies in the biotechnology revolution requires a very careful process to identify opportunities. Our group has been active in assisting Mexican firms to develop competitive intelligence capacities to properly assess technology trends in selected markets in order to create a solid base for technology development and transfer strategies. Our experience shows that adequate management of information and the use of advanced techniques to analyze scientific and technical literature allow firms to respond to opportunities optimizing the use of internal capabilities and external technology inputs. This paper reports a case of a Mexican company dealing with three different cases in which we analyze the logical framework for conducting competitive intelligence, the main sources of information, the review process, the analytical tools and the means to selectively disseminate results. Based on this analysis, we draw recommendations for the development of technological services to support "me too" strategies of firms in developing countries.

SD-02.4 [R] Sustainable Competitive Advantage and Marketing Innovation of Firms: Towards a Model Development

Peijuan Shen; Beijing University of Technology, China
Guangya Xie; Beijing University of Technology, China
Liqin Ren; University of Twente, Netherlands

The research on the firm sustainable competitive advantage (SCA) has already become a major topic in the science of strategic management; however, there are some different views when it comes to how to create and how to sustain competitive advantage. Based on a comprehensive survey of references about the firm SCA, this paper accepts that neither is the firm SCA stemmed outside from outer factors such as the market structure, nor completely inside from inner ones supported by a resource-based view of firms and capability-based view of firms, but rather from the sustainable innovation-based view of firms. The marketing innovation has become an important path to creating the firm SCA in practice. Especially speaking, firms in a dynamic competitive environment should lay more stress on their marketing innovation. In the subsequent analysis, case examples in large part illustrate the power of marketing innovation strategies in such leading firms that always create the firm SCA in the different dynamic competitive markets in which they have chosen to compete as Compaq, Haier, Intel, IBM, P&G and the like. Based on it, this paper has taken advantage of marketing innovation to formulate the analysis framework of the firm SCA.

SESSIONS

SD-03 Decision Making in Technology Management: 1
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Sorak II**
Chair(s): Jonathan C Ho; Portland State University

SD-03.1 [A] Simulation Modelling: Tool for Performance Enhancement in Industrial System

Edward Szczerbicki; University of Newcastle, Australia

Industrial systems have grown in complexity over the years mainly due to the increased striving for innovation and performance enhancing combined with a greater degree of uncertainty and imprecision in systems' external and internal environments. This complexity applies also to all areas of systems operation and calls for new decision support and problem solving tools. Many of these new tools come from the area of decision sciences, artificial intelligence, and soft modeling. In this paper, simulation is proposed as a technique which can cope with complexity, uncertainty and imprecision. The paper is structured in the following way. First, a brief discussion is provided on complexity in industrial systems in general, and an approach is suggested to deal with it. Next, the simulation technique is introduced and proposed as an effective tool in solving some complex industrial problems (scheduling, manning, maintenance servicing, agility development, etc.). Then, two well-documented case studies are looked at from the perspective of a complex resource allocation task which can be solved using the simulation technique. AveSim simulation environment is applied as a modelling platform, and VISUAL SLAM simulation language is used as an implementation tool.

SD-03.2 [R] The Cause and Influence of Accidents in Corporations

Junzo Watada; Waseda University, Japan
Yoshiyuki Yabuuchi; Shimonoseki City University, Japan
Maojun Li; Waseda University, Japan
Kunio Shibata; Waseda University, Japan

This paper analyzes the influence of the organization and human relations on accidents in factories and on the software qualities. We summarize the results of these analyses and explain the importance of the organization and human relations for quality control in factories. On the other hand, the total assets consist of tangible and intangible ones. Recently, the portion of intangible assets has a high portion of the total assets. Brand evaluation especially occupies a very large portion of the intangible assets. Therefore, the brand image has a really important influence on the consumer's behavior in purchasing. But only one accident causes a corporation very serious damage to its brand image. The objective of this paper is to compare the corporate brand image between the previous time and post time of the accident. We can then evaluate the damage of the accident to the corporation.

SD-03.3 [A] Forecasting Demand for Vehicles using Alternative Fuel

Youngsang Cho; Seoul National University , Korea, South
Jongsoo Lee; Seoul National University, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South

The research on demand for new products has chiefly focused on the diffusion of new products resulting from the process of technological innovation. In the present research, we forecast the demand for new products introduced by changes in market regulations regarding the introduction of diesel passenger cars in Korea. It is questioned that the introduction of the latter raises various problems regarding the environment, energy supply and demand, and associated taxes, to name just a few. For reasons of environmental protection, Korean policy makers must control the demand for diesel vehicles by means of adjusting the fuel pricing system, vehicle taxes, controlling the installation of the DPF (Diesel Particulate Filter) system, and so on. On the supply side, the car-producing companies need to know consumers' preferences for the new vehicles in order to develop the right pricing strategy. In this study we use a micro-simulated demand forecasting method in order to address these questions. Our model accommodates various types of government policies and car attributes such as the price and engine efficiency. We believe that the results of this research will be useful for policy making in the area of designing the fuel price system and taxation. Managers of the car-producing companies will benefit from the benchmark pricing system developed in this study.

SD-03.4 [R] Comparing Concurrent Engineering Approaches: Set-Based versus Point-Based

Alceu S Camargo Jr.; Universidade de São Paulo, Brazil
Abraham Oih S Yu; University of Sao Paulo, Brazil

Innovation has become the great pro-active capability craved by competitive organizations. Concurrent Engineering is deemed to be one of the most efficient methods of innovation process management nowadays. This research compares the performance of two different Concurrent Engineering approaches: 1. Point-Based Concurrent Engineering, which drives the development process through improvements from only one initial concept, and 2. Set-Based Concurrent Engineering, which manages the product development that begins with multiple concept alternatives and, iteratively, converges towards the best one. Mathematical models simulating the sequential decision process are developed to compare the economic performance of the product development project as managed by Set-Based Concurrent Engineering versus that managed by Point-Based Concurrent Engineering. This comparison is undertaken for projects with different levels of technical uncertainty and complexity, different development costs and in the presence of different product sales opportunity window extensions. Our computer simulation results show that Set-Based Concurrent Engineering performs better in projects with higher levels of technical uncertainty and complexity. Another interesting result is that Set-Based economic performance is also superior in projects with a lower level of technical uncertainty, but with higher development costs and in a more dynamic environment (smaller product sales opportunity window). Implications for product development practices are discussed.

SD-04 Science and Technology Policy: 2
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Sorak III**
Chair(s): Lee, Johng-Ihl; KOTEF

SD-04.1 [A] Evaluation and Pre-Budget Review of Government R&D Programs: A New Initiative in Korea

Heeseung Yang; Sejong University, Korea, South
Byoung Ho Son; KISTEP, Korea, South

Over the past few decades, rapid growth of the government R&D budget has increasingly provoked issues of public accountability and efficiency of government R&D programs in Korea. In response to such demands, the Korean government has long been concerned about effective ways of priority setting and budget allocation for government R&D programs. Based on the "Special Act for Scientific and Technological Innovation" in 1998, the Korean National Science and Technology Council (NSTC) was established to evaluate all government R&D programs and coordinate all relevant agencies in the processes of priority setting and budgeting. Under the NSTC scheme, "Evaluation and Pre-Budget Review of the Government R&D Programs" has been carried out and the results have reflected in budget appropriation processes. The purpose of this paper is to explain how the new initiative has been developed and to explore the lessons learned during the implementation stages. Also, the new system will be compared with the coordination and evaluation system of federal R&D programs in the US in terms of the purpose, the process, and the usage. Korea's experience might be of significance in giving some insights into understanding an effective resource allocation and research management system of R&D-intensive countries.

SD-04.2 [R] The Technology Development Path of Research Institutes in Taiwan

Hsueh-Chiao Chiang; National Science Council, Taiwan

Since industrial technology innovation is one of the important factors in upgrading industrial structure, the government has been continually promoting industrial research, and setting aside budgets to commission research institutions to take part in industrial technology research. The research institutions mainly aim to upgrade the technology standards of traditional industrials and establish developing technology industries. The study of the technology development path of research institutions in Taiwan divided the past three decades into several stages for strategic analysis purposes: 1) The 70s, a period of technology importation and presence of foreign high-tech professionals, were used to develop industrial technolo-

gy. 2) The 80s, a period of research and development project endeavors for added-value features of products, especially for commercialization and mass production purposes. 3) The 90s, a period of core technology and new product development, in which research activities were aimed at coping with the industrial requirements. 4) The future development, which is characterized by a highly internationalized global economy. The advanced and innovative technology R&D activities are conducted to further establish industrial core technologies. In closing, the objectives and characteristics of all stages were placed under regression analysis, and recommendations are made for future national systems for technology development.

SD-04.3 [R] National R&D Policy in Korea: Focusing on the CDMA Commercialization R&D Project

Saeeok Han; Dong-A University, Korea, South
Joong Ick Ryu; Ministry of Science and Technology, Korea, South

Because of its economic and social significance, National R&D Policy is increasingly the focus of national policy. In recent times the R&D policy of Korea has backed an ambitious drive to restructure the Korean society and economy. Having seen remarkable growth in the past, Korea's modernization is now at a turning point, facing a new paradigm of a knowledge-based society that it has not experienced before. After examining the past and current situation of R&D policy progress in Korea, this paper proposes a desirable policy process model. On the basis of the cases, which resulted in successful achievements in spite of the inferior conditions inherent in a late comer, the success factors are to be analyzed. That is, the analysis object of this paper is aimed at The Digital CDMA Mobile Telecommunications Technology R&D Project, which was formulated to secure the competency of the Korean mobile telecommunications industry. This paper also considers an advanced strategy that Korea's National R&D policy may have to shift during the knowledge-based society.

SD-05 Strategic Management of Technology: 1
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Kum Kang I**
Chair(s): Seongjae Yu; KAIST

SD-05.1 [R] Managing Change - Strategic Innovation

Petteri Laaksonen; Lappeenranta University of Technology, Finland
Jukka-Pekka Bergman; Lappeenranta University of Technology, Finland
Jan Edelmann; Lappeenranta University of Technology, Finland

In emerging industries, innovation is firms' primary resource to gain competitive advantage. Studies in this area have mainly focused on new products and technologies, and little attention has been given to strategic level innovation. The accelerating pace of change makes the decision-making more complex than before. In addition, firms do not have effective methods for understanding and analyzing strategic alternatives to full extent. New technologies and the emerging business environment create threats and opportunities for firms, which they are incapable of managing with currently offered methods and tools. Wireless technologies are not yet widely used in industrial applications, and the potential of new business concepts enabled by the technologies is still mainly undiscovered. Emerging technologies have a great impact on the value chains of different industries and, therefore, the main focus of our research has been the new competition made possible by wireless technologies between the business concepts of firms. This paper presents a new strategy formulation process integrating strategic innovation, scenario planning and strategic options which is a result of our research activities in the field of strategic innovation management.

SD-05.2 [R] Business Concept Innovation for a Mobile Multiplayer Game

Mikko Pynnönen; TeliaSonera Finland Oyj / LUT, Finland
Petteri Laaksonen; Telecom Business Research Center Lappeenranta, Finland
Kimmo Suojapelto; Telecom Business Research Center Lappeenranta, Finland

Mobile Internet market is merging from the Internet and mobile communications market. Due to technology standards, firms see that margins are getting thinner in their present business models like computer manufacturing or communication industries. The firms operating in this highly competitive global environment seek continuously new business opportunities. This is caused by the fast development of a relatively young industry in both business- and technology-wise and the convergence of industries that enable new opportunities and markets for companies that are originally from totally different industries. The game industry has been seen as one of the growth areas. However, mostly games are played on computers, standalone or over the Internet. There are only few very simple games operated on the mobile Internet. There is an assumption that next "killer application" could be a mobile game. In Asia and especially Japan, the mobile game industry has been successful already. Mobile games have become popular in the third generation networks and especially in i-mode. This same development is now believed to happen in Europe and on a global scale, although it is not clear that this will directly happen due to, for example, cultural or legislative differences between the countries. This paper addresses the question of what kind of new business concepts a game in the mobile Internet would provide. The paper is part of the European commission IST (Information Society Technologies) - project WISE (Wireless Internet Service Engineering) and the business model research of the methodology work package. In this paper the focus is in the business concept innovation. The paper adds knowledge on the business concept innovation work made earlier in Lappeenranta University of Technology (LUT) and Telecom Business Research Center (TBRC).

SD-05.3 [A] The Anti-Piracy Strategy for Optical Disc and its Relationship with Technology Development in Taiwan

Wen-hsiang Lu; Intellectual Property Office, Taiwan
Paul C. B Liu; National Chengchi University, Taiwan

Protection of intellectual capital and intellectual property are essential for Taiwan's government to develop the nation to be a "Green Silicon Island". Technology innovation is the key to maintaining competitive advantage for economic success. It also depends on continued strengthening of IPR protection. However, copyright piracy has been causing serious losses to our economy and grave damage to Taiwan's reputation as a leading international trading country. Optical disc piracy, which includes CD, CD-ROM and DVD, like any other crime, earns a lot of money but pays nothing. The government should engage in a comprehensive attack on optical disc piracy to secure ratification and implementation under the TRIPs. The piracy rate based on interest groups calculated could be overestimated. These incorrect estimated rates deeply damaged the image of Taiwan. Nowadays, one of the most important tasks for Taiwan's government on anti-piracy policy should be to conduct a piracy rate study which exactly reflects the real situation of Taiwan. The purpose of this paper is to explore the nature and result of OD (optical disc) piracy problems: the economic effects that OD piracy has on the trading partners and the measurement of calculating the reasonable piracy rate. According to the result of our research, we can find more grounds in international negotiation and increase the attractiveness of Taiwan as a site for the undertaking of innovation.

SD-06 Information/Knowledge Management: 2
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Kum Kang II**
Chair(s): Choi, Ji-sun; STEPI

SD-06.1 [R] Evaluation of a Software Tool for Knowledge Management in Software Process Improvement

Ilmari Saastamoinen; University of Joensuu, Finland
Markku Tukiainen; University of Joensuu, Finland
Timo K Mäkinen; Tampere University of Technology, Finland
Timo K Varkoi; Tampere University of Technology, Finland

The best practices in software engineering have been widely studied and documented. However, software practitioners still seem to have difficulties putting these innovations to work. The transition of software engineering technology (i.e. best practices, processes, methods, tools) in production environment is hard and risky because all practices don't fit all contexts. It is difficult and time consuming to evaluate how appropriate a practice is for the context of a particular organisation. We are developing a knowledge management tool for software process improvement, which supports problem solving, analysis and prioritisation in software process improvement work. The purpose of the tool is to support the transition of software process improvement knowledge and best development practices to the software companies. The tool will be validated in two trial phases. The trials are prepared to provide

valuable information about directions and issues to be addressed in future enhancements of the tool. The study is performed with close collaboration between science and industry including seven software companies in the first trial. In this paper we present our approach to knowledge management in software process improvement and describe preliminary experiences and ongoing evaluation of the tool and draw conclusion of the work done so far.

SD-06.2 [R] Website Information Architecture for Chinese Enterprises' Competitive Advantage

Yihong Rong; Capital Normal University, China
Zhanping Liang; Institute of Sci. & Tech. Information of China, China
Zhe Wang; Harbin Institute of Technology, China
Guang Yu; Harbin Institute of Technology, China
Hongxing Wu; Harbin Institute of Technology, China

An enterprise's website today is a stage for the enterprise to show its own to both (potential) cooperators and thousands of (potential) customers all over the world. The website quality thus plays a significant role in building the enterprise's competitive advantage. This is even more serious for Chinese enterprises because many of their websites lack both effectiveness and efficiency. The paper puts forward a useful means to improve the website quality of Chinese enterprises for reinforcing their competitive advantage. The paper first gives a review on how an enterprise website can reinforce the enterprise's competitive advantage. Then it studies the current situation of Chinese enterprises' websites and gives a brief summary on the reasons why these websites have so many problems. Based on this, the paper proposes that such websites need rebuilding according to the idea of "Information Architecture," which provides a bridge among contents, users, and enterprises, concerning planning, designing and implementing the organization and operations of web information. Then the paper illustrates the components of website information architecture and also establishes a flow for the rebuilding at last.

SD-06.3 [R] Design and Development of New Information Infrastructure: Case Studies of Broadband Public Network and Digital City

Dong-Hee Shin; Penn State University, United States

A comparative case study is conducted on three digital city (public networks) projects. The focus of the study is on the processes involved in the development of such networks and the consequences of such networks. This study looks at (1) two broadband network projects in Central New York, U.S. and (2) one digital city project in Korea. For the U.S. cases, this study discusses problems in the development of public network projects in Central New York. The two broadband projects were funded under a state program to diffuse broadband technologies in economically depressed areas of the state. The digital city project was sanctioned by the Seoul metropolitan government and is now being developed. This study investigates the initiation of the information infrastructure projects, their policy formulation processes, and the development of such projects. The new praxis of new information infrastructure is recommended.

SD-07 Technology Acquisition: 2
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Kum Kang III**
Chair(s): Audrey M Alvear Báez; Portland State University

SD-07.1 [R] Why Tsubame-Sanjo Area has been Sustaining Cluster of Industries for the Past 400 Years in Japan: Regional Innovation System for Sustaining Cluster

Tomomichi Yoshikawa; Waseda University, Japan

Tsubame-Sanjo area, which is located 350 km north of Tokyo, has been known in Japan for exporting tableware industry, especially after World War II. But because of the high evaluation of the Yen and increasing wages, this cluster lost her competitiveness in terms of export in the middle of 1980's. However, some of the companies are now innovating their competitiveness to enter into new industries based upon their accumulated technologies. We would like to describe the way that they drastically changed their structure of industries in the 1990's. When we research the history of industries in this area, firstly we confirm they have been a sustaining industry cluster for 400 years. Secondly, we observe for the past 400 years similar kinds of mechanisms and dynamics to promote changing industries. Tsubame-Sanjo area has been sustaining clustering 400 years by innovating their structures of industries to changing situations. We will describe the characters and dynamics of these innovations as regional innovation system.

SD-07.2 [R] Technological Catching-up of IT Start-ups with External Learning in Eastern China

Jiang Wei; Zhejiang University, China
Jianghua Zhou; Zhejiang University, China

This paper examines the experiences of IT start-ups in Eastern China to identify the external learning mechanism in the process of technological catching-up, and thereby, to sort out the application of external learning for IT start-ups to create and improve their special capabilities. In this paper, we first introduce theoretical background of our study, as well as the methodology used in this paper. Then, three representative cases are presented in detail, to illustrate the catching-up of three IT start-ups. The catching-up is measured in terms of both market catching-up and technological catching-up. Different forms of external learning are explored in the different stages of technological catching-up, and the roles of different external learning in technological catching-up are shown in every case. Furthermore, based upon the semi-structured interviews, with the information and data above, a mode of successful technological catching-up for IT start-ups is put forward to improve the technological catching-up of IT start-ups in Eastern China. Thus we hope to contribute to the field of technological capability by shedding some light on how IT start-ups can exploit the opportunities presented by the external knowledge base to acquire and improve internal capabilities for survival, and lately, for competitive advantage.

SD-07.3 [R] Technology Imports and Marginalization Risk of Manufacturing in China

Xiaobo Wu; Zhejiang University, China
Jian Du; Zhejiang University, China
Ying Wei; Zhejiang University, China

In the context of globalization, China is becoming one of the most important areas to bear international manufacturing transfer. Because of the weakness in innovation capability, the dominant model of China manufacturing is characterized by high resource cost and low labor force cost. It may succeed in the short-term, but would face the risk of marginalization for the long-term. This paper investigates more than 10 industries in China and demonstrates the characteristics of marginalization, which include the poor positioning in the international industrial value chain, the low rate of contribution to profit with technology of the finished products and market shares. This paper examined the key factors affecting the marginalization, and the mechanism of marginalization is also analyzed.

SD-08 Technology Marketing: 2
Sunday, 8/1/2004, 14:00 - 15:30 **Room: Kum Kang IV**
Chair(s): Jungwon Lee; STEPI

SD-08.1 [A] Customer Response Analysis and Business Strategy Direction for Telematics Service in Korea

Kyoung-yong Jee; ETRI, Korea, South
Jane J Kang; ETRI, Korea, South
Bong-jun Kim; ETRI, Korea, South
Sang-min Lim; ETRI, Korea, South

There is an unprecedented trend to create new markets from the convergence of information system technologies with traditional industries. In the center of all the changes is the telematics service, which brings the benefits of traffic information, emergency services and Internet by both mobile network and location information. In 2003, the Korean government selected telematics service as one of the new growth engines of Korea's industries and is in the process of acquiring core technologies aimed at creating and strengthening the foundation of the industry. However, despite the time and efforts by the government and the

industry, telematics service is yet to take off with its growth. Thus for a market promotion of telematics service, it is inevitable to clearly identify users' needs and establish appropriate business strategies. This study, with results from market surveys, is aimed at analyzing the market potential of current telematics service in Korea, which is experiencing a chasm in the early stage of market, and establishing service provisioning strategies. After reviewing and defining telematics service and its current and future market status, usage intention, willingness to pay, preferred devices and other specifics, services and customer reactions were empirically analyzed. Finally, service promotion factors and barriers were analyzed, and directions for business planning were developed in the view of strategic alliances.

SD-08.2 [R] Surviving the Death Valley through Strategic Marketing Alliance: A New Business Model for Japanese High-tech Start-ups

Miho Moritake; Kobe University, Japan

The previous research outlined the competitive advantage of high-tech start-ups as its core technology, while its weakness is marketing and channel development. As a consequence, the transition from invention to commercialization leads high-tech start-ups to the Death Valley, where they suffer from a high degree of failure. To better manage how to bridge these gaps, developing a viable marketing strategy, including channel development, is the critical issue. The aim of this paper is to identify a new business model of using the traditional Japanese trading company's capability and networks to meet the needs of developing marketing strategies of high-tech start-ups. More specifically, the paper examines the two different approaches of corporate venturing activity so as to help the high-tech start-ups survive through the Death Valley.

SD-08.3 [A] Knowledge Creation, Innovation and Strategic Commercial Relationships: Dupont and Festo Cases in Mexico

Celso Garrido ; Universidad Autónoma Metropolitana , Mexico
Enrique Martinez; Universidad Autónoma Metropolitana, Mexico

The tenet of this paper is to describe DuPont and Festo cases in Mexico about knowledge and innovation creation and their commercial strategies with clients in the construction of development technology based on long-run relationships to increase their competitiveness. These relationships are based on Nonaka and Takeuchi's knowledge creation model, Porter's competitive advantages and Pavitt's knowledge webs; all of them are combined with Kaplan's Balanced Scorecard methodology for measuring an organization's performance. One of the best ways to realize the effectiveness of innovation behaviors is by Capon's Key Accounts methodology, which is one of the best commercial practices in the development of long-run relationships among clients and suppliers. Both cases show how every subsidiary defines present and future innovation technology requirements that, on one hand, will be demanded by clients in future years and, on the other, are promoted by the providers (pull and push market), creating unique relationships with each client, which include customized technologies with enough autonomy respect to their corporations abroad. Thus, from marketing's point of view, the technology life cycle's process acquires new elements to asses every client's needs with the supplier's organization and technology capabilities.

SE-01 Innovation Management: 2
Sunday, 8/1/2004, 16:00 - 17:30 Room: Ballroom I
Chair(s): Charles M Weber; Portland State University

SE-01.1 [R] Product Efficiency and the Speed of Product Innovation: An Application to the German PC Market

SeogWon Hwang; STEPI, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South

In this paper a new method of measuring the speed of product innovation using the shifts of consumption efficiency frontier is suggested. Not only the static product efficiency but also the speed of product innovation are important to firms' market performance. The familiar theory of Malmquist productivity index requires basically the balanced panel, which is not the case for our quality dataset. Also, the technical variables of a product do not change over time. Only the price of the product is varying. Therefore, Malmquist productivity index is not appropriate to measure the intertemporal change of the efficiency frontier. Also, it is necessary to take into account discreteness of the consumer's choice in estimating the product efficiency frontier using hedonic data (prices and quality attributes of a group of products). Consumers cannot choose a fictitious product which is a mixture of other products. With the above considerations, I use discrete RAM (Range-Adjusted Measure) for not only consumption efficiency of products but also the shifts of the consumption efficiency frontier to measure the speed of product innovation. Empirically, the German PC market is investigated and analyzed. Product efficiency and the speed of innovation are estimated. Also, the degree of catch-up is calculated from the speed of innovation of each firm and the whole market. Market performances of firms are analyzed with the measurement results.

SE-01.2 [A] Innovations in Telecommunication Industry: Is There an End?

Jing Zhang; Beijing University of Posts and Telecommunications, China
Xiongjian Liang; Beijing University of Posts and Telecommunications, China

This paper first studies the telecommunication service demand and gives classification for the demands. By analyzing the characteristics of telecommunication consumption, it points out that the telecommunication market will reach a saturation state because of the restriction from usage time. And it is determined by the living patterns of people. Based on the analysis, the paper puts forward some directions for telecommunication service innovations. In the past thirty years, great changes occurred in the telecommunication industry. A competition mechanism was introduced into the service market, which greatly stimulated innovation activities of telecommunication operating companies. More advanced technologies have been adopted, and more new services have been launched into the market. The telecommunication service market has largely expanded in scope and scale. But in recent years, with competition getting more dramatic, the development speed of the telecommunication industry slowed down. Operators all over the world are facing more challenges in innovation. It seems difficult to find the new point of growth for the telecommunication market. Can we expect another tidal wave of telecommunication industry development?

SE-01.3 [A] Innovation in Product Development Organizations: A Case Study of Agilent Technologies

Robert P McGowan; University of Denver, United States

The paper will focus on a case analysis of Agilent Technologies and 12 product development teams. The paper will examine forces motivating the need to speed products to market and how this is integrated into rapid product development. It will explore the factors that facilitate as well as inhibit rapid product development. This presentation was also the keynote presentation at the Chinese Society for the Management of Technology Annual Conference, Hsinchu, Taiwan, December 2003.

SE-02 Competitiveness in Technology Management: 2
Sunday, 8/1/2004, 16:00 - 17:30 Room: Ballroom II
Chair(s): Ad-J van de Gevel; Tilburg University

SE-02.2 [R] An Empirical Study on Corporate 'Comprehensive' Competitiveness Evaluation Model : Korean Manufacturing Sector

Chae-Suk Lim; Hanyang University, Korea, South

The purpose of this study is to develop a structural equation model for evaluating and diagnosing corporate 'comprehensive' competitiveness, in an attempt to integrate causal model with competitiveness evaluation model, both of which have developed independently of each other. From this integration, this model may have a relative advantage to diagnose whether resource & competitive competence and process competitiveness contribute to improving market competitiveness and financial performance and whether a good linkage is established between financial performance and nonfinancial performance, between internal performance and external performance. This 'comprehensive' competitiveness model is used to analyze empirically the causal relationship of manufacturing firms' resource competence, organizational performance, process (development/manufacturing) competitiveness, market competitiveness and financial performance. For this purpose, this study has surveyed 400 Korean manufacturing firms during the period of August ~ October 2003 to

gather statistical data for the analysis. The PLS estimation method on the multi-item measurement variables has been used to measure the effects of some strategic variables on corporate 'comprehensive' competitiveness.

SE-02.3 [R] New Scope of Japanese Industrial Technological Competitiveness

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

The paper discusses how Japanese industry is tackling the issue of industrial technological competitiveness. Japanese companies were evaluated poorly in the area of technological management compared with the US in a survey by a Japanese think tank in 2000. The training of management staff and the reinforcement of training infrastructure are urgent issues for the management of Japanese companies. JAIST (the Japan Advanced Institute of Science and Technology) began a training course for MOT staff in 2003 and subsequently many Japanese universities followed their lead. The essential aim of MOT exists in the execution of strategic technological management, which can encourage efficiency and produce new industries successfully. Japanese industry is well known around the world for its top-level manufacturing technology, for example, Toyota's "Just-In-Time Production System". By expanding the concepts of "Just-In-Time Production" into R&D and management areas and making the best effort toward the integration of innovation management process, that is, "Just-In-Time Innovation", Japanese companies can make further effective use of high technological capability and become more competitive. Strategic roadmapping as a knowledge support system is expected to be as useful as "Tsunagi Gijyutu" (linkage methodology) for the systematic understanding of this integration process.

SE-03 Decision Making in Technology Management: 2

Sunday, 8/1/2004, 16:00 - 17:30 **Room: Sorak II**
Chair(s): Hongyi Chen; Portland State University

SE-03.1 [R] Requirements for Modeling Approach in R&D Decision-making

Yasuo Kusaka; Dokkyo University, Japan

The model-based quantitative approach should be more effectively applied to R&D decision-making, which includes strategic and qualitative factors. In order to successfully apply the approach to practical R&D situations, it's important to develop prototype models, introducing basic structures and important viewpoints on related problems, and, at the same time, generalizing the knowledge obtained from the approach as much as possible. Recognizing this, the author et al. have developed some prototype models in R&D decision-making. This study clarifies the requirements for the modeling approach. Specifically, it (1) generally discusses the role of the modeling approach in the era of technical innovation, (2) summarizes the two basic product development prototype models proposed in the previous studies by the author and clarifies their specific features, (3) shows that these models are also applicable to other R&D decision-making problems including new ones and thus are essential, and (4) clarifies some general requirements in applying this approach to R&D decision-making by combining the above general consideration with the knowledge obtained from our previous modeling studies. The practice of R&D modeling has remained at the level of tacit knowledge, but it may be necessary to transform the tacit knowledge into the explicit one in the era of knowledge creation. The present study should be understood as an attempt to do this and at the same time modularize the decision-making process. It will be a guideline for researchers and business people who want to use this approach.

SE-03.2 [R] A New Framework of Business Modeling Method for R&D Outputs: Valuation and Communication Tool for Engineers, Managers and Investors

Hitoshi Abe; Oki Electric Industry Co.,Ltd., Japan
Yuji Hirabayashi; Shimizu Corporation, Japan
Toshihiko Horiuchi; Hitachi , 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. Because they are now expected to create outputs not only in technology but also in business, such a tool is useful for them to bridge R&D and business. We propose a framework to construct a business model 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.

SE-03.3 [R] Innovative Strategic IT-System Investment Case in Finnish Paper Industry: Real Options Perspective

Jan Edelmann; TBRC / Lappeenranta University of Technology, Finland

Strategic information technology (IT) investments are one of the areas where the real options approach (ROA) is considered a very advantageous and usable tool to support decision making. In recent years, the amount of literature in the area of real options has increased significantly. However, there is still a lack of studies which show the applicability of ROA in strategic IT-investments evaluation. This paper presents a real investment case where a Finnish paper industry firm carried out an innovative and strategic IT-system investment in wood procurement during the years 1988-1996. This real investment case is explained and analyzed through the RO framework. It will be clarified the applicability of the ROA in the decision making process concerning this innovative IT-investment under uncertainty.

SE-03.4 [R] Innovation Management of Intellectual Capital: Measurement and Optimization Through Multicriteria Method

Ricardo G DaSilva; Universidade Catolica de Brasilia - UCB, Brazil
Feruccio Bilich; Universidade de Brasília - UnB, Brazil

Intellectual capital is becoming the preeminent resource for creating economic wealth. Tangible assets such as property, plants, and equipment continue to be important factors in the production of both goods and services. However, their relative importance has decreased through time as the importance of intangible, knowledge-based assets has increased in developing and maintaining competitive advantage in R&D. This shift in importance has become critical for managing assets such as brand names, trade secrets, production processes, distribution channels, and work-related competencies. The paper develops a working definition of intellectual capital and a framework for identifying and classifying these components. This provides exploratory systems and processes useful for meaningful management of intellectual assets. As knowledge becomes the central asset in productive and strategic terms, mainly on innovation policies, the success of the organization depends evermore on the ability to measure and optimize Intellectual Capital. The paper presents and applies a model to evaluate intangible assets employing a multicriteria decision aiding method. This method makes it possible to not only measure intangible assets such as Intellectual Capital, but also to prescribe policies for optimizing intangible assets or, in other words, how and where the organization should invest, at a minimum effort, in order to improve its market value in the technology-driven world.

SE-04 Science and Technology Policy: 3

Sunday, 8/1/2004, 16:00 - 17:30 **Room: Sorak III**
Chair(s): Jongin Choi; Hanbat National University

SE-04.1 [A] Building a Smart Regional Innovation System: Guiding Cluster Strategies in Less Advantaged Industrial Clusters of the Southern Region of Taiwan

Ting Lin Lee; National University of Kaohsiung, Taiwan

For the past decade, the Taiwan government under the policy of "North Heavy, South Light" put more emphasis on the development of the north of Taiwan than the southern region. This has resulted in uneven development between the north and south regions of Taiwan, especially in introducing, developing and supporting high technology and resource allocation in education. Clustering provides firms with access to more suppliers and specialized support services, experienced and skilled labor pools, and the inevitable knowledge leakage that occurs where people meet and talk about business. It also acts as a tool for policy making and for strategic business development in both industrialized and developing countries. We

assume there are two basic categories of less advantaged regions. The first is the older industrialized region, dominated by labor-intensive industries that have old cost advantages for newly industrialized nations. The second is the merger of industrial regions that had few potential small firms that operate with very high levels of technology and are lacking in infrastructures at this moment. The purpose of this study is not just to define and explain the pattern of each cluster in the regional economies, but also to put more emphasis on cluster-based actions and strategies that are appropriate to less-advantaged regions. Finally, the aim of this research is to build up a smart regional innovation system in the south of Taiwan.

SE-04.2 [R] Is the Japanese Small Business Innovation Research Program Effective for Innovation?

Miyako Ogura; Keio University, Japan

Small and medium-sized enterprises (SMEs) have been expected to play a key role in technological innovation. The Japanese government has enforced new framework programs to promote technological innovation by SMEs in recent years. This research examines one of these programs, the Small Business Innovation Research (SBIR), adopted in 1999 after the U.S. system. We address three questions:(?) What is the difference of SBIR between Japan and the United States?(?) In Japan, how does SBIR affect innovation? (?) Does it make a positive/negative impact on innovation? First, we compared the SBIR framework of Japan with that of the United States using government documents and found some institutional differences of SBIR between the two countries. Second, we interviewed 23 SBIR awardees in 5 prefectures (Kyoto, Osaka, Hyogo, Shizuoka and Hokkaido). Through the 23 case studies, we got some evidence that SBIR makes both positive and negative impacts on innovation. One of the positive impacts is that SBIR gives opportunity for awardees to challenge uncertain but innovative R&D that is usually difficult to do. But SBIR is not always effective for innovation by awardees. Too complicated procedures and papers of SBIR contract prevent awardees from concentrating on R&D, which delays the project.

SE-04.3 [A] Designing a Technology and Innovation Observatory for the State of São Paulo, Brazil

Abraham Oih S Yu; University of Sao Paulo, Brazil
Conceição Vedovello; FINEP, Brazil
Marcos Avó; IPT - Instituto de Pesquisas Tecnológicas, Brazil

This paper reports and reflects on the experience of a pilot project to design a Technology and Innovation Observatory (OPTI) for the State of São Paulo, Brazil. The project, sponsored by the State Government of São Paulo, started with a survey of existing Science and Technology Observatories around the world in order to gather information such as their mission, services provided, clients, funding, and organizational structure. Simultaneously, pondering some questions such as “why should we observe?”, “what to observe?” and “how to observe?”, the research team established some guidelines such as the need of attending the industrial demands for technology and innovation and related public policy, the importance of technology and market foresight, and the need to avoid duplication of efforts carried out by other organizations. A methodology was developed aimed at reviewing available information of industrial clusters, selecting important topics, and promoting the interaction between relevant stakeholders of the national and local systems of innovation including industrialists, government representatives and academics. Four industrial clusters were selected as prototypes and subjected to observation and analyses by experts. The results emerging from this project provided a preliminary design of the OPTI, submitted to the state government.

SE-05 Strategic Management of Technology: 2
Sunday, 8/1/2004, 16:00 - 17:30 Room: Kum Kang I
Chair(s): William T Flannery; University of Texas - San Antonio

SE-05.1 [R] Transformation of Corporate R&D Center in Samsung

Youngjoon Gil; Samsung Advanced Institute of Technology, Korea, South
Sangmoon Park; Samsung Advanced Institute of Technology, Korea, South

This study explores the strategic transformation of the corporate R&D center in Samsung, which rapidly leapfrogged from technological follower to innovator. Private companies have invested numerous resources into R&D activities and aligned these innovative efforts with the needs of business units to strengthen the competitiveness of existing businesses and seek new business opportunities. This case study investigates the effects of change of mission and R&D management systems of Samsung's corporate R&D center on the R&D performance and alignment with business. The performance of Samsung corporate R&D center made it difficult to satisfy the initial missions contributing to the competitiveness of existing businesses and pursuit of new business opportunities. However, the strategic transformational efforts and close linkage with business units have fundamentally changed the R&D performance and organizational capabilities since 1999. For example, the rate of technology transfer or commercialization of technology developed has reached to 61% in 2002 from 18% in 1997. Also, the ratio of foreign patent applications to all patent applications dramatically increased from 19% in 1997 to 82% in 2002. This study focuses on the transformational processes of the corporate R&D center and suggests some implications for higher R&D performance of corporate R&D centers in technological followers.

SE-05.2 [R] Intellectual Capital Management in R&D Centers

José Luis Solleiro; National University of Mexico, Mexico
Rosario Castañòn; National University of Mexico, Mexico

The accumulation of knowledge develops expertise, which is the ability to apply knowledge to different situations producing highly successful results. The relevant aspects of this expertise is recorded and shared in an organization in order to improve its performance in all the processes that are critical for it, through specific management techniques. Knowledge management has been defined as the collective use of internally and externally available knowledge, experience and competencies to attend the requirements of the organization at any time and place. Knowledge management has tactical and operational perspectives related to the planning, introduction, operation and supervision of all the activities and programs related to the knowledge needed for shaping and managing intellectual capital. The intellectual capital of a determined organization is the sum of its ideas, inventions, technologies, general knowledge, informatic programs, designs, data treatment techniques, processes, creativity and publications. Intellectual capital can be understood simply as knowledge that can be turned into benefits. The analysis of the possibilities of extracting the value of intellectual capital from Mexican research and development centers is the main motivation of this piece of research, which is based on the hypothesis that the majority of said centers have placed excessive emphasis on knowledge generation activities, leaving their valuation on the side, which has marginated them from obtaining benefits and, in the final instance, from creating greater value for Mexican society.

SE-05.3 [R] Public Research Lab Strategies for Development of Technological Competencies in LDC's: Managing External Pressures and Internal Tensions

Ricardo Arechavala-Vargas; Universidad de Guadalajara, Mexico
Claudia Díaz Pérez; Universidad de Guadalajara, Mexico

Public R&D labs in Mexico have been created recently and face an uncertain environment. Under pressure to become profitable in the short run, they struggle to develop technological competencies while at the same time trying to open industrial markets to locally developed technologies. This process faces important restrictions from other organizations in their environment: funding is scarce and unstable, industrial firms tend to rely on foreign technology, and government agencies in charge of directing S&T development lack a strong and clear institutional environment for them. In this context, public R&D labs have created strategies for development of technological competencies with different foci but also with some common features. Strategies have different degrees of success, but they also generate distinct sets of organizational tensions within them. In this paper we present results from an ongoing research project that develops intensive organizational case studies of the labs and compares their development strategies and organizational profiles. Management implications are treated at length, as well as S&T and industrial policy implications at the regional and national level, particularly with respect to the possibility of using the labs as anchors for the development of regional innovation systems.

SESSIONS

SE-06 Information/Knowledge Management: 3
Sunday, 8/1/2004, 16:00 - 17:30 **Room: Kum Kang II**
Chair(s): Kiyoshi Niwa; The University of Tokyo

SE-06.1 [R] Yin-Yang Knowledge Management Model: A Unified Conceptual Model

Jiangdian Wang; Nanyang Technological University, Singapore
Tien Hua Yim-Teo; Nanyang Technological University, Singapore

This paper defines knowledge management as a continuous process conducted to motivate human interaction and take advantage of technology for knowledge sharing and creation. The aim of KM is to maintain and improve the organization's competitive position over a long period of time. According to different views of knowledge, we summarize five KM models in literature: Objective Model, Access Model, Community Model, Process Model, and Intellectual Property Model. Based on the five KM models, we adopt Chinese Yin-Yang philosophy and provide a unified Yin-Yang KM model. Knowledge in different processes requires different KM approaches. We generally classify knowledge management approaches into two categories: human-centric and technology-centric. The human-centric approaches involve using social activities to share knowledge, and technology-centric approaches require IT tools to codify, filter, store and access the codified knowledge. In an organization, knowledge grows around a cycle following four processes, namely Socialization, Externalization, Combination, and Internalization. In a whole cycle, knowledge transforms between tacit and explicit forms. To successfully implement KM, an organization needs a dynamic balance between human-centric (Yin) and technology-centric (Yang) approaches. The paper posits that knowledge (tacit or explicit), characteristics of the tasks (explorative or exploitative), types of innovation (product or process) and motivation to control knowledge assets (through public means or private means) influence the choice of KM approaches, and that an organization should flexibly adopt appropriate approaches under different contexts.

SE-06.2 [R] Individual Learning Motivation and its Implication on Team Learning

Hing-Wih Foong; National University of Singapore, Singapore
Kah-Hin Chai; National University of Singapore, Singapore
Chee-Meng Yap; ISE, National University of Singapore, Singapore

The search for appropriate organizational learning interventions has led researchers into investigating both the “know-how” (process) and “know-what” (content) of organizational learning. The “know-why” (motivation) of organizational learning was somehow neglected, probably assumed to be rather straightforward, that is, organizations are, clearly, motivated to learn in order to remain competitive. While such learning motivation may seem straightforward at the organization level, it is far more complicated at the individual level. In fact, learning motivation has always been a major research area in the field of educational learning. However, the significance of such motivational factors does not seem to get sufficient attention in the studies of organizational learning. Without knowing why organizational learning would take place, the processes involved would always remain as black-boxes. Consequently, it is not a surprise that the organizational learning interventions are seldom successful. In this study, we propose a causal model in order to understand the antecedent motivational factors for individuals to engage in organizational learning activities. We argue that, firstly, individuals play the central role in organizational learning. Second, organizational learning is an intentional process. Third, learning is a motivated behavior.

SE-06.3 [R] The Effects of Information Technology on Organization’s Competitiveness Regarding Innovation Characteristics

Sitki Gozlu; Istanbul Technical University, Turkey
Ferhan Cebi; Istanbul Technical University, Turkey

Organizations of all kinds have experienced fundamental changes in competitiveness and market conditions in their sectors. They have used information technology (IT) to respond to and alter these changes in order to maintain and/or improve their competitive position. IT has increasingly been a crucial source of organizations' competitiveness. This study aims to investigate the effect of IT on organizations' competitiveness in financial service sectors such as banking, insurance and stock brokerage firms. IT's effects are analyzed with regards to innovation types -product and process innovation, radical and incremental innovation - and adoption time - first/early and later adoption. It is questioned whether there are any differences in the perceived importance of IT's benefits expected from the adoption of IT innovation as well as the achievement level of these expectations regarding to the above stated issues. A field study including 260 financial organizations in Turkey was conducted to obtain the data to answer the research questions. The results obtained from 66 companies reveal that adoption time of IT yields significant differences in the achievement of the expectations from IT, whereas the innovation types do not create significant differences in the perceived importance of the benefits from IT and the achievement of expectations from IT.

SE-07 TUTORIAL: Technology Management Education and Research - Current Status and Strategic Directions
Sunday, 8/1/2004, 16:00 - 17:30 **Room: Kum Kang III**

Speaker: Dundar F. Kocaoglu, Professor, Portland State University

The status of Engineering and Technology Management education and research is described, and critical questions are raised about the key issues evolving in this growing discipline. The results of a worldwide study are presented as the focal point of the tutorial.

SE-08 Technology Marketing: 3
Sunday, 8/1/2004, 16:00 - 17:30 **Room: Kum Kang IV**
Chair(s): Peter J Sher; National Chung Hsing University

SE-08.1 [A] Value-Based Pricing For New Software Products: Strategy Insights for Developers

Robert Harmon; Portland State University, United States
David Raffo; Portland State University, United States
Stuart Faulk; University of Oregon, United States

Software pricing has traditionally been focused on the vendor’s internal business objectives of covering costs, achieving specified margins, and meeting the competition. Pricing methods such as flat price, tiered pricing, MIPS-based, usage-based, per user, per seat, and pay as you go, are often tactical in nature and easily matched by competitors, which can undermine profitability by accelerating the commoditization process. Conversely, a value-based approach charges a price based on the customer’s perceived value of the benefits received. Value-based pricing methodologies can be used to estimate the market value of new software concepts at various stages of the development process in addition to pricing new products for launch. This paper describes a value-based approach to pricing that is dependent on the firm’s commitment to invest in the development of its long-term “pricing capital.” This investment in methodologies, infrastructure, and processes to create, measure, analyze, and capture customer value is the key to successful long-term pricing strategy.

SE-08.2 [R] Decision Making Process of Licensees: How to Evaluate the Invisible Value

Michi Fukushima; Tohoku University, Japan
Toshiya Watanabe; University of Tokyo, Japan
Shigemi Yoneyama; Musashi University, Japan
Dai Senoo; Tokyo Institute of Technology, Japan

The purpose of this research is to provide a model explaining how to determine the economic value of licenses before they appear in concrete form. Our research especially focuses on the decision-making process of licensees, which includes uncertainties and risk. In this research, we deal with the technology transfer activities by the university technology licensing offices (TLOs) in Japan. Thirty six TLOs have been authorized in Japan since 1998, and they are one of the main players of technology transfer in Japan. According to the interviews with the TLO and its licensees on the technology transfer that they engaged in, it turned out that the licensees faced serious problems in the process. We can attribute one of the causes of these to the technology the TLOs have, which is immature for commercialization. It is quite difficult for licensees to evaluate their accurate economic value before the technology becomes concrete. Under these circumstances, how do licensees make

determinations about licensing? What kinds of factors have an effect on their decision-making process? Although a lot of research so far has seen these things from licensers' points of view, our research introduces licensees' view and tries to combine them to create a comprehensive model, making this research unique.

SE-08.3 [R] E-Service Value: Effects of Consumer Knowledge and Risk Perceptions

Chien-hsin Lin; National Chi Nan University, Taiwan
Hsin-Yu Shih; National Chi Nan University, Taiwan
Peter J Sher; National Chung Hsing University, Taiwan

Technology-based service provides greater value for consumers than traditional non-technology-based service. While most studies stress the importance of technology as a service instrument, some contend that consumers may feel incapable of or be reluctant to interact with technologies. Therefore, while technology may increase consumer value, perceived value may be leveled off because of improper consumer knowledge or risk perceptions regarding technology. This study extends the concept of technology service value from two perspectives: consumer product knowledge and consumer risk perceptions. Two experimental studies were conducted, demonstrating that both knowledge and risk are critical moderators between value components and technology value perceptions.

MA-01 PLENARY SESSION – 2

DATE: MONDAY, AUGUST 2
TIME: 09:00 – 10:30
ROOM: BALLROOM

Session Chair: Dr. Kwan Rim, Chairman, SAIT (Samsung Advanced Institute of Technology, Korea

KEYNOTE – 1

Jong-Yong Yun, Vice Chairman, Samsung Electronics Co., Ltd., Korea

"The Technology Revolution and Management: Digital Convergence, Now and the Future"

KEYNOTE – 2

Dr. Seiichi Watanabe, Consultant, Sony Corporation, Japan

"Technology Driven Business Creation - From the Study at JATES and the Cases at Sony"

The prevailing Internet with the broadband accessibility is opening up great opportunities in the consumer industry as well as in business. In this revolutionary transformation, the traditional operating functions such as production, sales, distribution, etc. seem to become increasingly commoditized owing to the speedy information access and sharing. Under such an environment, the R&D side would be expected to take initiatives in creating major corporate values and thus opening the promising future for the corporation.

The joint study at JATES (Japan Techno-Economics Society) has aimed for discovering formulas to apply to those who wish to take advantage of such a change and let their R&D teams revitalize the company. The conclusion of the study includes proposals to the top management to allow strong autonomy to R&D for taking initiatives.

Many of the new business creations and resulting growth at Sony have been driven by technological innovation. How such innovation has been managed to create revolutionary success for the company would be informative to those who wish to turn R&D value to major corporate values in this rapidly changing business environment.

MB-01 Innovation Management: 3
Monday, 8/2/2004, 11:00 - 12:30 **Room: Ballroom I**
Chair(s): SeogWon Hwang; STEPI

MB-01.1 [R] Anatomy of the Front End of Innovation: Contents, Shortcomings and Trends

Jouni Koivuniemi; Lappeenranta University of Technology, Finland

The findings in earlier technology management research clearly show that the management of the front end of innovation in companies is still experienced as a major challenge. There is a lack of practical approaches and tools, and even a lack of a commonly accepted vocabulary for innovation in companies on how to manage the early phases of new product, service and business development. The purpose of the paper is to provide a critical analysis of the goals and contents of the front end of innovation. The paper aims at constructing a relational model to examine the linkages between the aims of innovation, the front end of innovation as a business process, and other business domains. New emerging trends, the open innovation paradigm, cross-organizational arrangements in the early phases of innovation, and the potential of integrated IT based systems as the next phase in the evolution of front end models are discussed. A modern networked organization needs to understand the front end of innovation as an organic part of its business system. Organizations get connected to the origin of their business value creation as soon as they integrate the front end of innovation explicitly to other business processes.

MB-01.2 [R] Implementing Management Technology in a University: A Case Study

Jay L Tontz; California State University, Hayward, United States
Sam Basu; California State University, Hayward, United States

In the mid 1990's our University was directed to adopt the PeopleSoft sofeware to manage the institution. The university decided to implement three modules: Human Resources, Budgets and Purchasing, and Student Records. At that time our University followed the traditional academic staffing organizational model. Each academic department had a department secretary. Secretaries maintained the processes used to hire, retain, and promote faculty and staff, the budgets and purchasing functions of the department, and student records, as well as organizing advising and registration in department courses. Given this structure, the plan was to train each department secretary in each of the modules. When the administration of the School of Business reviewed the implied costs in time away from the job for training, and the appropiateness of this traditional staff structure, it decided to embark on a bold alternative organizational structure. This change in managment technology offered us the opportunity to look to new ways to organize our staff and develop a more efficient operation with improved services for our faculty, staff, and students. This paper traces the history of this conversion. It discusses the characteristics of the new management technology, the processes the administration followed in convincing the individuals involved to adopt the new technolgy and organizational structure, and the lessons learned in the process. We believe we have been successful in making the transiion and have evidence that the quality of services performed by our staff have increased over time.

MB-01.3 [R] A Study on the Shift of Innovation Paradigms Based on the Habitual Domains Theory

Lei Ma; Zhejiang University, China
Jin Chen; Zhejiang University, China
Liang Tong; Zhejiang University, China
Ying X Wang; Zhejiang University, China

The complex, uncertain and global competition today requires the enterprises to change the innovation paradigm, such as the shift from close innovation paradigm to open innovation paradigm. Based on the framework of the enterprise habitual domains theory, this paper provides a mechanism of the innovation paradigm change. First, we define innovation habitual domains. Second, we review the innovation paradigm by analyzing the close innovation and open innovation. And we propose that the shift of close innovation paradigm to open innovation paradigm is in fact the breakthrough of the habitual domains. Third, we take UTStarcom

as an example to illustrate this mechanism. Finally, we propose some effective ways for the shift of the innovation paradigm.

MB-02 Project/Program Management: 1
Monday, 8/2/2004, 11:00 - 12:30 **Room: Ballroom II**
Chair(s): Dragan Z Milosevic; Portland State University

MB-02.1 [A] Adaptive Project Management Model for Wireless Technologies

Leonid B Preiser; National University, United States

Proliferation of wireless technologies and, in particular, the issues that developers and technical managers need to account for - how to integrate wireless applications into mobile devices and enterprise networks - calls for the development of new standards and opportunities aimed at the design of more effective and efficient project management tools and methodologies. The proposed Adaptive Project Management Model has been conceptualized to include twenty five Associate Analysis Areas (AAA) mapped into the five Interacting Layers (IL). Those ILs are: wireless-business layer, applications layer, knowledge management layer, telecommunications layer, and engineering/technology layer. For each IL, the respective sets of AAA have been structured to accommodate for volatility of the Environmental Interacting Components, such as International Standards Organization, International Telecommunications Union, American National Standards Institute, Institute of Electrical and Electronics Engineers, telecommunications carriers, regulatory agencies, vendors, manufacturers, business customers, and legislative bodies. A seven-layer open interconnection system was included in support for the architecture of telecommunications IL allowing for accurate inventory of the protocol conversions associated with any wireless project. The proposed model has been tested through implementation into the capstone Telecommunications projects at National University.

MB-02.2 [R] Challenges in Global Software Projects Management

Nazmun Nahar; University of Jyväskylä, Finland
Najmul Huda; Tallinn Technical University, Estonia
Jaak Tepandi; Tallinn Technical University, Estonia

Increasingly, software companies are undertaking global software development projects in order to reduce project completion time, reduce costs, and gain competitive advantage. In a global software project, various tasks (e.g. planning, budgeting, controlling, requirement analysis, architectural design, coding, etc.) are performed in various locations around the world. Some tasks are performed concurrently and others are performed chronologically in different parts of the world. A variety of new and very tough challenges are encountered in global software projects due to distance, time zone differences, technological differences, people emerging from several cultures, and other factors. Due to these new challenges and high complexity, many of the global software projects fail. A limited empirical research has been conducted on challenges in global software project management and its remedies. Therefore, this study explores and identifies the key challenges in global software projects and the remedies to overcome these challenges. In order to execute the research, we make a literature review and utilize a multiple case study method. The research results can guide the software firms to tackle these challenges of global software projects effectively, avoid failure, and obtain high benefits from global software development projects. This research also suggests the future research directions.

MB-02.3 [A] The Benefits of Global Delivery Models to Enterprises in Technology-Based Organizations

Salvatore Savino; Cap Gemini Ernst & Young, United States

The use of nearshore and offshore technology centers for sourcing information technology work at the best prevailing prices are moving into mainstream purchasing patterns of technology-based corporations. This year, approximately 40% of these corporations will have completed some pilot or will be sourcing through a global delivery model (GDM) for application-related services. GDMs are becoming more important in developing and maintaining competitive advantage. As enterprises evaluate the leveraging of global resources, understanding the associated risks will be essential to the long-term success of the strategy. There are key considerations for establishing an integrated model that will ensure effective management of this technology. These include infrastructure, program management, data security and project candidates. This paper defines a GDM and describes its essential characteristics. It will look at the offshore markets and analyze center costs and capabilities. This paper will also present a successful offshore delivery model, a sample workflow for managing applications offshore, and creative ways, which were used to resolve the issues and risks, associated with such an endeavor.

MB-03 Decision Making in Technology Management: 3
Monday, 8/2/2004, 11:00 - 12:30 **Room: Sorak II**
Chair(s): Antonie de Klerk; University of Pretoria

MB-03.1 [A] MADM Approach for Selection the Performance of Outsourced ERP Systems in the Data-Communication IC Design Industry in Taiwan

Tsai-Hua Kang; National Chiao Tung University, Taiwan
Benjamin J. C. Yuan; National Chiao Tung University, Taiwan
James K. C. Chen; National Chiao-Tung University, Taiwan
Yuan-Hsin Wang; MA in Finance and Investment of Exeter University, United Kingdom
Jan-Mou Li; National Chiao Tung University, Taiwan

The growing maturity of the foundry industry has led to a rapid growth in the IC design industry in Taiwan. Being the second largest in the world, the Data-communication IC design in Taiwan is a highly competitive industry. For Data-communication IC design companies, focusing on their core businesses, i.e. IC design, is to enhance their competitiveness. Outsourcing the Enterprise Resource Planning (ERP) systems of the IC design house helps reduce their financial burdens. The Data-communication IC design industry is knowledge-intensive, so the ERP outsourcing is very important for IC design companies. Finding a good ERP provider is a very important issue.

MB-03.2 [R] A Quantitative Model for the Strategic Evaluation of Emerging Technologies

Nathasit Gerdsri; Portland State University, United States
Dundar Kocaoglu; Portland State University, United States

This paper presents a quantitative model used for evaluating the impact of emerging technologies on a company's objective. The hierarchical model with four levels (objective-criteria-factors-technology alternatives) is structured to decompose the complex decision problems and incorporate quantitative and qualitative aspects into the evaluation process. A new approach on applying a semi-absolute scale to quantify the values of technologies is proposed in conjunction with the determination of criteria priorities and the relative importance of factors under each criterion. The impact of technologies on a company's objective is calculated as a composite index called Technology Value. The improvement gap and improvement priority of each technology are also determined to identify the characteristics of the emerging technologies on which technology-driven companies would focus in order to maximize the impact of those technologies on the company's strategic objectives. A case study is included in the paper to illustrate the applicability and computations of the proposed model.

MB-03.3 [R] FMCDM Approach for Evaluating the Strategies of Fuel Cell Development in Taiwan

Benjamin J. C. Yuan; National Chiao Tung University, Taiwan
Gwo-Hshiung Tzeng; Industrial Technology Research Institute, Taiwan
Chien Pin Wang; Industrial Technology Research Institute, Taiwan

The fuel cell is one of the most important energy products in the 21st century, and most industrially advanced countries in the world are placing high expectations on its development. In Taiwan, applications of fuel cells are spread broadly to many products in which Taiwan takes a high global market share, such as notebook computers, PDAs and digital cameras, along with items like automobiles, motorcycles and power generation equipment. This study aims to help the establishment of the fuel cell industry in Taiwan. Through identifying relevant challenges and issues and evaluating the development priority, the study proposes a strategic solution for sustainable development of the domestic fuel cell industry. It adopts the Analytical

Hierarchy Process (AHP) method for the index weighting distribution, and ranks the criteria according to the Fuzzy Multi-Criteria Decision Making (FMCDM) concept. It is the first research paper in the topic of Taiwan fuel cell development to combine the two theoretical approaches, and offsets the obstacle of ambiguous vocabularies usually occurring in traditional questionnaire survey approaches. The conclusion suggests that the priorities for Taiwan to develop the fuel cell are the fields of 3C electronics (Information /Communication and Consumer products), power generation equipment, motorcycles and automobiles. The encountered difficulties the industry has faced, in turn, are the technology bottlenecks, insufficient R&D investment, high costs, unclear government policy and short supply of R&D professionals. Experts believe the top five strategic actions for the problems are to realize a clean energy policy, establish a national-level research program, increase the R&D budget, carefully select the niche products and to plan the operating demonstrating or pilot zone. The result will serve as a reference for the government to stipulate relevant industry policy.

MB-04 Science and Technology Policy: 4
Monday, 8/2/2004, 11:00 - 12:30 **Room: Sorak III**
Chair(s): Heeseung Yang; Sejong University

MB-04.1 [A] Leverage Strategy to National R&D Investment in Korea: A System Dynamics Approach

Seahong Oh; KISTEP, Korea, South
Hunjoon Park; Yonsei University, Korea, South
Sangjoon Kim; Yonsei University, Korea, South

Various conflicting situations arise when the government decides the R&D investment area and makes an indispensable choice. Difficulty in the decision can be amplified due to misalignments among decisions on the adequate amount of R&D investment ("strategic loop"), R&D system ("structural loop") and acceptance and realization by an R&D laboratory and its researcher ("efficiency loop"). This study aims to grasp the invisible yet dynamic systemic structure that influences the general procedure of the national R&D investment system in Korea using "system dynamic method" and to suggest policy lever. Results of modeling and simulation with consideration of cyclic causal loops show that it is desirable to concentrate the R&D investment on industrial development research in order to develop strategic technologies, but increase in the investment for basic research is needed in order to strengthen research capability. Furthermore, this study identifies delays and side effects during transition periods between different stages of technology innovation by perceiving the switching pattern dynamically, in which the form of technologies shifts from one to another stage like a paradigm shift, when the R&D investment reaches a certain stock. It is also suggested that the development of strategies is necessary in order to enhance efficiency of the technological development process.

MB-04.2 [A] An Analysis of the Role of Government with Respect to Promoting Domestic Innovations in the Manufacturing Sector of Iran

Mohammad Halimi; Department for Hi-Tech Industries, Iran

The system of innovation perspective is a convenient framework to understand the process of innovations occurring in an economy and especially within the manufacturing sector. In this framework, the economy is decomposed into various components such as the government, independent research institutes, firms and the higher education system, which supplies human capital to firms, research institutes and the government. The success of an innovation system depends very much on how closely knit the relationship between the various components are. Needless to add, innovation policy instruments and institutions play a very important role in cementing the relationship between various components. An application of this framework to the situation in a specific country is very useful in identifying the systemic failures that hamper the generation of innovations. In this paper, this framework is applied to understand the innovation system of Iran, whose economy is a mixture of central planning, state ownership of oil and other large enterprises, and small-scale private trading and service ventures. The study will use the national system of innovation perspective. The study will also use a mix of primary (direct personal interview of key personnel in the Ministries) and secondary (the Statistical Centre of Iran) source materials. The study is supported by the Department for Hi-Tech Industries of Iran in collaboration with UNU/INTECH.

MB-04.3 [A] Mixing Silicon Valley and Mexico Together - a New Technological Innovation Model in Hong Kong

Ricky Ma, Hong Kong Science and Technology Parks, Hong Kong

This paper will describe the new innovation and technology policies and technology transfer model to encourage the upper stream production activities in Hong Kong and support the down stream production operations in its neighboring Pearl River Delta region in Southern China. It will also examine how local industries are taking benefits of the new technology infrastructure to manage their high value added processes in the production value chain. Such a technological innovation model is similar to mixing Silicon Valley and Mexico together which is very unique in the world.

MB-05 Strategic Management of Technology: 3
Monday, 8/2/2004, 11:00 - 12:30 **Room: Kum Kang I**
Chair(s): Jinho Kim; University of Texas at Arlington

MB-05.1 [A] A Technology Relation Analysis for the Evaluation of R&D Projects in the Defense Technology Sector

Kwang-Ho Jang; Seoul National University, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South
Young-Hoon Kim; Seoul National University, Korea, South
Si H Joo; Seoul National University, Korea, South

The subject of this study is "A Technology Relation Analysis for the Evaluation of R&D Projects in the Defense Technology Sector". The purpose of this study is to derive the overall technology-relation matrix and discuss its applications based on the previously done research in order to formulate R&D strategies for the defense technology sector. This study analyzes the technology-relation matrix, develops an empirical model, and applies it to the R&D projects in the area of defense technology. We measure R&D stock in the defense technology sector and their associated spillovers in order to assess the extent of allocative efficiency of the R&D expenditure across a set of peer groups of R&D projects. We also combine technology-relation analysis with the measurement of the defense technology R&D stocks. We identify the technological relationship between various defense-related R&D technologies and research projects, also estimating this relationship empirically. We extended our analysis to the grouping and mapping of analogous research projects using the co-word analysis, resulting in the construction of a technology matrix for the defense sector. Based on our empirical results we formulate policy implications for managing the defense technology.

MB-05.2 [R] Linking the Technological Regime to the Technological Catch-up: An Econometric Analysis Using the US Patent Data

Kyoo-Ho Park ; Seoul National University, Korea, South
Keun Lee; Seoul National University, Korea, South

This paper conducts an econometric analysis of the relationship between the technological regime and the possibility and degree of technological catch-up, using U.S. patent data. In this work, we have identified new elements of the technological regimes that are relevant in the context of catch-up, and they are access to external knowledge flows, uncertainty or fluidity of technological trajectory, initial stock of technological knowledge, and technological cycle time. One of the more robust and specific findings is that the higher appropriability and long cycle time of technology of a sector implies a lower possibility and degree of technological catch-up and hence lower level of technological capability attained by catching-up economies. To put it simply, this finding implies the barrier of entry caused by appropriability and, at the same time, the window of opportunity opened up by the rapid technological change as asserted by the leapfrogging argument. The study also confirms the organizational selection hypothesis such that the firms of different organizations and strategies show divergent degrees of fitness in the different environment or technological regime. We find that the Korean firms find themselves less fitted in such environments featured by high fluidity and high frequency of innovations, whereas the Taiwanese firms are less fitted by high originality and low spill over.

MB-05.3 [A] Strategic Analysis of the Brazilian Aeronautical Cluster

Jose Henrique S Damiani; Institute of Aeronautical Technology (ITA), Brazil
Arnoldo S Cabral; Institute of Aeronautical Technology (ITA), Brazil
Ligia Maria S Urbina; Institute of Aeronautical Technology (ITA), Brazil

The paper analyses the Brazilian aeronautical cluster and its anchor company, Embraer, which is located in the city of São José dos Campos, State of São Paulo. Embraer, a Brazilian company established in 1969, is one of the country's leading exporters, placing itself in a selected group of national enterprises that are competitive in international high–tech markets. The model developed for the cluster study is based on Michael Porter's analytical framework for cluster analysis, and it follows closely the indicators utilized by the U.S. Competitiveness Council in order to preserve a comparative approach. Thus, the paper studies the regional economy where the cluster operates and its performance. Lessons learned are emphazided throughout the research. Finally, the challenges to sustain its current competitive advantages are presented.

MB-06 Information/Knowledge Management: 2
Monday, 8/2/2004, 11:00 - 12:30 Room: Kum Kang II
Chair(s): Charles M Weber; Portland State University

MB-06.1 [R] A Framework for Designing ICT Systems that Enhance Innovative Clusters Performance

Gilson D Santos; Federal Center for Technological Education (CEFET), Brazil
Fernando José A Schenatto; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil
Beatriz T Borsoi; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil

In previous research, a model that shows the interaction between the various actors involved in the process of technology development in Pato Branco was developed. The purpose of the present paper is to describe a framework to design a communication platform that enables interorganizational interaction, specifying a framework that includes information systems, protocols and personnel involved. The information system is designed to support interorganizational communication, facilitating the storage and retrieval of information. The protocols are defined according to the values and agents involved, determining the best media and format to be used. The human aspect is focused on the interaction between network agents, considering cultural aspects and their evolution. In this research, communication platform is defined as an interorganizational system that aims to maximize the interaction between network agents, considering personnel management, communication standards and information systems. This research is exploratory, based on references and dialectic and phenomenological analysis. The result suggests a framework for developing a knowledge management system, focusing on the definition of the best protocol. The utilization of theories to define the best protocol enables the agents to help build the network communication platform that considers individualities and adds flexibility, efficiency and dynamism to the network.

MB-06.2 [R] The ICTs Distributor's Perspective on the Assessment of Information Quality for the Automated Information Systems

Athakorn Kengpol; King Mongkut's Institute of Technology North Bangk, Thailand
Markku Tuominen; Lappeenranta University of Technology, Finland

The objective of this research is to propose an assessment to the Information and Communication Technologies (ICTs) distributor firm in convincing its customer on the investment in Information Quality (IQ). The contribution of this research is in applying IQ to improve the accuracy, completeness, consistency and validity of Automatic Information System (AIS) in order to minimise risks of current customer loss and potential customer loss. The benefits of this research to the ICTs distributor firm lies in that it can be used to convince and reassure its customers on the investment in IQ hardware or software or both. The core set of IQ and Benefits/Costs/Risks/Opportunities (BCRO) analysis have been presented through a case study, which is a medium-size textile and garment industry in Thailand. Several designed procedures in AIS have been upgraded to minimise its mismatched data. The major result indicates that, with the enhancement of IQ project, the risk cost of losing current customers has been dramatically reduced compared with the risk cost of losing potential new customers. The other results, limitations and recommendations are also presented.

MB-06.3 [R] The ICTs User's Perspective on the Assessment of Information Quality for the Automated Information Systems

Athakorn Kengpol; King Mongkut's Institute of Technology North Bangk, Thailand
Markku Tuominen; Lappeenranta University of Technology, Finland

The objective of this paper is to assist the end user in the assessment of the Information Quality (IQ) investment for the Automatic Information System (AIS). The contribution of this research is in developing a new approach embedded in Total Data Quality Management (TDQM) process at the Benefits/Costs/Risks/Opportunities (BCRO) Analysis by using the Analytic Network Process (ANP) model to obtain the ranking (B*O/C*R) that is flexible and applicable to the business to customer (B2C) users who are planning to find the most appropriate investment for their IQ systems. The value of this research lies in the methodology for integrating quantitative and qualitative analysis which can be implemented in a real industry. The assessment of IQ has been presented through a case study, which is a medium-size textile and garment industry in Thailand. The major result indicates that costs are amongst the most important to the firm. The other results, limitations and recommendations are also presented.

MB-07 Technology Management Education: 2
Monday, 8/2/2004, 11:00 - 12:30 Room: Kum Kang III
Chair(s): Marthinus W Pretorius; University of Pretoria

MB-07.1 [R] R&D Management Literacy

Hiroyuki Yamasaki; Renesas Technology Corp., Japan
Takeo Matsubara; Innovation Promotion Association-Japan, Japan
Shin'ichi Otsuki; Hannan University, Japan

Practical education, as related to research and development (R&D) management, has finally taken hold in Japan and has been increasingly applied in recent years. Of the greatest importance here is the philosophy behind management of technology (MOT) and literacy in general. Key points that must be understood to foster R&D management literacy include: 1) the relationship between R&D and profitability, 2) the application of customer-focused (CF) innovation, 3) the fostering of talented individuals to become leaders, and 4) the relationship between R&D uncertainty and risk. Today, R&D management literacy is a key element required for determining whether or not it is possible to overcome problems in real-world situations.

MB-07.2 [R] An Analysis of the Development of Successful Engineers: The Structure and Cultivating Factors of Engineer Competence

Midori Kato; Tokyo Kiezai University, Japan
Yoshiya Teramoto; Waseda University, Japan
Makoto Kanda; Meiji Gakuin University, Japan
Toru Takai; Nihon University, Japan
Caroline Benton; University of Wales Validated MBA Programme, Japan
Toru Uchida; Waseda University, Japan

This paper discusses the factors effective for the development of successful engineers and a structure of engineer competence through interviews with engineers who have been successful in achieving results and a questionnaire survey of respondents whose overall profile was similar to that of the general populace of the Japanese manufacturing industry. Our study shows that the factors effective for training successful engineers and the average engineer differed. Tasks from bosses are critical and have great influence on educating engineers, while difficult challenges are not effective for all the engineers. In addition, we suggest that successful engineers achieve the results with "leverage competence" to leverage organizations through the interaction with various factors of the organizations, although less-successful ones have less interaction with their organization.

MB-07.3 [R] Not Just Technologists: A Delphi Study on the Future Skills Needs of UK Engineering

Nigel Spinks; Henley Management College, United Kingdom
Jean-Noel Ezingeard; Henley Management College, United Kingdom
David W Birchall; Henley Management College, United Kingdom

SESSIONS

The engineering industry is at the forefront of technological innovation, but as Reich points out, it is the human "software" that underpins that innovation. It is not surprising, therefore, that workforce skills have been a long-standing concern for policy makers and business managers in the UK (Hogarth and Wilson 2001; CBI 2004). Finding ways to develop the skills that businesses need to be competitive in the future is seen as a key challenge for the UK economy (DfES 2001). The engineering industry is a sector which has particular concerns in this regard. It was against this background that the current research was undertaken to identify the future skills needed by the engineering industry in order to inform the ongoing policy debate on education and skills in the UK . Building upon research presented at PICMET 03 (Ezingeard, Birchall et al. 2003), focus groups and an online Delphi Study were used to identify key skills that industry members believe will be important over the next two decades for employees, professional engineers and those in managerial and supervisory roles. The paper begins by setting the scene with a review of how skills have been conceptualized and measured in previous studies. Particular attention is paid to forecasting techniques and the Delphi Method in particular. A short review of the methodology is then followed by a discussion of the results of the Delphi.

MB-08 Collaborations in Technology Management: 1
Monday, 8/2/2004, 11:00 - 12:30 **Room: Kum Kang IV**
Chair(s): Jun Numata; Musashi Institute of Technology

MB-08.1 [R] Success Determinants of Industry-University Collaboration Projects: An Empirical Analysis in Chinese Technology-Based Firms

Bin Guo; School of Management, Zhejiang University, China
Zhiyu Xie; School of Management, Zhejiang University, China
Yongyi Shou; School of Management, Zhejiang University, China
Huifang Wu; Zhejiang University, China

There are increasing pressures on technology-based firms in China to continually commercialize new technologies in order to ensure long-term competitiveness under the intensifying competition both domestically and from abroad. And more and more firms are aware of the urgent need to gain more benefits from industry-university collaborations beside their in-housing R&D, such as cost sharing and source of external expertise. This paper first gives a perspective for success determinants of industry-university collaborations at the project level, and then builds up a conceptual model with four dimensions, i.e., the player dimension, nature of project, organizational modes, and external environment. It is pointed out that if managed correctly, these will increase the probability of a collaboration being perceived as successful by both academic and industrial partners. Also, by a dataset obtained from questionnaires and a comparative in-detailed analysis on two typical projects, some supporting demonstrations are advanced for these determinants and their interrelationships, as well as the meaning of policy making.

MB-08.2 [A] Innovational Corporations between The Academy and The Industry: The Views from inner China (Nanjing, Wuhan, Xian, Chengdu) and The Lessons for Taiwan

JJ,Jou-Juan Pan; National Chengchi University, Taiwan

Along with the openness of the economic system and an aggressive economical growth policy, there are heavy corporations between the academy and the industry in inner China. While past research focused more on the costal regions of China, this article interviews the inner parts of China, including organizations in Nan king, Wuhan, Xian and Chengdu, and finds the benefits or effects of these corporations, the necessary factors to build up successful corporations, and the meaningful implications to other emerging economic entities like Taiwan.

MB-08.3 [R] The Locating Analysis of Technological Innovation for Chinese Pharmaceutical Firms: Based on the View of Strategic Networks

Xiaobo Wu; Zhejiang University, China
Ying Wei; Zhejiang University, China
Dongqin Li; Management School, Zhejiang University, China

We argue in this paper that for technological innovation, Chinese pharmaceutical firms should pay more attention to their strategic networks rather than only research institutes and universities, which most of the firms have usually focused on in the past decade. Using the field study approach, the strategic network of a pharmaceutical firm is analyzed as a firm's set of relationships with research institutes, universities, other pharmaceutical firms and so on, in which network members and tie modality are both important strategic resources. A case study is employed to illustrate that strategic networks could promote technological innovation of the firms. With the introduction of a sketch map for technological innovation, Chinese pharmaceutical firms should find, in cooperation with their strategic network members, ways to improve management and the capability of technological innovation in various ways by obtaining technological resources and capital support beyond their boundaries.

MD-01 Innovation Management: 4
Monday, 8/2/2004, 14:00 - 15:30 **Room: Ballroom I**
Chair(s): Kongrae Lee; STEPI

MD-01.1 [R] Searching for a New Legal and Institutional Fix: Changing Korean Techno-Park Policies towards a Regional Innovative Hub

Johng-Ihl Lee; Korea Industrial Technology Foundation, Korea, South
Sung-Hoon Jung; Korea Industrial Technology Foundation, Korea, South
Chan-Jun Kim; Korea Industrial Technology Foundation, Korea, South

The aim of this paper is to examine reasons for changing Korean Techno-Parks' (TPs) policies from hardware-centered (focused upon building the infrastructure of the park) to software-focused policies (based upon establishing a regional innovative "hub"). This change is directly related to the successful establishment of TPs' infrastructure at the first stage (1998~2003). Additionally, it has been deeply concerned with the transformation of Korean regional policies since 2003, which is focused upon the improvement of a regional autonomy and region-specific innovation capacity. Within these contexts, searching for a new legal and institutional fix to make each TP a regional innovative hub is the most important task. Consequently, this issue links to roles of the state-driven regional innovation supportive systems (RISS) in the further development of regional industrial clusters and at the same time, links to making different types of governance structures over such regional industrial clusters and innovative hubs. This paper is divided into four sections. Firstly, theoretical approaches to RISS are explored. Secondly, trends in the establishment of RISS and regional industrial clusters are outlined. Thirdly, the necessity and feasibility of changing Korean TPs' policies are examined. Finally, different types of governance structures over regional industrial clusters and TPs are presented as new models of endogenous regional development in Korea.

MD-01.2 [R] Role of New Stock Market; Kosdaq in Creating and Growing Korean Innovative New High-tech Start–up: In the Center of Financial Innovation Network Analysis

Youngseok Yang; ETRI, Korea, South
Hoyoung Hwang; ETRI, Korea, South

High-tech firms, so called "high-tech start-ups," have initiated and still orchestrate innovation management since the 1999 venture boom of Korea. Many high-tech start-ups during this period were spin-offs of diverse research institutes with new ideas and new technologies. By commercializing the process of starting a new business, they have brought new products and penetrated them into markets. As a result, they made a big success in the first round of innovation management in Korea. However, besides new ideas, new technologies, and new products, abundant venture funds have mainly triggered the success of Korean high-tech start-ups. In particular, the role of Kosdaq - new stock markets - was enormous in the venture boom bio-cycle. In short, Kosdaq has nurtured a innovation process of high-tech firms through this period. Therefore, efficient Kosdaq have become a prerequisite of maintaining successful innovation management of high-tech firms in Korea. This paper is aimed at two things. First, this paper analyzes how the stock market is interlocked with innovation management of high-tech firms in Korea. Second, it focuses on testing how much Kosdaq has been an efficient stock market so far since the 1999 venture boom of Korea. In particular, the focus of the market efficiency test falls on the inquiry of "Is the Kosdaq stock market efficient enough to lead successful innovation management of high-tech firms constantly?"

MD-01.3 [R] Innovation Management in the Australian Government: Cost and Benefit of R&D Tax Concession Program

Joseph Yoon; Department of Industry, Tourism and Resources, Australia
Yong-Eun Moon; Silla University, Korea, South

In industrialized countries, innovation is a key source of economic growth. Research is a key driver of technological innovation and involves the process of systematic investigation and/or experimentation to discover new knowledge. The Governments' industry innovation policy supports a business focus on Research and Development (R&D) through a range of programs in order to achieve these aims. The Innovation Statement (DISR 2000, 20010), launched by the Australian Prime Minister in January 2001, commits an additional $3 billion over five years to encourage and support innovation. The Australian Government aims to build world competitive firms and a strong research capability in industry to strengthen Australia's international competitiveness and increase national prosperity. It develops policies and programs to enhance investment in innovation. The Australian Government has established a number of R&D funding support programs aimed at increasing the level of R&D in Australia. The backbone of these programs is the tax concession program, which is made up of the 125 per cent R&D tax concession, the 175 per cent premium tax concession and the tax offset. Over 4000 businesses take advantage of the tax concession scheme, which costs the government around $400 million a year. This cost is expected to rise to over half a billion by 2005-06 (Commonwealth of Australia, 2003). Ensuring these resources are invested where they provide significant national economic benefits is a major policy issue. In this sense, this paper looks at the appropriateness, effectiveness and efficiency of the R&D tax concession with costs and benefits analysis.

MD-02 Project/Program Management: 2
Monday, 8/2/2004, 14:00 - 15:30 **Room: Ballroom II**
Chair(s): JangJae Lee, KISTEP

MD-02.1 [R] The Impact of Project Organizational Structures on Project Success - Revisited Thomas G Lechler; Stevens Institute of Technology, United States

Dov Dvir; Ben-Gurion University of the Negev, Israel

A central issue in managing projects is determining their organizational structure and defining the distribution of authority and responsibility among the parties involved. Despite their managerial importance, empirical studies have not provided evidence for a relation between project organizational structure and project success. A major problem in finding meaningful results is the conceptualization of the project organization variable. In our study we revisit this central concept and empirically analyze the impact of project organization on project success, using a large sample including about 450 projects. We propose that the project organization is a multidimensional structure. From a theoretical analysis, we derive five variables needed to distinguish between different project organizational structures: level of project manager authority (project vs. line), responsibility (project vs. line), and existence of supervising entity (steering committee), the project manager authority on the personnel involved in the project and the project responsibility he has. Analyzing these five variables simultaneously using cluster-analysis we could identify six different organizational types. Contrary to the existing literature, these structural types are significantly correlated with project success. The results clearly indicate that projects that are not properly controlled by the project manager due to lack of project authority and responsibility and line-oriented project structures show the lowest success levels, while projects managed as stand-alone projects or within a matrix structure with a supervising steering committee show the highest level of success. From the research perspective, we suggest an alternative measure for the project organization and from the management perspective; our results suggest how to set up project organizations for improving the chances for project success.

MD-02.2 [R] Upper Management: A Scarce Project Resource?

Thomas G Lechler; Stevens Institute of Technology, United States
Maik Fuerstenberg; Stevens Institute of Technology, United States

This study sets out to revise, condense and empirically evaluate the impact of top management support on project success. A meta-analysis is conducted to calculate a correlation coefficient across many different empirical studies. The resulting high correlation indicates that top management support is in general crucial for project success. The Agency theory is used to analyze this influence by identifying detrimental effects of the information asymmetry between top managers and project managers. The goal is to determine empirically what part of the overall effect on project success could be attributed to the top managers' need to minimize the detrimental effects of the information asymmetry. The moderating or mediating effects of the identified variables determining the information asymmetry are empirically analyzed on a sample of 448 projects. The results show how specific conditions may support a reduction of the need for top management support to ensure project success. But, even given these conditions, the effect remains significant, meaning that top management support cannot be foregone. The results suggest that top management is a scarce project resource. Time and the attention of top managers are limited and have to be considered in planning, selecting and implementing projects.

MD-02.3 [R] Project-Based Organizations as Complex Adaptive Systems

Carlos E Sato; PM21 Solutions in Projects, Brazil
Dario E Dergint; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil
Kazuo Hatakeyama; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil

As it is being propagated all over the world, companies in general have to deal with fast-changing and globalized markets, increasing product and technology complexity, interdisciplinary expertise, continuous innovation and market uncertainty. The approach to the market is interdisciplinary due to the fact that customers demand more and more integrated solutions, not only isolated products or services. In this context, the project-based organization (PBO) emerges as an ideal option of organizational structure to cope with the emerging properties of the temporary and unique demands, within a complex market. Complex adaptive systems (CAS) exhibits coherence under change, interacting and exchanging information with the changing environment, not necessarily with a central coordination, having leverage points, where a low quantity of input may lead to significant changes. There are key characteristics of CAS such as autonomy, cooperation, aggregation and self-organization that may be applied to the PBO in order to better understand the dynamics of the PBO project portfolio and to have better results. This paper discusses the concepts of the theory of complexity and uses the complex adaptive system as a model to approach the PBO, illustrating the application of these concepts to R&D organizations, considering them as a PBO, as a result of the direct observations of one of the authors, who works at an R&D organization.

MD-03 Global Technology Management: 1
Monday, 8/2/2004, 14:00 - 15:30 **Room: Sorak II**
Chair(s): Hyun-Dae Cho; STEPI

MD-03.1 [R] Success Factors for MNCs' Inducement Strategies Based on IT Regional Cluster

Yong-Wook Jun; Chung-Ang University, Korea, South
Jung-Hwa Lee; Chung-Ang University, Korea, South

Since attracting investment from Multinational Corporations (MNCs) proves to be a great economic benefit for the destination country, countries around the world are actively competing with one another to lure MNCs. In Korea's case, the need for inducing MNC investment is even greater as it was disadvantageous in attracting investment from MNCs in the 70's and 80's and as it has lost its advantage as an investment destination because of uncertainties surrounding its domestic and international business environment. What constitutes the most significant part of foreign direct investment (FDI) policy discussions is attracting MNCs through a regional cluster (RC) focusing on a specific industry. Successful regional clusters in advanced countries, namely Silicon Valley, the Bio-Cluster of San Diego in the U.S., the Finance Service in London, Oulu in Finland, and Kista in Sweden, have been successful in attracting world-class MNCs and are serving as the driving force for regional and national growth. Not to be outdone by developed nations, developing countries such as China (Zhong Kwan Chun) and India (Bangalore) are entering the competition for MNCs by fostering a new innovation-driven cluster. Against this backdrop, this paper aims to analyze the success fac-

tors for attracting MNCs based on fostering successful IT Regional Clusters, focusing on Oulu in Finland, Bangalore in India, and Zhong Guan Cun in China, to illuminate the importance of MNCs' roles in RC, and, finally, to suggest a proposal applicable to Korea's regional cluster strategy. Our case study results show that the RC-related success factors for MNCs strategy are as follows: first, a strategic setting, which national/regional governments choose to focus on depending on one's regional capabilities and industrial base; second, an investment climate, which government supports in an indirect way by investing such industrial driving forces as human resources, research and development, and education, and by establishing a strong network among MNCs, academic centers, and government; third, innovative incentives for MNCs; fourth, an early promotion for world-class MNCs and domestic companies which would prompt rival MNCs to follow suit and expand the related and supporting industries; and finally, continuous monitoring and after-care.

MD-03.2 [A] Secondary Innovation in Globalization: The Case of the Technological Evolution of Haier Refrigerator

Xiaobo Wu; Zhejiang University, China
Guannan Xu; Zhejiang University, China
Su-li Zheng; Zhejiang University, China

In recent decades, there is an increasing tendency of globalization all over the world, and it is of vital importance for developing countries to take the opportunities to improve their technological competence. Secondary innovation is an efficient way for them to gain the latercomer's advantage and accelerate their technological development. This paper extended the model of secondary innovation based on global competition through the case of Haier Refrigerator. It observed the different stages of Haier Refrigerator's technological evolution with its secondary innovation and analyzed the changes of Haier's dominant strategies and the correspondent changes in management focus, management modes, R&D emphases and technology tactics over time. This paper examined the validity of the technological innovation mode for later-comers to succeed in globalization.

MD-03.3 [R] Multinational Companies in Clusters: Case Studies in Malaysia's Multimedia Super Corridor

Mohan V Avvari; Multimedia University, Malaysia
Hui Ching Long; Malaysian Communications and Multimedia Commission, Malaysia

The 'cluster' based approach for industrial development is popular among many developing countries in recent times, and Multinational Companies (MNCs) seem to play an important role in cluster development. This study investigates the factors that drew the MNCs to the Multimedia Super Corridor (MSC) Cluster and the role they play in the MSC for providing support for innovation growth. Two MNCs were selected for the study, one European and the other Asian. The cases were developed to identify what policy and market elements attracted both MNCs into the MSC cluster and how the companies contributed back to the development of the cluster. In the analysis of both cases, it was found that various incentives laid out by the Government such as tax breaks and no restrictions of foreign equity, as well as market factors of the cluster, worked in attracting MNCs into the MSC cluster. Also, the MNCs, through their interaction and the creation of alliances and partnerships with other firms in the MSC, have helped in the development of the cluster.

MD-04 Telecommunications Industry: 1
Monday, 8/2/2004, 14:00 - 15:30 **Room: Sorak III**
Chair(s): Chaiho Kim; Santa Clara University

MD-04.1 [A] The Direction of Price Controls by Regulators in Telecommunication Industry

Sun A Kang; ETRI, Korea, South

It is a general characteristic that natural monopoly and the economy of scales are operated in the Telecommunication industry. This causes a monopoly of the telecommunication market in early stages and prices to be controlled at rate of return by regulatory party. Rate of return controls are aimed to guarantee general returns of Telecom operators and prevent them from the over pricing that may come from the monopolistic strength. But there are changes in regulatory controls on prices as competitions are introduced in telecommunication markets. It is one of them that a change from 'Rate of Return' to 'price cap' regulation. If there are complete competitions at telecommunication markets, then price controls themselves are not meaningful. But it is true that other than complete competition types remain in telecommunication markets in most countries. Price cap controls are an interim means toward no controls from direct regulations. We study the direction of price controls changing by market situation and the reason why they carry out a new regime in their controls as well as spreading effects on this new one.

MD-04.2 [R] Analyzing the Performance of Broadband Communication Network Industry Using BSC Model: Focused on Information & Communication Industry

Ryu K Seok; ETRI, Korea, South

This study is for analyzing the critical success factor that the broadband communication network industry affects on the national economy. For this, it will finally embody the performance analysis model for studying the distribution effect of the broadband communication network industry on the economy. After studying the broadband communication network business development process step by step through the analysis of the present condition, it will light up the broadband communication business in view of various points and propose the appropriate analysis model, which has been examined concretely to find out the facts that the broadband communication industry affects on national economy by applying this model to the current business.

MD-04.3 [R] A Comparative Study on Information Competitiveness among APEC Countries

Shinwon Kang; ETRI, Korea, South

This study has created an information competitiveness index on APEC countries, under the assumption that information competitiveness is a determining factor of a nation's international competitiveness. In order to assess the information competitiveness of selected nations, a new model of information competitiveness index has been developed using a new computation method. The result obtained by this study indicates that among APEC countries, the state of a nation's economy bears a close relationship to its level of information competitiveness. Moreover, analyses by year and by group have revealed that the use of information was a major factor affecting information competitiveness index scoring among the APEC nations studied. The result also showed a sharp rise in the information competitiveness index scores among these countries during the period between 1992 and 1997, which may be explained by the dramatic increase in advanced information use experienced during the same period thanks to progress made in IT technology and the IT industries, and also the massive expansion in equipment investment in this area. It may be therefore inferred that the level of information competitiveness reached by these APEC nations is the direct result of the advancement achieved by national information industries and the surge of investment in information infrastructures. The results of this study further suggest that information infrastructure and use of information equipment and devices not only accelerate progress in the information industry, but also boost the overall national efficiency, whether at an industrial or individual level, driving up industrial outputs and ultimately international competitiveness. The implication of this study, therefore, is that Korea, in order to leverage its international competitiveness and become a full-fledged member of the group of most advanced industrialized nations, must step up its investment in underdeveloped areas of the national information technology environment and provide adequate policy support toward this direction

MD-05 Strategic Management of Technology: 4
Monday, 8/2/2004, 14:00 - 15:30 **Room: Kum Kang I**
Chair(s): Petteri Laaksonen; Lappeenranta University of Technology

MD-05.1 [R] Identifying Objects to Build an Object-Oriented Business Model Using Group Technology

Jinho Kim; University of Texas at Arlington, United States
Jamie Rogers; University of Texas at Arlington, United States

The current industry environment requires an enterprise to have an adaptable business model to survive. Adaptability of the business model requires the ability of frequent remodeling with reduced risks and setup-time. Although there are several modeling methodologies, an object-oriented modeling approach could be a better way to meet the requirement. In addition, the most important and difficult stage in the object-oriented modeling procedure is identifying classes/objects for the business system. Existing methods for this purpose typically depend on the designer's subjective opinion and often result in a lack of consistency in the output model. To overcome this potential weakness, we have adopted clustering algorithms used in GT (Group Technology) to object-oriented modeling, and suggest a systematic procedure for identifying classes in the model. This paper shows a new application of GT for object-oriented modeling beyond the traditional shop floor level machine-part clustering. Finally, we have applied this methodology to the modeling of an object-oriented supply-chain business model.

MD-05.2 [R] Current Situation of Chinese FDI and the Analysis of its Positive Effect on Economy Growth

Lanlan Xie; Beijing University of Technology, China
Guangya Xie; Beijing University of Technology, China
Feng Zhang; Beijing University of Technology, China

China is one of the most successful countries in the world to introduce FDI in the last 20 years. At the beginning of the 21st century, the foreign economy is becoming a more and more important part of the Chinese economy. It not only promotes the continuous development of Chinese economy but also changes Chinese growth mode. This article describes the current situation of FDI and analyzes its contribution to industry and industry structure upgrading of China.

MD-05.3 [A] Assessing the Potential for Technology Based Enterprises and Regional Innovation Systems in Emergent Economies: The Case of Jalisco, Mexico

Ricardo Arechavala-Vargas; Universidad de Guadalajara, Mexico
Lilia Arechavala-Vargas; Fundación México Estados Unidos para la Ciencia, Mexico

Industrial policy in Mexico has been unsystematic and rather on the laissez – faire side. Only recently are policy initiatives directed to strengthening a technological base that may root foreign – based industry to local capacities. In this effort, the assessment of the potential for technology based enterprises and regional innovation systems becomes a crucial endeavor, in order to allocate scarce resources that may trigger significant innovation processes. Given the attention that these processes have received in the last decade in the specialized literature, a significant amount of knowledge and experience can be brought to bear in this effort. However, some key issues still remain unsolved, among them the necessary and sufficient conditions for innovative milieux to develop. The case of emerging regional innovation systems in western Mexico is closely analyzed in order to determine key factors that may be crucial in developing those systems. The study was designed with an effort to identify path dependent factors that affect the applicability of general principles derived from the literature to several high technology industries: electronics and telecommunications, software, electronic auto parts, and biotechnology. Explicit comparisons enable the assessment of the impact that relevant factors identified in the literature have in the process.

MD-06 Supply Chain Management: 1
Monday, 8/2/2004, 14:00 - 15:30 **Room: Kum Kang II**
Chair(s): Jun Numata; Musashi Institute of Technology

MD-06.1 [A] Gray Prediction Model for Forecasting the Planning Material of Equipment Spare Parts in Navy of Taiwan

Hua-Kai Chiou; National Chiao Tung University, Taiwan
Gwo-Hshiung Tzeng; National Chiao Tung University, Taiwan
Gia-Shie Liu; National Defense University, Taiwan
Chih-Kang Cheng; National Defense University, Taiwan

The inventory management of maintenance spare parts plays an important role on their logistic policy. In addition, due to the intermittent nature of demand for aircraft repair parts, the ground personnel perceive difficulties in forecasting and are still looking for superior forecasting methods. For reasons of insufficient data or uncertain demand of maintenance requirements that we have, the traditional prediction method makes it generally hard to predict the optimal quantity of spare parts fitting the required quantity. In this study, we introduce Grey Prediction Model (GPM) for coping with such problem. After taking three types of weapon system periodic items of planning material from 1999 to 2002, we then apply GM(1,1) model to predict the planning requirement of intermittent spare parts of 2003. In order to verify the performance of our forecasting model, we also compare the results with the observed data, which are calculated by the rule of technical manual of equipments. Through this study, we demonstrate the GPM can conduct accurate prediction of spare parts, especially in situations of insufficient data or resources within high uncertainty, and that accurate prediction should reduce the operation cost and improve the reliability of maintenance equipment.

MD-06.2 [R] Product Modularity in Supply Chain Coordination: Experiences on Pearl River Delta

Antonio Lau; City University of Hong Kong, Hong Kong
Richard Yam; City University of Hong Kong, Hong Kong

Nowadays, modular product design is commonly adopted by manufacturers to accelerate product innovation by mixing and matching product modules. Research has explored the importance of the modular product design with its effect on supply chain coordination, including supplier, customer and internal coordination. However, there is limited empirical research that examines explicitly the relationship between product modularity and supply chain coordination in product development projects. This paper addresses this gap by exploring five modular product development projects against two integrated ones in Pearl River Delta. Through within and cross case analysis of the seven cases, a contingent model is developed that product modularity relates to supply chain coordination under the considerations of technological knowledge leakage, supply chain efficiency, product newness, customer's knowledge and product development team size. Results also explored that manufacturers demand knowledge management systems to coordinate suppliers in new product development.

MD-06.3 [A] Information Technology and Logistics: A Case Study in Road Transportation Companies

Claudemir Gimenez; Renato Archer Research Center, Brazil
Luiz M Aguilera; Renato Archer Research Center, Brazil
Miguel J Bacic; State University of Campinas, Brazil
Oscar S Silva Filho; Renato Archer Research Center, Brazil
Tatiana B Belizário; State University of Campinas, Brazil

Nowadays, a common sense from literature is that "due to offer agility, low costs, reliability, and so forth, Information Technology (IT) has became the key of success in any logistic management environment". The objective of this paper is to contribute to enlarging this sense, investigating, in this way, a Brazilian case study. In this study, two road transportation companies are analyzed. The companies are located in Santos, a main harbor city of São Paulo state. A large and complex intermodal transportation system is available to support the logistic policies in Santos. Such a system encompasses two international airports, a net of railroads, freeways and marine resources. This study analyzes the impact of application of IT on company performance. The company's investment in IT - as for instance the Internet, ERP (Enterprise Resource Planning) systems, hardware (e.g. a Global Positioning System (GPS) provides specially coded satellite signals that can be processed in a GPS receiver, enabling the receiver to compute position, velocity, and time), software (i.e. contract management, freight invoicing, price management, and full reporting), etc. - is all reported and associated with its improvement performance.

MD-06.4 [A] Market Analysis in the Brazilian Telecommunications Supply Chain

Claudemir Gimenez; Renato Archer Research Center, Brazil
Oscar S Silva Filho; Renato Archer Research Center, Brazil

SESSIONS

Globalization and rapid technological changes are compelling enterprises to look for competitive advantages. The ever-increasing customer or demand added to environmental protection legislation are taking place while informatics and telecommunication technologies are rapidly diminishing time and distance: customers have virtual access through cyberspace to aid them in making more informed and personalized choices. It is a fact that technology is now affordable and abundant to everyone in any place, while skilled technical workers are in short supply. In the current world scenery, a new kind of organization is emerging. It is known as Virtual Enterprise and is deeply based on digital Information Technology. A special and important way of representing virtual enterprises is the supply chain. A supply chain can be defined as a collection of all components and functions associated with the creation and ultimate delivery of a product or service in a local or global market. In this paper, a market analysis of the Brazilian Telecommunication Supply Chain sector is presented. This market analysis is obtained from a survey which was carried out in a very important region of São Paulo state during the period between August 2001 and May 2002. The basic objective of this market study is to identify opportunities of research and development related to telecommunication supply chain management. One of these opportunities is mentioned in the conclusion.

MD-07 PANEL: ETMERC
Monday, 8/2/2004, 14:00 - 15:30 Room: Kum Kang III
Chair(s): Antonie de Klerk, University of Pretoria, South Africa, President of ETMERC

John O Aje; University of Maryland
Tony Bailetti; Carleton University
William T Flannery; University of Texas - San Antonio
Dundar F Kocaoglu; Portland State University
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 special meeting 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.

MD-08 Technology Management Framework: 1
Monday, 8/2/2004, 14:00 - 15:30 Room: Kum Kang IV
Chair(s): Kazuo Yanagishita, Nihon University

MD-08.1 [R] The Study of Computer Industry Company's Performance: The Roles of Entrepreneurship, Technology Strategy and External Network

Fen-Hui Lin; National Sun Yat-sen University, Taiwan
Hsing-Ya Chang; Sun Yat-sen University, Taiwan

This is a survey research to study the influencing factors of company performance in Taiwan's computer industry. Three independent factors are proposed including entrepreneurship, technology strategy and external network. Using the random sampling method, the questionnaires were mailed to members of Taiwan Electrical and Electronic Manufactures Association. Among those returned questionnaires, there were 144 valid responds that were tested by the statistic software, the Linear Structure Relation (LISREL), for the structural equation modeling analysis. The empirical results show that entrepreneurship and technology strategy indirectly affect the company performance, while the external network is the only direct influencing factor on company performance.

MD-08.3 [R] Industry Cluster Effect Influence on Enterprise Operation: Precision Machinery Case Study in Taiwan

Benjamin J. C. Yuan; National Chiao Tung University, Taiwan
James k Chen; National Chiao Tung University, Taiwan
Peter Y. C. Peng; National Chiao Tung University, Taiwan
Tsai-Hua Kang; National Chiao Tung University, Taiwan

The industry cluster is groups near region, in some specialized domains there are interaction enterprise or relation governance departments. They are using common and compensation linking each other. Industry cluster include from single region, industry, enterprise, to near country and international relation that are interaction connected network. There are different alliance types depending on their multiples and hierarchy of connection network. In general, an industry cluster includes products, issue elements, components, machine equipment, service providers, banking departments and relation industry of enterprises. Also, it includes industry supply chain employees, compensation products manufacturer, industry infrastructure, government and others who provide professional training, education, information, research and support technology department (such as: university, consultant, job training department), and defined standard department. In addition, industry cluster include similar industry committee and other support populace for industry cluster. Because of this, industry cluster can control different enterprise and company interaction connection, compensation, technology and information communication efficiency, sales channel and customer needs. The most partner of the industry cluster who isn't competitor, there are serviced on their industry region, but there are a lots of common seeds and opportunity also, a lots of limitation and difficulties in business operation. Recently in mainland China, southeast, Taiwan had developed in the field of industry cluster. There is influence in Asia economic development. How deep influence on enterprise operation that industry cluster efficiency? This study purpose is focused on "industry cluster efficiency" influence enterprise operation research. The industry cluster efficiency influence enterprise production, research and design, human resource, finance, marking equal so relation operations domain. This study using "Taiwan high accurately machinery" for a case study, applies Delphi Method, Factor Analysis, Cluster Analysis research industry cluster efficiency to enterprise operations efficiency.

ME-01 TUTORIAL: Measurement Tools for Creativity Capabilities of Organizations
Monday, 8/2/2004, 16:00 - 17:30 Room: Ballroom I
Speaker(s): Yong-In Shin; Samsung Electronics Co.

It is not an easy task to measure the creativity capability of organizations. In most cases, the number of submitted patents has traditionally been a barometer for the innovation capability of organizations. This certainly is an indicator for innovations, but does not fully represent the creativity capability of organizations. For a more accurate representation, multiple indicators are necessary such as a motivation level for creativity, the innovative intelligence level of the group, innovative culture, an innovative knowledge sharing level, resource support level for creativity, management's commitment level for creativity and others. In this article, the author will discuss these new indicators for creativity and innovation capability of organizations in practical ways.

ME-02 Project/Program Management: 3
Monday, 8/2/2004, 16:00 - 17:30 Room: Ballroom II
Chair(s): Peerasit Patanakul; Portland State University

ME-02.1 [R] Managing Risks in High-Tech R&D Projects

Hans J Thamhain; Bentley College, United States

The ability to identify and manage risks is critical to successful R&D. The findings of this two-year field study of R&D/product developments show that effective risk management involves a complex set of variables related to task, people and organizational process. The results identify the specific challenges and barriers to effective risk management, as well as the type of organizational environment and leadership style conducive to proactively dealing with these challenges. Effective "risk managers" must understand more than just the tools and techniques of enterprise risk management (ERM). They must know where risks lurk and be com-

petent in applying these tools proactively. They must also know how to simplify the R&D work and its transfer processes, and deal with the complex social, technical and economic issues that determine the culture and value system of the enterprise.

ME-02.2 [A] Korea-MOST Independent R&D Management Program Operation Case

Kwon-Joong Sohn; Tera-level Nanodevices, Korea, South

As part of the 21C Frontier R & D Program, Korean Ministry of Sciences and Technology has set up a ten-year National Program for Tera-level Nanodevices (TND Program) in July of the year 2000 as a form of a temporary independent research and development team to impose global competitiveness in the high-tech field of semiconductor technology. To allow efficient and scientific management of National R&D Research development project, there has been a demonstrative introduction of MBO(Management By Object) in the first step of the project, which has been successfully operated. Through this, it has established a new collaboration system between business companies, universities, and government R&D institutes, and knowledge management system for cyber real-time research. In addition, by maximizing the efficiency of the National R&D management through field centered management such as pre-instruction, usage of overseas consultants, open presentation, the entire researcher's workshop and more, the project allowed for, in the point of achievement, obtaining of a number of world's leading and original technology during the first three years of implementing the first step.

ME-02.3 [R] Evaluating the Performance of R&D Project in Taiwan Using Data Envelopment Analysis with Imprecise Data

Hua-Kai Chiou; National Defense University, Taiwan
Gwo-Hshiung Tzeng; National Chiao Tung University, Taiwan
Benjamin J. C. Yuan; National Chiao Tung University, Taiwan

In original data envelopment analysis (DEA) models, inputs and outputs are measured by exact values on a ratio scale. Cooper et al. (1999) recently addressed the problem of imprecise data in DEA models; they also presented the general form of DEA with imprecise data. We develop in this paper an alternative approach for dealing with imprecise data in DEA. Our approach combines two stages. The first stage is to transform a non-linear DEA model to a linear programming equivalent based on the original data set, by applying transformations only on the variables. Upper and lower bounds for the efficiency scores of the units. The second stage is to derive the relative efficiency of DMUs modifying the fuzzy multiple objective programming method proposed by Chiang and Tzeng (2000). We then classify DMUs into strictly efficient, weakly efficient and relatively inefficient according to natural outcomes of our formulations. The proposed approach is adopted to improve the discriminating power of IDEA in this work The evaluation of performance of government funded R&D projects in Taiwan is employed to illustrate the merit of our approach.

ME-03 Global Technology Management: 2
Monday, 8/2/2004, 16:00 - 17:30 **Room: Sorak II**
Chair(s): Yong-Wook Jun; Chung-Ang University

ME-03.1 [A] S&T Globalization and Korea's Response

Myung-Jin Lee; STEPI, Korea, South

Under the new government, Korea is pursuing being an economic hub and R&D center of Northeast Asia. Is this the right direction for Korea's S&T internationalization policy in response to the S&T globalization? If not, what would be the desired policy direction? This paper tries to answer these policy questions. Globalization of S&T could include collaborative as well as competitive R&D activities among scientists and business firms, S&T policy discussions in international organizations, and the S&T related agreements and regulations among multilateral participants. Then, internationalization of S&T can be defined as the national response responding to the ever-increasing phenomena of S&T globalization. This paper intends to explore how Korea has responded to the S&T globalization, especially in the context of human resource development, and what the policy implications for Korea's future S&T internationalization policy might be. In this paper Korea's internationalization of S&T is analyzed with a focus on the following issues: 1) the openness of the human resource development system, for example, whether foreign S&T personnel are free to enter the Korean innovation system and, at the same time, if Korean S&T personnel are free to enter the innovation system abroad; 2) rate of exchange and mobility of S&T personnel across national borders; and 3) how well the relevant policy and infrastructure are established in Korea when compared with those of advanced countries.

ME-03.2 [A] Differences in R&D Patterns between MNEs and Domestically Owned Firms in Korea

Hyun-Dae Cho; STEPI, Korea, South
Jooyoung Kwak; MIT, United States

There may exist differences in R&D patterns between multinational enterprises and domestically owned firms located in catching-up countries. This study examines the differences in R&D patterns between different ownerships in Korea. An interview survey was conducted and the interviewed firms were selected from the telecommunication, semiconductor and display industries. The study reveals that multinational firms tend to focus on sales oriented R&D while domestically owned firms are likely to cover from applied R&D to pure R&D. The most outstanding difference lies in the length of the R&D period, the proportion of advanced degree researchers, and the variety of research areas. Whereas foreign firms in Korea can acquire advanced technology and scientific knowledge from the R&D in their home countries, local firms need to develop their own capability. On the basis of the research findings, this study discusses some implications and recommendations for Korea and other catching-up countries.

ME-03.3 [R] Absorptive Capacity of Multinational Companies: How Japanese and European Companies Absorb New Technologies from the US

Seiko Arai; University of Oxford, United Kingdom

During the past decade, multinational companies have made radical organizational and management changes to absorb technologies from abroad. Defining the capability to search, evaluate, acquire, internalize, and utilize R&D knowledge from abroad as 'Absorptive Capacity (AC)' of Multinational companies (MNCs), this research provides a literature review to understand the process of international management and organization of R&D to absorb technological knowledge from abroad. The environments of each region and sector are explained that may influence the managerial and organizational differences of domestic and international R&D activities. The hypotheses concerning AC are explored in the final section.

ME-04 Disruptive Technologies: 1
Monday, 8/2/2004, 16:00 - 17:30 **Room: Sorak III**
Chair(s): John O Aje; University of Maryland

ME-04.1 [R] An Uncertainty and Risk Reducing Process for the Strategic Management of Discontinuous and Disruptive Technology

Gaston A Trauffler; ETH Zurich, Switzerland
Hugo Tschirky; ETH Zurich, Switzerland
Mischa Czendes; ETH Zurich, Switzerland
Andreas Biedermann; ETH Zurich, Switzerland

The high impact of a discontinuous or disruptive technology on the competitiveness of a company has been intensively discussed in literature and is acknowledged by industry. As a matter of fact, disruptive technologies increase competitiveness for those few companies that master its management by opening opportunities for radical innovations. However, for the majority of companies it seems to be difficult to seize the opportunities that disruptive technologies offer. Poor management of disruptive technologies often turns out to be threatening or even detrimental to the competitiveness of a company. Thus far, literature describes the phenomenon of disruptive technologies mainly from a macroeconomic point of view, entirely neglecting the microeconomic point of view. This is due to the nature of a disruptive technology, which is essentially of a nascent character and can only in hindsight be revealed as disruptive. Thus microeconomic aspects that describe the implications for a company engaging with such a technology are poorly specified. As a consequence, management processes that respond to the need of disruptive technologies are rare. This research seeks

to shed some light on the implications of disruptive technologies for a company's strategic management. It points out that the main difficulties companies encounter with the management of disruptive technologies can be traced back to their inherent uncertain and risky character. For this purpose, two action research projects were conducted that developed and tested a double iterative process reducing uncertainty and risk for the strategic management of disruptive technologies.

ME-04.2 [A] Disruptive Technologies and the Competitive Dynamics of Firms

Akkanad M Isaac; Governors State University, United States

Technological innovations disrupt the industrial structure and impose a new business model for firms entering emerging markets. When disruptions alter the economics of an industry, new market segments emerge where customers have a different rank order for the product performance attributes. The context within which incumbent firms should respond to customer needs changes, and new rules for competition are introduced. Clayton Christensen through his pioneering studies of the hard disk industry, retailing industry, etc. has developed a new set of theories to explain the disruptive technology phenomenon. Geoffrey A. Moore through his books, Crossing the Chasm, Inside the Tornado, etc., has outlined a set of high-tech marketing strategies to help firms who had initial success in launching a new technology product to transition into serving the main-stream market. Ron Adler has developed a formal model to examine how the relationships among the preferences of different market segments lead to the emergence of different competitive regimes. The primary objective of this paper is to survey the developments in the area of disruptive technology and develop a new framework to understand the nature of competition by integrating different theoretical strands, especially the thoughts of Christensen, Moore and Adler. Three disruptive technologies which have recently emerged are studied: DWDM (Dense Wavelength Division Multiplexing); Mobile ad hoc technology; and Mobile Internet.DWDM helped carriers to sell more bandwidth through its ability to carry substantially more traffic on strands of fiber; but caused a fiber glut which negatively impacted the telecom stock prices. Mobile internet offers performance improvement over fixed-line internet, but the size of the screen (key pad) is much smaller and so is applicable only to a new set of users. Mobile ad hoc networks are "self-forming/self-healing networks that are potentially an order of magnitude less expensive to deploy and maintain." The study of these industry segments provides useful ideas to leverage disruptive technology.

ME-04.3 [R] Anticipating Technological Discontinuities

Gaston A Trauffler; ETH Zurich, Switzerland
Tim Sauber; ETH Zurich, Switzerland
Shoko Okutsu; ETH Zurich, Switzerland
Hugo Tschirky; ETH Zurich, Switzerland
Masaharu Kinoshita; Nitta Corporation, Japan
Kazu Otsuka; Nitta Corporation, Japan

Today's global competition creates a complex environment that demands an enforced strategic long-term planning of innovations in order to ensure the future competitiveness of a company. Thus, innovation strategies should take care not only of continuously evolving technologies but also of discontinuous technologies that might emerge in the long-term future which would disrupt continuous technological developments. Existing innovation strategy development processes do generally not allow future technological discontinuities to be detected. This is due to the difficulty companies have in capturing their future environment in a holistic and accurate way in order to identify discontinuous technological changes. On the other hand, the increasing information flow prevents companies from in enlarge the search fields they must take into consideration. Additionally, current innovation strategy development processes are focused on short-term evaluation methods that often miss technological discontinuities emerging in the future. The aim of this research work is to generate within the company context a methodological solution to identify technological discontinuities. Thus, action research has been chosen as a research method in order respond practically to the phenomenon of technological discontinuities, which is already well described in literature. The case has been conducted in a technology intensive Japanese company.

ME-04.4 [A] Capturing Opportunity from Disruptive Innovation: HTT's and Their Impact on the Organization – A Case Study

David W Birchall; Henley Management College, United Kingdom
George Tovstiga; Arthur D. Little, Switzerland

Significant disruptive innovations, though easily identified once they have made their mark, are rarely perceived for the real business opportunity they represent at the outset. Hence, they are often viewed with misgiving. Contrary to widespread perception, disruptive innovation is not only about "stealth attacks" on incumbent industry leaders. In fact, disruptive innovation is inherently more about new opportunities than it is about destruction. Evidence suggests that in every industry changed by disruption, the net effect has been total market growth. Disruption, however, does introduce new rules to the new playing field. It demands new sets of knowledge and appropriate organizational structures, processes and culture. Last, but not least, it challenges the very mindset of those organizations about to introduce them. The notion of disruption is typically associated with disruptive technologies. In this paper the authors look at a particular form of disruptive innovation, that of high-throughput technologies (HTT). Building on earlier work that describes the adoption of external technologies by organizations, the authors propose tracking the adoption of HTT and its impact on the organization in terms of an innovation trajectory. The trajectory consists of a multiple of strands, including that of the technology itself alongside those of the accompanying social process and the capabilities required to exploit the technology. The paper focuses on a particular case example in which a HTT is introduced into an organization.

ME-05 E-Business: 1
Monday, 8/2/2004, 16:00 - 17:30 **Room: Kum Kang I**
Chair(s): Robert Harmon; Portland State University

ME-05.1 [R] Optimal Return Policy for e-Business

Samar Mukhopadhyay; University of Wisconsin Milwaukee, United States
Robert Setoputro; University of Wisconsin Milwaukee, United States

In a direct supply chain, the seller directly sells to the final customers, eliminating the need of intermediaries. Customers like the convenience but sacrifice the benefit of physical inspection of the product, increasing the probability of dissatisfaction and the likelihood of return. Many internet sellers have problems offering a clear return policy and ease of return. Basically, they design their supply chain more for the fulfillment rather that the reverse logistics. Much can be gained by the seller by way of increased sales if they could offer an easy return policy. The trade-off here is in the increase in the cost. The profit function increases with the generosity of the return policy because the sales increases, but decreases as the cost increases. A model for obtaining the optimum return policy in conjunction with the optimum pricing policy giving the optimal strategy would be very useful. A profit-maximization model to obtain an optimal return policy, including price as a decision variable, is presented in this paper. Managerial guidelines for making optimal decisions to influence market parameters are also developed.

ME-05.2 [R] Repurchase Intentions Analysis and Customer Segmentation in the Internet Shopping Mall

Jung-Hwan Lee; ETRI, Korea, South
MunKee Choi; ICU, Korea, South
eok-soo Han; ETRI, Korea, South

Identifying customer repurchase intentions is very important for the Internet shopping mall to activate CRM (customer relationship management) in B2C eCommerce. In this paper, the repurchase intentions are analyzed by using the approach of benefit segmentation. Most of the previous studies on repurchase intentions have been done by overlooking to reflecting the customer's heterogeneity. Since each consumer has uniqueness, the researchers need to consider it for the effectiveness of their marketing. Therefore, a market is divided into a few segmented groups, and a deep understanding process for the constituents is preceded by identifying private benefits for which consumers seek from any services. The results show that the different group has a significant difference in the repurchase intentions. Thus the benefit pursuit in using the Internet is an effective segmentation variable for the customer segmentation.

ME-05.3 [R] Development of e-Business in China

Hongyi Chen; Portland State University, United States
Dundar F Kocaoglu; Portland State University, United States

The potential market for e-business in China is huge. Hampering factors such as the low percentage of household computers and inconvenience of Internet access in the past are no longer big issues in today's e-business development. However, problems still exist in online payment and delivery issues. To deal with these problems, component innovations such as payment by cell phones and e-cash purchases were put forward by Chinese e-business entrepreneurs. However, given the limitations of these innovations, they can only work as supplementary methods. A credit card system needs to be developed and Internet security needs to be improved. While leveraging business strategies, Chinese shopping culture should be taken into consideration by managers. Special features and joyful shopping experiences are attractive points for Chinese e-business customers, and offering satisfactory online shopping experiences to early adapters will accelerate the acceptance of e-business by Chinese customers. Guaranteeing product quality and building trust should be the central issues in developing business strategies. Even then, the question still remains as to whether e-business companies can keep growing by continuous innovation in the Chinese Internet industry that is regarded as a "me too" industry.

ME-05.4 [A] Self Regulatory Behavior for Consumer Privacy Protection in e-Business: Comparing between US and Taiwan

JJ,Jou-Juan Pan; National Chengchi University, Taiwan
Paul C. B Liu; National Chengchi University, Taiwan

B to C business usually leads the development of the internet. The degree of recognition and protection on consumer privacy represents the degree of the utilization of electronic commerce, the maturation of internet technology, the interaction with international organizations, and the self-regulatory behaviors of organizations. Organizations in the US and Taiwan happened to have the same behavior patterns to protect consumer privacy. This article examines both historical developments, contributions, the future difficulties and the meaningful implications for a booming internet society.

ME-06 Supply Chain Management: 2

Monday, 8/2/2004, 16:00 - 17:30 **Room: Kum Kang II**
Chair(s): Jin Chen; Zhejiang University

ME-06.1 [R] Detecting Changes and Avoiding Unwanted Behavior in Supply Chains

Luis C Rabelo; University of Central Florida, United States
Magdy Helal; University of Central Florida, United States
Chalermmon Lertpattarapong; MIT, United States

The new forces of globalization, advances in web technologies, new methodologies/tools to integrate engineering and business functions, the developments in e-commerce and their complex interrelationships are shaping the competitive landscape of business. Organizations are looking for strategies to meet these challenges and take advantage of new opportunities. One of such strategies is supply chain management. This paper introduces a methodology to detect changes in supply chain behaviors due to endogenous and/or exogenous influences, and predict the impact of these changes in the short- and long-term horizons. System Dynamics is used to model the dynamic supply chain behavior. Neural Networks, which can be encapsulated in software agents, are utilized to detect the changes at a very early stage so that enterprises have enough time to respond and counter-effect any unwanted situations. Then, principles of stability and controllability are used to apply and make modifications to the information and materials flows to adapt to the changes and avoid the undesirable behavior. A case study of an actual electronics manufacturing company is used to demonstrate the methodology.

ME-06.2 [R] A Study on the Design of Supply Chain Management via Workflow Management System

Xiaobo Wu; Zhejiang University, China
Jun Lin; Zhejiang University, China
Zhuoyong Chen; Zhejiang University, China

Supply chain is an inter-enterprise process that connects upstream and downstream companies closely. Nowadays, a major problem exists in supply chain management which the information systems of upstream and downstream companies cannot integrate: the information flow is getting too slow causing the decision information to be in error. In order to accelerate the information flow in the supply chain, therefore, we need an inter-enterprise and integrated information sharing method. The study designs a workflow management system by using workflow management. All the supply chain partners can then be processed according to the established process definition. And they can access the needed data to fulfill their processes by the individual workflow management system, first, by building a business process definition, and then by integrating to the virtual data warehouse. By this way, the information sharing among enterprises can be transparent. Upstream and downstream companies access the virtual data warehouse, and the enterprise can achieve customer quick response by supply chain management.

ME-06.3 [R] Influences of Aggregate Production Planning on Bullwhip Effect in the Supply Chain

Lan Xiao; Tsinghua University, China
Dacheng Liu; Tsinghua University, China
Li Zheng; Tsinghua University, China

Bullwhip Effect has been well known as the phenomenon that distortion of demand information increases as one moves up a supply chain, i.e., as one moves to the upstream company. The upstream company in the supply chain uses Aggregate Production Planning (APP) to decide levels of production, capacity, subcontracting and inventory in the way that satisfies the demand over a specified time horizon and has the maximum of profit. In this paper, we seek to examine the influences of APP on Bullwhip Effect in the supply chain. We establish a supply chain model with one retailer, one manufacturer and one supplier, which is evaluated by means of simulation. We then discuss several important managerial insights that can be drawn from this paper.

ME-07 Technology Management Education: 3

Monday, 8/2/2004, 16:00 - 17:30 **Room: Kum Kang III**
Chair(s): William T Flannery; University of Texas - San Antonio

ME-07.1 [A] Technology Management Education & Training in Japan

Kiyoshi Niwa; University of Tokyo, Japan

This paper discusses current issues in MOT education and training in Japan. Some universities which are trying to provide MOT courses and departments have difficulties in finding good instructors. On the other hand, there has been an excellent MOT education course established by Japan Productive Center for Socio-Economic Development because it succeeded in organizing excellent instructors from many universities as well as industries.

ME-07.2 [R] A Study of Developing Educational Program to Foster Entrepreneurship in Japan

Yoshiki Nakamura; Aoyama Gakuin University, Japan
Yuichiro Mitsuhashi; NEC Corporation , Japan
Masashige Tsuji; Aoyama Gakuin University, Japan

Education to foster entrepreneurship has recently gained much attention in Japan. This study tries to develop a teaching program that would help foster entrepreneurship in Japan. The study tends to be holistic dealing with a whole range of issues relative to entrepreneurship in business. Three major points stand out as the most specific feature of this program. First, its target audiences would be wide to extend from an elemental school level to a university or business level. Second, the Web support system, which is essential for this program, has already become available. Third, those who are exposed to this program will be able to exper-

iment with the effectiveness of the method by actually selling their products in the market. The program thus takes a total approach to the idea of entrepreneurship. It extends the business process from planning to sales. It would upgrade the business skill of individuals who aspire to become skilled entrepreneurs.

ME-07.3 [A] MOT Education and the Revitalization of Japanese Industry: An Assessment of the New Policy Framework

Steven W Collins; University of Washington, Bothell, United States
Akio Kameoka; Japan Advanced Institute of Science and Technology, Japan
Meng Li; Japan Advanced Institute of Science and Technology, Japan

Over the past two years, technology management has become a major focus of Japanese public policy. This is in response to mounting evidence that Japan's innovation system is struggling to translate the fruits of research and development into marketable products and services. According to the International Management Development, while Japan ranks number two in the overall quality of its science and technology infrastructure, it scores a dismal 20th in management, and even lower in indicators of entrepreneurship and marketing. To close this gap, Japan's government, with the cooperation of major business organizations, has begun to strengthen and expand educational curricula in management of technology; from a starting base of around 670 students last year, the goal is to graduate 10,000 technology management professionals each year by 2007, a level comparable to that of the US when adjusted for GDP. The purpose of this paper is to examine and assess the philosophy, goals, and strategy underpinning MOT education in Japan today, using as a case study the experience of the Japan Advanced Institute of Science and Technology (JAIST), which launched a professional MOT program in October, 2003.

ME-08 Technology Management Framework: 2
Monday, 8/2/2004, 16:00 - 17:30 **Room: Kum Kang IV**
Chair(s): Marthinus W Pretorius; University of Pretoria

ME-08.1 [R] The Application and Characteristics of Technology Management: The Case of Korean Manufacturing Firms

Heeseung Yang; Sejong University, Korea, South
Yongsang Cho; KISTEP, Korea, South

As technology innovation has become a competitive weapon in the globalized era, firms are engaged in the development of new products to gain competitiveness in the marketplace. One of the main phenomena in a firm's effort to enhance technology development activities is the formation of technology strategy, i.e. the formalization of technology development activities within the firm. This paper explores the practice and management of technology innovation in the Korean manufacturing sector. Based on a survey of over 100 manufacturing firms in Korea, it identifies the contemporary practice of technology planning, and also characterizes the types of relationships that exist among participating interest groups for technology strategy formulation within a firm. The major findings are that (1) the formulation of technology strategy is the outcome of integrated and collaborative efforts of a firm, and the formality of technology strategy within a firm is critical for effective implementation, (2) the characteristics of R&D activities of a firm are well reflected in the degree of participation of specific interest groups in the process of technology strategy formulation, and (3) two distinctive management types for managing R&D projects exist, depending on the characteristics of the firms.

ME-08.2 [A] Fuzzy Front End Management Strategies under High Risk, Fast-Changing Environmental Conditions

Yong-Il Song; Korea Institute of Science and Technology, Korea, South
Dae-Hee Lee; Korea Institute of Science and Technology, Korea, South
Sung-Bae Park; Korea Institute of Science and Technology, Korea, South
Yun-Chul Chung; Korea Institute of Science and Technology, Korea, South

As the speed of technological changes increase with the investment requirements steadily expanding, private firms and government-funded research institutes experience similar pressures with respect to the necessity of risk reduction and technological alliances in R&D activities. This paper first attempts to review previous research in managing R&D projects with large, risky, and long-term investment requirements. Our primary focus is placed on the "fuzzy front-end" (FFE) projects with uncertainties and ambiguities at the investigation and planning stages. We analyze various elements that create FFE conditions, classify them into basic constructs, and suggest tools and methods to deal with FFE conditions. The findings suggest that both initial FFE conditions and the effectiveness of FFE management affect the performance of the project later on, and thus, especially for large projects, we must deal with FFE seriously in a comprehensive manner. We utilize in-depth panel interviews and case studies to approach the research questions.

ME-08.3 [R] Why Managers in Developing Countries do not Implement 'Technology Management' Guidelines: Case of Iran

Kamran Bagheri; Research Institute of Petroleum Industry (RIPI), Iran
Javad Mahboubi; Ministry of Commerce, Iran

Accumulation of man's knowledge and experience in the field of technology development eventually shaped the "Technology Management" discipline. Unfortunately, some managers in developing countries, regardless of all Technology Management guidelines, still insist on the try and error approach and therefore waste their limited valuable resources. In this paper, we will examine the hidden reasons behind this, through an analytical approach, in the context of Iran. Thus the various barriers to implementation of these guidelines are presented, and finally, a package of policies for removing the barriers and promoting technology management is recommended.

TA-01 PLENARY SESSION – 3

DATE: TUESDAY, AUGUST 3
TIME: 09:00 – 10:30
ROOM: BALLROOM

Session Chair: Dr. Gunnar Hambraeus, Chairman Scandinavia-Japan Sasakawa Foundation, and former chairman, Royal Swedish Academy of Engineering Sciences, Sweden

KEYNOTE – 1

Dr. Chun-Yen Chang, President, National Chiao Tung University, Taiwan

"Oriental Philosophy, Aesthetics and Science and Technological Innovation"

There is a huge cultural divide between the East and the West. However, around 500 B.C., both regions created many brilliant works of philosophy, art and literature. Now, after more than 2500 years, the developments of science and technology in the East and the West are also deeply divided. In this presentation, the cultural factors accounting for the different paths of scientific and technological development in the two regions will be explained. Greater emphasis will be given to the cultural context of the East.

Looking ahead, we can see that a Renaissance made possible by merging Eastern and Western cultures is essential for the future of the 21st Century. To create an open, liberal, innovative university environment is therefore indispensable for building a unique culture conducive to scientific and technological innovation, a new kind of oriental society cultivated by an aesthetic, creative education system in the universities.

Finally, using NCTU as a prime example, this presentation will demonstrate how our universities can effectively promote such a new culture and help advance science and technology in the 21st century.

SESSIONS

KEYNOTE – 2

Rosalie Zobel, Director, Information Society Directorate-General, European Commission, Belgium

"Key European Policies for Innovation in the Knowledge Economy: An Overview"

Innovation is the cornerstone of the Lisbon strategy, which was formulated by Europe's leaders in March 2000. Since then the European Commission has launched its 6th Framework Programme for research with an ambitious goal to create a single market for research in Europe. It has published a Green Paper on entrepreneurship and has also launched a debate on ways and means to increase research spending in Europe to 3percent of GDP from its current level of near 2 percent.

The recent Commission proposal for innovation policy is based on the "multidimensional view" of innovation. Besides research as a key driver for innovation and the need for higher spending on R&D, new ways of organising work and new concepts in design and marketing are key factors. Innovation policy must also provide the skills and develop the motivation for entrepreneurialism. And it needs to have an impact on the immediate operating environments of businesses. The large size of the public sector in Europe's economy is a further distinguishing feature. Under its eEurope policy framework, the EU aims to help public authorities provide services online. The enlarged Union with ten new member countries joining in May 2004 is a major and quite unique challenge. The acceding countries have shown a remarkable capacity to transform their economies, and this is a good sign that they will contribute to a more innovative European Union.

The paper analyses what innovation could mean in the context of the knowledge economy and society, it draws attention to several factors that have an influence on innovation, in addition to research. And it also maps out the "new deal" for innovation policy, including concrete proposals made so far, to turn Europe's diversity into a powerful impetus for innovation and economic growth.

TB-01 Innovation Management: 5
Tuesday, 8/3/2004, 11:00 - 12:30 **Room: Ballroom I**
Chair(s): Jay L Tontz; California State University, Hayward

TB-01.1 [R] The Concept of Innovation Engineering to Expand the Horizon of Japanese Engineers

Chie Sato; Biztech Inc., Japan
Satoshi Kumagai; Musashi Institute of Technology, Japan
Junsei Tsukuda; Musashi Institute of Technology, Japan
Jun Numata; Musashi Institute of Technology, Japan

Engineers in Japan are required to make more contributions to innovations these days in order for Japanese industry to make full use of its technology competitiveness. Though engineers are mainly responsible for operational and practical sides of business, there are few discussions and tools for them to work on innovations. Therefore, we put focus on the importance of the innovation evolvement, especially at the operational level, and develop a new concept of "innovation engineering (Innovation Engineering)" as a concept for engineers to enable innovation in the environments of operational level. Since what engineers would do for innovation enabling environments at their operational levels would be only another engineering matter for them, this concept is named Innovation Engineering, in contrast to innovation management, which is basically for professionals of business management to establish the environments of innovations. As a basis of this concept, we start with a discussion on the definition of innovation and its evolvement process, followed by a detailed explanation of key frameworks of the concept, six generic components and 2-Dimensional matrix through the Innovation Engineering process. As a new concept, Innovation Engineering has relative meanings with existing methodologies, and some of them are briefly discussed here. We still keep refining this concept, and several issues to be addressed in further studies are also discussed in the last section.

TB-01.2 [R] Difficulties Encountered in National Innovation Surveys

Mary Mathew; Indian Institute of Science, India

Innovation measurement is intriguing and will continue to be so as organizations grow into complex entities. Many researchers have developed measures of innovation. The difference between an internal organizational assessor of innovation and an external organizational assessor of innovation brings in a range of differences in research design, focus and applicability. Irrespective, innovation, when looked at using the systems approach, has newness and commercial implications at each stage, namely input, throughput or output as its criteria of assessment. At each stage, innovation typologies such as incremental, radical, product, process, service, marketing and administrative innovation are measurable. New to whom, further complicates the matter. Questions in the innovation measurement debate are many, for example: Are inventions the best forms of innovation? Is R&D intensity and investments sufficient indicators of innovation? Is the Ph.D. profile of an organization indicative of innovation? Organizations with active R&D, namely basic and applied R&D, require supportive manufacturing and sales functions for the market diffusion of innovation. Feedback is further ploughed back into basic R&D. Capturing this innovation chain and cycle in innovation measurement is difficult as outsourcing of activities is becoming popular. The contrast between formless - borderless organizations and R&D intensively structured organizations is growing. Cluster innovation, where groups of organizations with different core competencies come together for innovation, are also common. This paper discusses difficulties in applying any one approach during a national innovation survey comparing organizations in small and medium enterprises of India. The OSLO manual is discussed. New frameworks of innovation measurement are required to ensure a balance between internal and external validity in measuring technological and non-technological innovation in organizations.

TB-01.3 [R] Industry – Science Relationships for Innovation and Technology Development Process in Iran

Jafar Bagherinejad; University of Azzahra, Iran

In the research presented in this paper, industry-science relationships in Iran were studied theoretically and empirically. Actually, the model of a triple helix of university-industry-government cooperation has been examined. The proper mechanisms, initiatives, motivations, legal and financial framework, institutional and structural influential factors and policy implications have been drawn in order to reduce the barriers and obstacles in the way of triadic cooperation. Based on the results of this research, there is a system of university–industry relations which must be analyzed. Further, the main reason for weak interaction is based on the situation of economic, scientific and cultural structures. Besides, the results show the lack of a triple helix model of cooperation among actors in the National Innovation System. However, there is strong potential and overall willingness to shape such a triple helix model and to improve the behavior of the National Innovation System.

TB-02 PANEL: Country Representatives Meeting
Tuesday, 8/3/2004, 11:00 - 12:30 **Room: Ballroom II**
Chair(s): Kiyoshi Niwa, University of Tokyo, Japan, PICMET Director of International Activities

PICMET has more than 80 Country Representatives from 52 countries. They provide news items for the PICMET Newsletter, TMN (Technology Management News), about developments in technology management; disseminate PICMET information; identify authors and session chairs; recommend nominees for PICMET awards; submit proposals for the location of future PICMET conferences; and represent PICMET in their countries.

All current country representatives and those who want to join the Country Representatives organization are invited to attend this special session to discuss the roles of the country representatives and the future strategies that are being developed for making PICMET information and activities readily available throughout the globe.

SESSIONS

TB-03 Manufacturing Management: 1
Tuesday, 8/3/2004, 11:00 - 12:30 **Room: Sorak II**
Chair(s): Tugrul Daim, Intel Corp.

TB-03.1 [R] Enterprise Risk Management Strategy Based on Phase-wise Cost Control

Kun Zhu; Tsinghua University, China
Yueting Chai; Tsinghua University, China
Jiaben Yang; Tsinghua University, China

Nowadays the market is providing more and more individual products to meet demand. The low-volume high-variety production increases production costs per unit. Risk increases considerably as manufacturing changes to be more flexible than before. Thus, manufacturers now may have to plan their production in a very careful manner and request prudent management to avoid risk. This paper introduces a phase cost based control strategy: in the orders' lifetime costs at different phases are controlled discriminatively. Implementation of the phase-wise cost control policy is first presented. After that, risk management for each phase in orders' whole lifetime is discussed in detail. The project risk management idea is applied for those phases. Next, a real instance is given to verify this strategy. The paper ends with conclusive remarks on this strategy's validity, efficiency and implementation issues.

TB-03.2 [R] The Failure of the Korean Numerical Controller Industry and the Characteristics of the Technology

Chaisung Lim; Korea Christian University, Korea, South

In spite of a 20-year investment by a number of Korean companies and by the government, companies manufacturing the numerical controller failed in gaining the domestic market. This study captures the characteristics of the technology of the numerical controller in terms of technological regime and in terms of architecture of the design of the numerical controller. This study analyzes an influence of the characteristic on process of learning to make a commercially viable numerical controller. The characteristics left Korean firms a limited condition for gaining market, accessing sources of knowledge. Korean firms fell in a trap of a vicious circle in accessing and accumulating the parochial knowledge. The knowledge for making the numerical controller, an integrated computer of a machine for controlling movement of general-purpose machines, could be only gained by selling mass produced goods to customers in various conditions. Korean firms and the government did not know the characteristics of the technology and adopted the approach used in the machine industry and learned the difference of the characteristic only after unsuccessful results of R&D activities. A 'technology-characteristic-friendly approach' for learning to make commercially viable numerical controllers in a catching up country is suggested on the basis of stylized facts from existing literature.

TB-03.3 [A] Keeping the Essence of the Manufacturing Spirit

Kazuo Hatakeyama; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil
Edson N Shigueoka; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil

This paper aims to describe the method to maintain the identity of a production system through the effective participation of workers in its production line projects, focused on essential questions in the manufacturing system. The workers' participation occurs in different program stages conducted by the manufacturing engineering sectors. At the beginning, a comprehensive survey to verify people's satisfaction on certain work aspects related to working positions was carried out, thus creating an opportunity of individual and collective learning and, what is more important, appraising the human being and his work. As an example, environmental conditions, process ergonomics, safety conditions, muscle efforts, storage conditions, work procedures and sequence, are evaluated. Survey results are tabulated and become a great joint action to look for productivity and work joy.

TB-03.4 [R] The Efficiency Improvement of Automated After-Sales Service Information System for Taiwan Personal Computer Industry: A Case Study of MiTAC, Inc.

Min-Jen Tsai; National Chiao Tung University, Taiwan
Hsiao-Ying Hung ; National Chiao Tung University, Taiwan
Ming-Fong Wu; National Chiao Tung University, Taiwan

The quality of computer products is not the only key to surviving in the currently highly competitive PC industry while after-sales service is gaining its importance rapidly. As the computer hardware vendors continuously improve the function and quality of the computer products, even the retailer price is consistently dropping, the issue of customer service for the buyers has become the key decisive factor and has been irreplaceable. This paper describes the system infrastructure which integrates the modern information techniques, including the friendly after-sales service modules, and can be categorized as having the following three key characteristics: 1. Self-Service: Customers could access the web site to download the software patches or upgrades, look up the status of the reported problem history, or refer to the intelligent FAQ without the intervention of the supporting personnel. 2. Up-To-Date Information: Information posted on the web site would be the latest and most accurate all the time, and it is the most qualified resources that customers could rely on and have access to. 3. Quick Response: The automated support site is running 24x7 over the Internet; customers could access the web site widespread all over the world around the clock. The MiTAC Service Site has been built up under the principles mentioned above and compared with the leading companies' service sites in this study. We have found that the technical enhancement, the customers' expectation and the corporate strategy have been significantly communicated since the web site was created. The continuous improvement to the after-sales support site is still needed in order to deliver the most value to the customers.

TB-04 New Product Development: 1
Tuesday, 8/3/2004, 11:00 - 12:30 **Room: Sorak III**
Chair(s): Se Jung; Ajou University

TB-04.1 [R] Firm Leveraging of "User Collaboration Communities" for Product Innovation and Development

Tzu-Ying Chan; National Chengchi University, Taiwan
Jen-Feng Lee; National Chengchi University, Taiwan

With the recognition of growing customer involvement in product development via networks, scholars have started to address the concept of "Co-creation", and have further addressed the concept of the "utilization of online customer communities to create new product development models". These models involve both manufacturers and customers in product creation, and consider customers to be innovation partners. This investigation uses open source software projects originating from two commercial companies, Mozilla and OOo, as research objects to explain how internal company development teams co-develop products with external development communities, and to explain the function of the project organizations, development processes, and licensing agreements. From the research results, it is difficult for companies to co-create knowledge with customers, because such an approach to knowledge creation is not merely a question of opening sources and setting up community websites. Careful thought also needs to be provided regarding how to cooperate with open source communities, so that it is possible to establish an appropriate development system. This system would involve the drafting of licensing agreements, arrangement of source modules, introduction and implementation of development manuals and development tools, interaction systems between company development teams and the community, product planning and attribution of control decision-making rights, community management, and commercial profit models.

TB-04.2 [R] Intelligent Design Advisor for Manufacturing Process Knowledge

Carl A Reidsema; University of New South Wales, Australia
Tim Jones; University of New South Wales, Australia
Adrian Smith; GKN-Aerospace, Australia
Don Kelly; University of New South Wales, Australia
Yang Quangang; University of New South Wales, Australia

Concurrent Engineering (CE) attempts to process as many product development tasks in parallel as possible while at the same time maximising the use of downstream life-cycle knowl-

edge at early stages of the design process. An effective implementation of this strategy can reduce the duration of design projects, save development costs, and provide better quality products through reductions in design to manufacture rework. An Intelligent Design Advisor (IDA) would have the capability to assess in-progress designs based on the requirements for the design, assist in verifying structural integrity, and recommend the most cost-effective strategy for manufacturing the structure. Many of the leading CAD systems that incorporate sophisticated solid modeling capabilities also allow the inclusion of product knowledge and design intent in the form of Knowledge Based Product Models. Such models contain the design intent in the form of geometry, material type, functional and other pertinent constraints, as well as process information by which the product is analyzed, manufactured, and tested, and can form the basis for developing an IDA. This paper discusses the current research issues and results regarding the development of an IDA that is capable of recognising features of the design and recommending manufacturing processes within simple constraints such as cost and time.

TB-04.3 [R] Consideration of Human Problem-Solving Style in the Conceptual Design of a Blackboard-Based Design System

Yang Quangang; University of New South Wales, Australia
Carl A Reidsema; University of New South Wales, Australia

Today, although various CAD/CAE/CAM systems are commonly used in engineering design, the nature of design is still traditionally "trial and error". To further increase competitiveness and adapt these rapid changes of technology, many companies are now looking for integrated design systems with higher levels of automation that will also consider concurrent engineering issues. One area of particular interest in this integrated model is that of problem-solving and information handling style. This is concerned with how to retrieve, store, analyze and verify information, and develop solutions in an automatic design system. One possible approach is to utilise a Blackboard Database architecture to learn and then employ the problem-solving and information handling styles of human designers and participants in the product development process. This paper discusses what human problem-solving styles are suitable for an automatic design system, how to embody the human problem-solving style in such a system, and how it will affect the performance of the whole system.

TB-05 Technology Transfer: 1
Tuesday, 8/3/2004, 11:00 - 12:30 **Room: Kum Kang I**
Chair(s): Frederick W Betz; University of Maryland University College

TB-05.1 [A] Technology Licensing Practices of Government-funded Research Institutes in Korea: Present and Change

Jong-Bok Park; Korea Institute of Science and Technology, Korea, South
Jeong-Kyu Park; Korea Institute of Science and Technology, Korea, South
Young-Bo Shim; Institute of Information Technology Assessment, Korea, South
Kil-Choo Moon; Korea Institute of Science and Technology, Korea, South
Eunnyeong Heo; Seoul National University, Korea, South

Since the early 1990s, science and technology have been regarded as major forces for economic growth in Korea. Although the Korean government created a variety of public-to-private technology transfer polices, unfortunately the technology licensing practices are not well known to shareholders such as government agencies, universities, and the private commercial sector. This paper unveils the conventional practices by which technology is transferred, mainly through licensing, from government-funded research institutes (GRIs) to industrial businesses. According to governmental pro-technology transfer policies, rapid changes over the technology licensing practices or strategies in the technology licensing offices (TLOs) of GRIs are progressing. The paper presents three cases of technology licensing practices newly adopted in Korea Institute of Science and Technology (KIST) and proposes new ones or strategies accordingly from the perspectives of TLO and GRI management, respectively.

TB-05.2 [R] Compensation Structures in Korean Technology Licensing from Abroad

Hyun-Woo Park; KISTI, Korea, South

Studies on compensation structures of international technology licensing show that the level of intellectual property protection in the host market and the favorableness of the host country's economic environment are positively related to the use of running royalty-based compensation structures. Lump-sum fee or fixed royalty compensation is more likely to be used in the introduction and decline stages of the technology life cycle, and running royalty compensation in the growth stage. The international experience and the size of the licensor company are positively related to the use of running royalties. In this theoretical context, this paper analyzes the compensation structures of technology import in Korea by using the officially reported data. It analyzes the characteristics of the compensation structures in terms of fixed royalty and running royalty by licensor country, group of licensor countries and size of licensee companies.

TB-05.3 [R] An Agency Explanation for Determinants of International Technology Licensing Contracts

Peter J Sher; National Chung Hsing University, Taiwan
Joseph Y Lu; National Taiwan University, Taiwan

International technology licensing has been long regarded as an important entry mode for international business. In this regard, most researches developed from the western perspective deal with outward technology licensing and its impact on foreign investment. However, following the increasing complexity and diversification of international operations, international technology licensing is employed to function as more dynamic and strategic tools in international businesses. Inward international technology licensing plays important roles in introducing, cultivating, and upgrading of industrial R&D (Kotabe et al., 1996). As organizational structures of contemporary economic organizations evolve toward more decentralization and more inter-firm relationships, little is known from previous research on inward technology licensing in technological innovation under circumstances of inter-firm collaborations. Agency theory is introduced in this research to explore the licensor-licensee relationship in international technology licensing by examining licensing contracts. This paper is developed from a licensee's perspective that the licensee is treated as a principal who does not suffice in technological expertise and that it depends on the licensor for acquiring technologies. The conventional outcome-based and behavior-based contracts are compared in this licensee (principal) and licensor (agent) relationship. Empirical findings on Taiwanese firms generally support the hypotheses proposed in this research.

TB-08 Technology Assessment and Evaluation: 1
Tuesday, 8/3/2004, 11:00 - 12:30 **Room: Kum Kang IV**
Chair(s): Kichul Lim; STEPI

TB-08.1 [R] Improved Technology Scoring Model for Credit Guarantee Fund

So Young Sohn; Yonsei University, Korea, South
Taehee Moon; Yonsei University, Korea, South

In Korea, the liquidity problem is a major setback for many small and medium companies with a great degree of growth potential in technology. In order to support such companies, the Technology Credit Guarantee Fund has been established. A credit guarantee is given to the companies which obtained a high score by a technology evaluation model so that they can get loans from the several financial institutes. Therefore, critical loss would occur when an inadequate evaluation model is used. In this study, we examine the existing scoring model with many attributes and provide an improved version which eliminates the multicollinearity. The proposed approach is expected to provide valuable information for the effective management of the various technology funds.

TB-08.2 [A] A Model of Defense Offset Technology Valuation: The Option Approach

Won Joon Jang; Seoul National University, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South
Tae Ho Lyoo; Seoul National University, Korea, South

Defense offset is considered to be an effective way of acquiring defense critical technologies and arms components as a counter-trade obligation of defense acquisition contracts.

Although arranging the offset contracts is widely perceived as necessary, there hardly exists an acceptable model of valuation of the offset technology. By undertaking the technology valuation approach and applying the option approach to the offset program, we present an offset technology valuation model that maximizes social net benefit of the countries transferring the technology. We apply our model to an actual case of defense technology transfer in the Republic of Korea. The contribution of this paper is in applying the option approach to the valuation of defense offset technology, providing for the additional flexibility to the analysis. Our research suggests several policy implications that can be applied to the actual process of defense offsets. Our results elucidate managers' role and responsibilities in designing such a process by applying option approaches.

TB-08.3 [R] The Development of a Contingent Valuation Model Integrating Technology Strategies and Valuation: The Application of Patent Analysis

Yiche Chen; Yuan-Ze University, Taiwan
Yan Ru Li; Yuan-Ze University, Taiwan

Technology valuation is viewed as an important tool in high-tech investment and R&D decision-making. So far, most of the valuation activities are based on a financial perspective in which the basic assumption is the known future of cash flow. These activities not only ignore the uncertainties of a technology and its market but also disregard a variety of applicable technology strategies while facing different external environments. It is thus hard to figure out a correct and proper number for valuation. Based on the emerging perspective on the importance of intangible assets, patents, which usually evolve from efforts of technological development, are seen as the most protected intellectual property right in legal regimes. Therefore, a utilized patent analysis is expected to be able to provide some solutions and answer part of the complex questions. Among various kinds of valuation tools applied in figuring technological values, a basic common question is shown quite often, i.e., how to properly present the technological values while applying different strategies. This part indeed is forgotten and in literature just like a black box. Moreover, the terms used in literature describing technology valuation are rather confused and raise some ambiguities, such as valuation, evaluation, assessment, pricing, values, and price. Therefore, we clarify the confused terms and further, by setting up a new technology evaluation framework, we try to integrate technology assessment, technology valuation, technology pricing, and technology prices. This paper mainly contributes by (1) founding a technology evaluation construct for future research, and (2) building up a systematic and contingent valuation model which consolidates technology strategy and patent analysis.

TB-08.4 [A] An Evaluation Model for a Strategic Innovation and Technology Management: The Case of Competitiveness Improvement of a Mexican Decentralized Public Institute of Research

Adriana Zavala; Buro Ambiental, Mexico
Enrique Martinez; Buro Ambiental, Mexico
Sixto Moya; Buro Ambiental, Mexico
Julio Sida; Buro Ambiental, Mexico

The present case shows a mix of different evaluation instruments of internal and external factors to promote the technology transfer of a recent Decentralized Public Institute, which faces the challenge of generating its own income from research and innovation activities after a long period of government's economic dependency. In order to achieve it, an original systemic model was developed with Competitive Intelligence (CI), Balanced Scorecard (BSC) and Porter's Competitive Factor Conditions (PCFC) tools, which are simplified in a set of specific indicators that includes organization performance, linking activities, research and development and also finance and non-finance items to understand the general competitive position that the institute keeps. The model's design is a combination of both different nature indicators from BSC and CI as filters to measure the Institute's strategic planning, which are integrated in a PCFC scheme to detect the opportunity areas that must be attended in a feedback process. Also, the model grants the conciliation between the research and innovation's opportunities defined by the CI process, with the creation and development of technology capabilities from human and material resources defined by the BSC process.

TD-01 Technology Diffusion: 1
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Ballroom I**
Chair(s): Ad J van de Gevel; Tilburg University

TD-01.1 [R] Key Success Factors Affecting 3G Wireless Diffusion in Japan

Kumiko Miyazaki; Tokyo Institute of Technology, Japan
Kjartan Jonsson; Tokyo Institute of Technology, Japan

Japan has been leading the world in 3G wireless. Two and a half years have passed since NTT Docomo started its 3G FOMA service based on WCDMA and over 2 years since KDDI started its 3G service based on CDMA2000. In this paper, the diffusion of 3G wireless is analyzed, focusing on NTT Docomo and KDDI. KDDI, a latecomer with a smaller customer base, has been much more successful in attracting customers to its 3G services than Docomo, a first mover and a market giant. This case is used as a base in trying to explain the key factors affecting 3G mobile diffusion. Of special importance are factors such as technology adoption pattern of users, the different corporate and technology strategies especially regarding backward compatibility, links with service and handset/network equipment suppliers. Subscriber and company statistics, brochures of handsets and services have been used in conjunction with data obtained through a preliminary survey of mobile phone users as well as interviews with key people connected to the mobile sector in Japan. In the conclusions, it is stated that some of the differences between the two companies' 3G services may relate to different types of innovations and that backward compatibility and pricing are key reasons for KDDI's higher subscriber growth compared to DoCoMo. Success in gaining 3G customers depends, to some extent, on standards choices and timing of standards changes.

TD-01.2 [R] More Perspective towards Infusion of Mobile Phones

Jukka Mäkinen; Tampere University of Technology, Finland
Hannu Jaakkola; Tampere University of Technology, Finland

The priority of the research on infusion has been on quite a high level during the recent decade. This study tries to reach lessons-learned perspectives on the concept of infusion of mobile phones. The mobile phone is integration of many innovations which have different kind of diffusion, infusion and lifecycle. The lifecycle of infusion of mobile phones is a cumulative and integrative lifecycle of many technologies. This means that the infusion of mobile phones depends on many other innovations. The infusion phenomenon can be measured – it is a question of observing the scope of use. The users and the infusion of a specific innovation are mortals. How are the users of mobile phones? Instead of cornering or training individuals, it is possible to make an everyday role state plan for infusion or its process. The users of mobile phones are predisposed to their everyday activities and they are change agents. In a Finnish "seven numbers from 39" lottery game, you should try to find an unpopular number combination of seven numbers. But, it is not enough – your "lucky 7" combination should be selected from among the other numbers, and there are 15380937 alternatives.

TD-01.3 [R] Innovation Diffusion in a Context of Radical Industry Restructuring: A Case from China's Telecommunication Industry

Jiang Yu; University of Cambridge, United Kingdom
Yongjiang Shi; University of Cambridge, United Kingdom
Xin Fang; Chinese Academy of Science, China

This paper, based on a detailed case study on Internet Protocol (IP) telephone innovation diffusion in the Chinese telecommunication industry, seeks to explore the complex relationships in a regulatory environment and enrich the traditional diffusion models. The study reviews the reforms in the Chinese telecommunication industry and analyses different players' interests and strategic moves, which illustrate that the diffusion of a new technology innovation can trigger a fundamental transformation in an industry as well as provide an effective tool for a regulator to stimulate the transformation and to achieve its strategic objectives. The paper also indicates the importance of the institutional infrastructure within the industrial system.

SESSIONS

TD-02 Science and Technology Policy: 5
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Ballroom II**
Chair(s): Miyako Ogura; Keio University

TD-02.1 [R] A Korean Regional Innovation System: A Case of Gyeonggi-Province

Hyuna Park; Sejong University, Korea, South
Doohee Hwang; Sejong University, Korea, South
Sunyang Chung; Sejong University, Korea, South
Jeonghwa Kim; Korea Research Council of Fundamental S&T, Korea, South

Nowadays, the twenty-first century will be characterized not only by knowledge-based economy but by regionalization. Confronted with massive globalization, innovation activities are increasingly becoming regionalized. Innovation and economic activities should be systemized and networked among regions. Therefore, many experts emphasize a regional innovation system (RIS). In many countries, including Korea, there have been strong efforts to formulate and implement regional innovation systems. Thus, like in foreign countries, there have been several studies on RIS. However, there have been only a few studies on a specific regional innovation system in Korea. Therefore, this paper will deal with a representative regional innovation system in Korea, i.e., Gyeonggi Regional Innovation System. Gyeonggi-Province surrounds the Capital of Korea, Seoul. Compared to other regional innovation systems in Korea, we can appraise that Gyeonggi Regional Innovation System is much advanced and produces many successful innovation and economic results. Therefore, this paper will give not a few strategic implications to Gyeonggi-Province for re-building to the innovative point in East-Asia and the others in Korea. We will also give foreign countries some meaningful issues, especially developing countries, concerning the remarkabe growth of Korea.

TD-02.2 [R] Managing Innovation at Higher Education Institutions in Taiwan: Towards a 'Scientific-Economic' Framework

Yuan-Chieh Chang; National Tsing Hua University, Taiwan
Ming-Huei Chen; Yuan-Ze University, Taiwan
Mingshu Hua; National Chi Nan University, Taiwan
Phil Y Yang; National Chi Nan University, Taiwan

Thanks to the passage of the Science and Technology Basic Law in 1999, Taiwanese universities have taken a more "scientific-economic" approach to protect and commercialize their research on their own rights. This paper examines the increasing innovative activities such as patenting, licensing and partnership with industry and incubated start-ups in the context of Taiwanese higher education institutions (HEIs). We propose a framework to analyze the innovation management of a university, namely: (1) intellectual property managerial capabilities, (2) the strength of external industrial partnership, (3) the entrepreneurial orientation of faculty, and (4) governmental commitment to research funding. We further examine how these factors influence innovative performance. Four hypotheses were developed. Via a postal questionnaire survey, all 122 HEIs in Taiwan were surveyed. The paper reveals that the intellectual property management, HEI-industry partnership and academic entrepreneurial orientation have differentiated effects on patent grants, licensing incomes, and firm incubating. Also, government resource commitment plays the role of moderator. Some managerial and policy implications were drawn for managing innovation effectively in universities.

TD-02.3 [R] The Evaluation of Daedeok Science Town and its Implication for the National Innovation Policy - in the Perspective of Innovation Cluster

Deok S Yim; STEPI, Korea, South
Wang D Kim; STEPI, Korea, South
Jung H Yu; Seoul National University, Korea, South

Recognizing its 30-year anniversary in 2003, the Daedeok Science Town (DST) of Korea was evaluated from the perspective of an innovation cluster. Even though the S&T achievement is remarkable, the technological potential was not fully realized. However, it shows that the innovation cluster is a very powerful mechanism to boost innovation in one country. It is concluded that the DST has been following the downstream path of evolution - from S&T development to marketing function - and is in the early stage of an innovation cluster. It is suggested that the business related function should receive equal attention when any innovation cluster is designed and operated.

TD-02.4 [R] Role of Technology in Korea's Economic Development

Doohee Hwang; Sejong University, Korea, South
Hyuna Park; Sejong University, Korea, South
Sunyang Chung; Sejong University, Korea, South

Korea's industrialization started at the beginning of the 1960s. In 1962, the Korean government initiated the First Five Year Plans for Economic Development. Since then the government implemented 7-time Five Year Plans. In this process of economic development, technology has played a terribly important role. Also such efforts of Korea have been regarded as an extremely successful model for foreign countries. However, in the second half of the 1990s, Korea was forced to be in economic crisis. This crisis basically comes from structural problems of the Korean economy, in particular the lack of basic technological capabilities. This paper will deal with the role of technology in Korea's economic development according to its industrialization process. We will discuss the process by the turn of the decades based on the concept of the national innovation system. In particular, we will discuss the division of labor among innovation actors in the Korean national innovation system. A particular focus will be placed on discussing the role of technology before and after the economic crisis at the end of the 1990s. By the turn of the century, the role of technology in economic development should be changed. Therefore, we will also identify the future role of technology in Korean economic development. Finally, based on our analysis, we will identify some meaningful implications, which will be really helpful for other countries.

TD-03 Technology Planning and Forecasting: 1
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Sorak II**
Chair(s): Tugrul U Daim; Intel Corporation

TD-03.1 [A] Technology Forecasting using Patent Searches and Growth Curves

Tugrul U Daim; Intel Corporation, United States

Rapid Technology Progress has made Technology Forecasting a key approach to decision making in high tech environments. This paper reviews applications where a combination of patent searches and growth curves are used for technology forecasting. A process for use of such data for technology forecasting purposes is defined. The applications are picked from the class work developed in Technology Forecasting course taught at Engineering and Technology Management Department of Portland State University and include technologies such as nano, digital imaging, optical storage and interconnect.

TD-03.2 [R] Technology Roadmapping as a National R&D Planning-Korea's Experience

Byeongwon Park; KISTEP, Korea, South
Doyoung Byun; Konkuk University, Korea, South
Seokho Son; KISTEP, Korea, South
Keunha Chung; KISTEP, Korea, South
Pyengmu Bark; KISTEP, Korea, South

Technology roadmapping has been widely used for individual companies and entire industries for technology management and planning. It enhances communication among the stakeholder and identifies the strategic S&T areas to allocate the limited R&D resources. In a view of one nation, the technology roadmapping process was applied and the national technology roadmap (NTRM) was made as the grand R&D plan in Korea. Korea has achieved remarkable economic growth during the last several decades and closed the technology gap between developed countries by following the path that is rather safer, avoiding possible pitfalls. However, the global competition has been fierce and the society has become knowledge-based and technology-driven. Korea has reached the critical moment to shift the R&D paradigm to be more innovative in the coming decade. Therefore, the Korean government initiated a national technology roadmapping process to align its limited R&D resources and have national R&D strategy and planning in 2002. The government also successfully

developed technology roadmaps for 99 core technologies based on five visions, which were identified and selected after analyzing competitiveness and future strategies of ten major industries. The NTRM has been well-received among stakeholders such as government, industry and academies for projects development, and it recently served for developing next-generation economic growth engines. In this paper, we present Korea's national technology roadmapping process in detail and assess its acceptance among the stakeholders. We also compare the NTRM process with the case of technology foresight activity of other countries.

TD-03.3 [A] Technology Roadmapping in Strategic Research Areas: An R&D Planning Example of Korea Institute of Science and Technology

Yong-Gil Lee; Korea Institute of Science and Technology, Korea, South
Se-Jun Lee; Korea Institute of Science and Technology, Korea, South
Yun-Chul Chung; Korea Institute of Science and Technology, Korea, South

Technology roadmapping approach is widely used as an R&D planning method. At the level of national R&D program, the Korea government designed national technology roadmap (NTRM) to develop technologies of high cost and risk effectively. A few firms and institutes also designed a lot of industrial technology roadmaps, which deal with promising products like DNA chip, micro robot, etc. In view of individual government-sponsored research institute (GRI), the technology roadmap approach could be used as a long-range R&D planning tool. Especially in fuzzy-front and cutting-edge research areas, which are the strategic research areas of KIST, the technology roadmap approach should be flexibly adjusted to the characteristics of the research fields. This paper suggests a technology roadmapping approach in fuzzy-front research areas with which KIST mainly deals as focused research areas. The technology roadmap of KIST seeks to capture the environmental landscape, e.g. threats and opportunities, and the research capability, e.g. strengths and weaknesses. So the technology roadmapping procedure is intimately associated with the vision-making process of KIST. This paper combines the technology roadmapping procedure with the vision-building mechanism of KIST. From this method, a lot of GRIs engaged in forefront and long-term research areas could get an example of technology roadmapping as an R&D planning tool.

TD-03.4 [R] A Planning Methodology Proposal for Integrated Product and Process Technology

Tufan V Koc; Istanbul Technical University, Turkey
Seckin Polat; Istanbul Technical University, Turkey
Verda Yunusoglu; BEKO Co., Turkey

Technology plays a vital role in corporate success. Therefore, the technology planning process should be considered and studied in detail and carefully. Usually, research on technology planning is either on product or on process. Product and process technologies are different in terms of structures and need different planning procedures, but since they interact in company operations, they should be considered together. In addition to this, another problem occurs when technology planning procedures are carried out independent of strategic planning of the business. In this paper a methodology for the process and product technology, when they are assessed together, will be described.

TD-04 New Product Development: 2
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Sorak III**
Chair(s): Robert Phaal; University of Cambridge

TD-04.1 [A] A New Approach for Technology Forecasting of New Product Development Targets

Lane Inman; Veritas, Inc., United States
Timothy R Anderson; Portland State University, United States

A new approach to technology forecasting has been developed using DEA to address weaknesses of existing state of the art, statistical-based, technology forecasting techniques. This approach has been tested on applications in disk drives, enterprise database systems, fighter jets, microprocessors, digital cameras, and computer display projectors. This presentation will introduce and refine the methodology first described at PICMET '01 as well as survey recent results and uses of the tool.

TD-04.2 [R] Optimization Models for Quality Function Deployment

Xin Lai; National University of Singapore, Singapore
Min Xie; National University of Singapore, Singapore
Kay Chuan Tan; National University of Singapore, Singapore

Quality Function Deployment (QFD) is widely used as an important product/service design method to improve quality and to better meet customers' needs. As the competition is multi-dimensional, companies have to make trade-offs between cost and other resource constraints. In recent years, many optimization methods were introduced into the QFD process to maximize customer satisfaction under certain constraints. However, there is lack of a generalized QFD optimization framework that can guide researchers and practitioners. There are many stages in the QFD optimization process. Most current optimization methods focus on only part of the QFD process though all of them are called QFD optimization. This may cause some misunderstanding to researchers and practitioners. To overcome these problems, this paper aims to provide a generalized QFD optimization framework, and nearly all the current QFD optimization methods can be included under this framework. It is useful to learners, researchers and practitioners of QFD, and further research can also be identified based on the framework developed.

TD-04.3 [R] Modularizing the New Product Design Process

Hyeonju Seol; Seoul National University, Korea, South
Yongtae Park; Seoul National University, Korea, South

New product development (NPD) is an important business process and a major contributor for keeping the competitive advantage in the market. As the NPD process becomes a vital factor for managing the business, many leading firms are searching for ways to improve the NPD process. Despite the strategic importance, however, it is very hard to manage the process effectively. This is because the NPD process involves complicated interaction among various activities and collaboration among cross-functional product teams. In that regard, modularizing the NPD process is considered a useful and effective concept. The notion is of modularizing means to partition of the whole process into sub-processes that could be handled independently yet by multi-disciplinary and cross-functional teams. This study concentrates on modularizing the new product design process of the whole NPD process. Broadly, the modularizing process in this study consists of the following three steps – (1) representing the relationship among the design activities by making the activity dependency matrix based on IDEF3 relationship primitives (link, junction), (2) modularizing design process by partitioning and grouping the activities having a close relationship, and (3) representing modularized design process by using IDEF3.

TD-05 Technology Transfer: 2
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Kum Kang I**
Chair(s): Jong Guk Song; STEPI

TD-05.1 [R] Revisiting the Concept of Technology Transfer

Frederick W Betz; University of Maryland University College, United States

We examine how industrial outsourcing has been a more effective mechanism in international economic development that has the idea of international programs of technology transfer. The most effective role that international institutions can play in fostering industrialization in less developed economies is to assist governments to construct advanced national infrastructures (1) for education and innovation, (2) for communication and transportation, and (3) for honest financial markets and corporate governance.

TD-05.2 [R] Codified-Tacit Knowledge Transfer in Cooperative Agreements: A Study of the e-Commerce Software Industry

Kung Wang; Industrial Technology Research Institute, Taiwan
Shu-Yu Yeh; Ming Chuan University, Taiwan

Using case studies about the software cooperative projects in Taiwan, this paper examines

the characteristics of knowledge transfer, exchange, and sharing concerning e-commerce software and services, especially. It describes the incentives and obstacles for knowledge transferring and sharing between provider and receiver. It also analyzes the level and main sources of tacit knowledge and the capabilities of the receiver about the knowledge accumulated. From case studies it is shown that foreign firms cooperate with Taiwanese firms because of complementary capabilities or cost-effective considerations. Firms have various incentives to decide the type and degree of knowledge transferring and sharing. It obviously depends on strategic objectives and contractual terms of the collaboration, such as intellectual property rights (IPRs) or copyrights, especially tacit knowledge. The absorptive capacity and motivation inhibits or facilitates firms for codified and diffused knowledge into internal organizations from their collaborators. From the results, we give suggestions for firms on how to move toward codified tacit knowledge transfers in cooperative agreements.

TD-05.3 [R] The Structure of Licensing Contract for Optimal Risk Sharing

Tae-Kyu Ryu; Seoul National University, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South
seong-sang Lee; Seoul National University, Korea, South

In licensing contracts for public-to-private technology transfer, the minimum royalty is considered as an effective device to prevent the licensee's strategic behavior. However, a use of minimum royalty falls into a dilemma because it must increase the burden of licensee in case of failure in commercialization of licensed technology by an unexpected change in state of nature. Introducing some other device to the licensing contract is regarded as a possible solution of hedging the risk on the part of licensee. We have focused on the ex-post option contract defined as a contract that a licensee has the option whether or not to go at the beginning of manufacturing stage. As a result of a previous study, we can find that the licensing contract with ex-post option coupled with minimum royalty can share the risk on the part of licensee and make the licensee do his best to commercialize transferred technology. The end of our research is to suggest an efficient structure of licensing contract for sharing the risk of licensee by the minimum royalty during commercialization of licensed technology. To derive the contract structure, we build up the model with two objectives. One is to find out the minimum royalty which prevents the strategic behavior. The other is to derive the relationship between minimum royalty and ex-post option fee, which maintains the advantage and reduces the disadvantage of minimum royalty.

TD-06 Telecommunications Industry: 2
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Kum Kang II**
Chair(s): Scott Wilson; University of Cambridge

TD-06.1 [R] Regulating VoIP: The Challenges and the Opportunities

Chaiho Kim; Santa Clara University, United States
Manoj Parameswaran; Santa Clara University, United States

The rapid growth of broadband access, increasing availability of VoIP services and equipment, and spread of VoIP standards have pushed VoIP into prominence in the telecommunications regulation debate. IP based telephony has become a credible enough alternative to prompt major telcos in the U.S. market to offer IP-based services and for the FCC to initiate a debate on regulatory issues. IP dissociates the telephony application from the infrastructure; and it subverts the concepts of distance, location and access that have traditionally defined the telecom industry's business and regulatory processes. It blurs the boundaries of states and nations; it alters the concept of what a phone call is. Regulators have so far taken a hands-off approach both due to the complexity of the problem, and due to the stated intent of letting the nascent technology develop. Today it is a more urgent concern: the current regulatory regime offers avenues that traditional telcos can exploit to keep IP-based providers out of the market; so also in other aspects it renders some of the traditional providers vulnerable to destructive competition. Both regulators and providers are trying to grapple with the impact of a technology that is set to fundamentally transform the entire industry. We review the nature of these changes, outline the challenges faced by regulators, highlight how the traditional view of industry structure may have to adapt and offer guidelines that will benefit the consumers in the long run.

TD-06.2 [R] The Third Generation 3G of Mobile Telecommunication System: Lessons Learned from Ghana Secondary Case Study

M. A. M Al-Saud; University of Bradford, United Kingdom
A M Ahmed; University of Bradford, United Kingdom
M E Woodward; University of Bradford, United Kingdom

The mobile telecommunications industry comprises a highly competitive, dynamic and uncertain environment; hence high velocity of innovation introductions in the market is a key success factor for offering new value-added services in the mobile industry. Extant literature has shown that a fast time-to-market of an innovation creates a sustainable competitive advantage. Mobile businesses can achieve a pioneering advantage by the fast introduction of new services. Research has revealed that pioneers benefit from higher brand recognition and a likely increase in customer loyalty due to customers' reluctance to change to competitors' services because of high information and switching costs. This paper reports on the fourth of six secondary cases that includes Sweden, Chile, Venezuala, Hong Kong, China and Japan, to be investigated individually to draw a number of learned lessons from each of them that can be useful in introducing the Universal Telecommunication System UMTS – 3G to the Kingdom of Saudi Arabia.

TD-06.3 [R] The Key Success Factors and Business Strategies for Market Diffusion of 3G Mobile Telecommunication Service

Jong-Hyun Park; ETRI, Korea, South
Moon-Koo Kim; ETRI, Korea, South
Jong-Hyun Paik; ETRI, Korea, South

Some of the recent trends in mobile telecommunication service in Korea include provisioning of 3G services, focused on mobile Internet and multimedia based cdma2000 (synchronous type) and emerging commercialization of W-CDMA (asynchronous type) service. However, with market uncertainty, lack of effective demands, rapid evolution of technology, non-existence of business strategy, lack of distinction with competitive services and killer applications are all contributing towards difficulty for extend of 3G services in the market growth. Hence for a road to a full market diffusion of 3G services, this study proposes: 1) key success factors and 2) competitive strategies, customer strategies, service and device provisioning strategies, and pricing strategies, empirically with experts' surveys and market research.

TD-07 Case Studies in Education in the Area of Technology Management
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Kum Kang III**

Moderator: Alexandre Repkine, Seoul National University, Korea, South
Panelists: Zong-Tae Bae, KAIST Graduate School of Management, Korea
W. B. Lee, Hong Kong Polytechnic University, Hong Kong
Kazuo Yanagishita, Nihon University, Japan

TD-08 Technology Assessment and Evaluation: 2
Tuesday, 8/3/2004, 14:00 - 15:30 **Room: Kum Kang IV**
Chair(s): Nathasit Gerdsri; Portland State University

TD-08.1 [A] The Assessment of Technology Level in Korea

MoonJung Choi; KISTEP, Korea, South
Sang-Youb Lee; KISTEP, Korea, South

It is important to identify key technologies and assess technology level for the establishment of national R&D policy to upgrade technology level in Korea, which is situated between the high technology power of advanced countries and the chase of developing countries. This paper summarizes the result of the assessment of technology level for 99 key technologies of "National Technology RoadMap", which consists of 5 visions, of Korea. The technology level, the time-gap of technology level between Korea and world-top country, the role of government to upgrade technology level, etc. were investigated by the survey (total 1,067 respondents) and the interview with experts related to key technologies. The average technology level of Korea was 65.1% of that of world-top country and average technological gap was 5.8 years. The technology level of vision I “Building an Information-Knowledge-

Intelligence Society" was 71.6% and highest among 5 visions. The highest technology level among 99 key technologies was 85.6% for "Digital Broadcasting Technology" and the lowest was 20% for "Weather Control Technology". The roles of government to upgrade technology level were investigated as the improvement of R&D support system (28.5%), the training of R&D personnel (26.6%), the expansion of R&D facilities/equipments (24.1%), and the promotion of application of research result (20.8%), in sequence.

TD-08.2 [R] Technology Shock, Non-technology Shock and Employment Effect in the Korean Economy

Sang Sup Cho; ETRI, Korea, South
Chun Mo Ahn; ETRI, Korea, South
Myung-Hwan Rim; ETRI, Korea, South

This study is an empirical investigation on the employment effect of technology shocks and non-technology shocks using long-term data (1970-2001) from Korea. In conducting this study, threshold effects were taken into account for the verification of the possibility of normality in the employment data, and technology shocks were identified and differentiated from non-technology shocks using a structural VAR model. The two types of shocks thus identified were subjected to a comparative study of their effects on labor productivity and employment using impulse response function analysis. The results obtained by the analysis can be summarized as follows: First, technology shocks have permanent effects on labor productivity (0.09%), while, in comparison, the effect of non-technology shocks is short-lived. Second, whereas both technology shocks and non-technology shocks have permanent effects on employment, the effect of technology shocks is more extensive than that produced by non-technology shocks (0.01% versus 0.006%). Accordingly, this study has found that, contrary to the conclusions reached by recent studies based on US economic data, in Korea, technology shocks and non-technology shocks have positive impacts on the economy. The techno-political implication of this study is that in the case of Korea, exogenous technology shocks (increased R&D expenditures and human capital formation) and non-technology shocks (monetary and financial expenditures) are valid tools for an employment policy seeking to increase jobs; however, non-technology shocks, in comparison, are ineffective instruments for a policy geared to a long-term productivity increase.

TD-08.3 [R] Science and Technology Indicators in Emerging Economy Country

Kazuo Hatakeyama; CEFET-PR (Centro Federal Tecnológico do Paraná), Brazil

This study aims to contribute to the understanding of the dependence relations and existing drivers among S&T indicators available in the State of Parana to subsidize the planning and economic policy by means of identification and discussion over relations among the main indicators utilized. In this context, the general objective was to systematize and discuss the main indicators utilized to analyze S&T. To attain the general objective, it has shown the importance of indicators of S&T through a survey on references aiming to gather subsidies to understand concepts, the history and the evolution of the data collection forms, and indicators analysis. Results obtained pointed out to a strong tie of the driver to the indicators number of researchers and the amount of financial resources allocated for R&D. Another contribution of this analysis is to present the degree and the feature of complexity that all variables take up in this system, mainly variables belonging to the two groups above mentioned.

TD-08.4 [R] A Classification of Methods for Technology Auditing

Mohammad R Arasti; Sharif University of Technology, Iran

This paper reviews the literature on technology auditing, classifying different methods of technological capability evaluation. Technology auditing - as a function of Management of Technology (MOT) - deals with the evaluation of technological capabilities at a firm/national level. There are different purposes for technology auditing. One of the main aims is to investigate technological strengths and weaknesses in order to formulate a firm's technology strategy. In the literature, there is some confusion between "technology auditing" and "technology assessment". For this reason, we describe firstly the concept of technology auditing and distinguish it from technology assessment. Technology evaluation is introduced as a general concept, which includes both technology auditing and technology assessment. Several methods of technology auditing are then explored. The advantages, disadvantages and application limits of each method are briefly discussed. Finally, a classification of these methods is presented based on their characteristics. For this purpose, two criteria are considered: Area of Application and Target Point. According to the mentioned criteria, a matrix of nine zones is developed and the methods of technology auditing are positioned in the matrix.

TE-01 Technology Diffusion: 2
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Ballroom I**
Chair(s): Kumiko Miyazaki; Tokyo Institute of Technology

TE-01.1 [R] Assuming Parameter Patterns on the Diffusion of Successive Generations of Technology

Choonmo Ahn; ETRI, Korea, South
IlSoo Rho; ETRI, Korea, South

There have been many works for the diffusion models of successive generations of technology. The product, based on new technologies, may have different diffusion aspects compared to its predecessors. However, it has been assumed that the patterns – the coefficient for each generation - of diffusion of successive generations are not varying for each generation. In this study, we assume that successive generations of a technology evolve with different patterns compared to their predecessors. That is, we assume that the coefficient of innovation and imitation for the successive generations is a function of the order of generations - varying along generations. Under the assumptions of several patterns, we perform empirical studies for the well-known data set - IBM mainframes cases. We show the advantage of this assumption on the classical sense of criterion.

TE-01.2 [R] Modeling Stochastic Diffusion and Defining Parameters for Substitutable Technological Innovation

Baomin Hu; Hebei University of Technology, China
Lili Wang; Hebei University of Technology, China
Ad J. W. van de Gevel; Tilburg University, Netherlands
Xiuxin Liu; Hebei University of Technology, China

It is well known that there are many stochastic factors in the diffusion process of technological innovations. To overcome the shortcomings of the S-shaped diffusion model, it is necessary to build more practical models from the stochastic point of view. On the basis of an analysis of firms' stochastic adoption behavior, this paper builds a stochastic model for a diffusion system of substitutable innovations and performs a computer simulation. Furthermore, in this study, an attempt has been made to explore how to define the parameters of stochastic diffusion models. Thus the approaches to control and optimize the diffusion process become clearer.

TE-01.3 [R] Social Capital Promoting Technology Innovation Dissemination

Hongyan Li; University of Science and Technology of China, China
Xuelin Chu; University of Science and Technology of China, China
Bao Chang; University of Science and Technology of China, China
Li Xiong; University of Science and Technology of China, China

Technology innovation dissemination is a social process. The authors applied the concepts of social capital in the analysis of technology innovation dissemination process. It was concluded that the social capital exerted positive influences on improving the quantity and ability of technology innovation, accelerating the speed of technology innovation and expanding the saturated volume of innovation dissemination. Suggestions for activating social capital are made in six aspects: disseminating the social capital concepts, accumulating social capital through organizational efforts, opening the communication channel to expand the operation space of social capital, completing supporting system, activating existing social capital, and applying physical, financial, cultural and social capital harmonically. The authors advocate that such measures would effectively promote technology innovation dissemination.

TE-01.4 [R] A Technology Diffusion Model of Business Method: An Integration of Patent Citation and Bass Model

Kuei-Kuei Lai; National Yunlin University of Science and Tech., Taiwan
Shann-Bin Chang; Nan-Kai College, Ph.D. Candidate at NYUST, Taiwan
Shu-Min Chang; Nan-Kai College, Taiwan

With the rapid advances in technology, it is critical for a company to keep abreast of technological changes and develop appropriate strategies in response. A patent is traditionally viewed as an index of research performance. Research on a patent citation can also reveal the trend and path of technological development. Similar to innovation diffusion, the pace of technological development is slow in the beginning, then accelerates, and finally slows down again. This paper discusses the trend of technological development, using business patents published in the USPTO database. Four main findings are as follows. First, technology diffusion through patent citation fits the Bass Model well. Second, the effects of direct citation and indirect citation resemble the innovation adopter and the imitation adopter, respectively. Third, the effects of diffusion to other technology fields are mostly generated via indirect citation. Fourth, predictions from the Bass Model may underestimate the technological development in the early stage of the technology life cycle. Two suggestions are proposed in this paper. One is to modify the Bass Model to match the characteristics of data in the early stage of the technology life cycle. The other is to include enterprise units in the analysis; the outcomes can thus provide references for enterprises to formulate technology strategies.

TE-02 Entrepreneurship/ Intrapreneurship: 1
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Ballroom II**
Chair(s): Charles M Weber; Portland State University

TE-02.1 [R] A Study of the Effect of Related Governmental Measures on Small and Medium Enterprises in Taiwan

Hsueh-Chiao Chiang; National Science Council, Taiwan

Innovation and entrepreneurial activities are the key factors for the establishment, growth, and sustainable operation of a business. Entrepreneurs employ innovative measures to create more wealth from available resources. Taiwanese businessmen possessed a unique entrepreneurial spirit, and the optimization of this entrepreneurship and putting this innovativeness into realization in industries became a significant driving force in the nation's economic development. The government played a key role in creating an environment that is beneficial for business innovation and entrepreneurship. Government functions were realized in the form of technology development, subsidy grants, human resource education, and market demand development for the achievement of this goal. This paper mainly compiled recent business incentive measures and entrepreneurial activity related government measures in an attempt to understand the creation of the related measures beneficial for the innovation and entrepreneurial activity, the key role that is played in small and medium businesses.

TE-02.2 [R] Modeling Innovative Project Teams: Entrepreneurial Leadership, Team Development, and Conflict

Ming-Huei Chen; Yuan-Ze University, Taiwan
Yuan-Chieh Chang; Yuan-Ze University, Taiwan
Tzu-Ming Chen; Yuan-Ze University, Taiwan

The paper proposes a team management approach to manage innovative project teams by integrating the concept of entrepreneurial leadership, team development, and conflict. The paper collects 129 responses of R&D members in high-tech service companies of Taiwan, specifically in telecommunications and software design categories. Results show that interpersonal, task, and performance cognitive conflict of intra-team are positively correlated to each other, but negatively correlated to team development.

TE-02.3 [A] Business Creation in the Era of the Fourth Generation Innovation

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

With the advent of IT technologies, especially IP technologies, the present-day relationship between business, technology, society and innovation will need to be changed to enable the creation of new and better models for driving forward progress in business. In this paper, we take a general view of the fact of being in need of a new innovation model and describe our thoughts on how to create a new innovation model. We also describe an attempt to create new markets to support business under a new business model. We propose a new and innovative model rooted in our attempt to create a new market as the 4th generation innovation model. We define a linear model as the first innovation model, KlineÅ@ model as the second innovation model, and the market experimental model as the third innovation model.

TE-02.4 [A] Lessons Learned about Spin-offs from University Research Center

Eungkyu Kim; Hanbat National University, Korea, South
Junbyung Park; Hanbat National University, Korea, South
Jongin Choi; Hanbat National University, Korea, South

This paper examines the three high-tech spin-offs from a research center of Hanbat National University in Korea. Our study of three spin-off companies leads us to suggest that there are many types of academic spin-offs, thus there are diverse strategies to survive in the early stage of the venture company.

TE-03 Technology Planning and Forecasting: 2
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Sorak II**
Chair(s): Robert Phaal; University of Cambridge

TE-03.1 [R] TV-based VOD Deployment Strategies among Telcos and Market Outlook: A Study of Digital Convergence

Byung-sun Cho; ETRI, Korea, South
Hoyoung Hwang; ETRI, Korea, South

As the high-speed Internet access market steadily nears its maturity phase, growth is quickly tapering off and competition, intensifying. As a result, telecommunications companies are at present faced with the urgent need to evolve away from a growth model based on continuous acquisition of new subscribers. They must now find new sources of revenue which can increase their subscribers and also ARPU (Average Revenue per Unit) in the existing subscriber pools, for instance by developing new value-added services and other differentiated service. The recent convergence of telecommunication and broadcasting has come about precisely at this transitional period in the telecommunications market, and is perceived by the industry both as a new business opportunity and as a threat. TV-based VOD (Video on Demand), for one, is able to attract new customers desiring multimedia services of superior quality and to lock in existing customers. This service is increasingly being adopted among telecommunication companies as a part of the comprehensive service differentiation strategy to win over customers from competitors, and is regarded by and large as a killer application and as one of the most promising new sources of revenue, which can boost ARPU as well as generate high added value. TV-based VOD business, if successfully introduced to the Korean market, can offer telecommunications companies (telcos) a broad spectrum of revenue sources. Extra revenue can be derived from subscription fees, monthly fees and fees on additional services; per-usage charges from pay-per-view (PPV) services will also be a considerable source of income. Companies can generate further profit by renting and selling terminal equipment such as set-top boxes, home gateways and servers, and VOD will also provide them with an additional platform to rake in advertising income. Furthermore, VOD providers may also tap into service incomes from media companies and content providers by offering them such services as security, digital certification, billing, payment processing, member administration and usage information service. Meanwhile, the latest evolution in network development is brightening the market prospect for TV-based VOD. The service has now hit the market, deployed over VDSL networks - a next-generation high-speed Internet - and advanced cable modem networks, delivering high-definition DVD-quality videos. Its potential as a new killer application, capable of jacking up ARPU and spawning additional income sources, is highly appraised. TV-based VOD is a service whose deployment is closely linked to the evolution of subscriber networks. According to the forecast pro-

duced by the present study, based on the forecast on the post-ADSL market and a survey conducted on VOD, as post-ADSL subscribers increase from 1.53 million in 2003 to 4.44 million in 2004, and 9.87 million in 2006, the percentage of post-ADSL subscribers with intention to also subscribe to a VOD service is expected to rise from 16% to 34% in 2006. Accordingly, VOD subscribers are estimated to increase from 0.24 million in 2003 to 0.98 million in 2004 and to 3.35 million in 2006.

TE-03.2 [A] A Prospective on the Evolution of Mobile Communications in Korea

Seok Ji Park; ETRI, Korea, South
Joo Seong Park; ETRI, Korea, South

Mobile communications services have led the rapid development of the IT industry in Korea. However, the mobile communications market is being saturated now. The 3rd generation (3G) mobile communications services have launched recently to make new business opportunities, but they still have many limitations such as expensive usage fees and low transmission speed. Thus, there is recently much concern for the next stage of 3G services to overcome previous restrictions. This paper not only reflects these trends but also suggests a vision and evolutionary R&D activities for new mobile communications services in Korea. Vision and strategy should be established based on the user's demand as well as on the service provider's technologies. The usage pattern of mobile Internet subscribers is changing from simple downloading of bell sounds and characters to various kinds of applications like mobile commerce. Therefore, the new services should meet user's requirements in terms of price, data transmission speed, and applications. 4G services can guarantee 100Mbps ~ 1Gbps transmission speed and various multimedia services phone with low price. 4G services could be a solution that satisfies customers' need for new mobile communications services overcoming existing restrictions.

TE-03.3 [A] Turkish Technology Foresight Project: Vision 2023 and Machinery and Materials Panel Methodology

Verda Yunusoglu; BEKO Co., Turkey
Seckin Polat; Istanbul Technical University, Turkey
Tufan V Koc; Istanbul Technical University, Turkey

The main axis of the "Vision 2023: Science and Technology Strategies" studies initiated for the purpose of determining the science and technology policies that Turkey will apply in 2003-2023 period is the "Technology Foresight Project". Technology Foresight can briefly be defined as the process of "opinion collecting and compiling the same" with the vast participation of all the related sectors and by a systematic method in searching for what must be done in the science and technology field to attain a desired future. As in the examples of many other countries, the basic element of the Technology Foresight Project method devised under the scope of Vision 2023 is the panels. The panels, which involve various socioeconomic activity fields and thematic topics, will conduct technology foresight studies in their respective field of interest, and then such studies will be dealt with in integrity, and the science and technology vision of the country will be determined. In this article, the authentic methodology is dealt with, which the Machinery and Materials Panel, being one of the panels, developed in respect to the studies it conducted in the technology foresight project. Any knowledge and experience to be acquired under this study, which is the first in Turkey, will be shared.

TE-04 New Product Development: 3
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Sorak III**
Chair(s): Peerasit Patanakul; Portland State University

TE-04.1 [R] The Role of Uncertainty in Speed-to-Market and New Product Success

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 is becoming an important weapon to achieve competitive advantages in the current environment of fast-changing technology and customer requirements. Speed-to-market has become the mantra of both researchers and practitioners in new product development (NPD), but there is limited empirical research and inconsistent or conflicting findings on the relationship between speed-to-market and product performance. A more important question is whether faster is always better. In a study of 692 NPD projects, we examined the relationship between speed-to-market and new product success (NPS) under conditions of different uncertainties. Our results indicate that speed-to-market is generally positively associated with overall project success, but market turbulence moderates the direct effect. Speed-to-market is less important to NPS under conditions of low market turbulence. One important implication is that it is necessary to execute time-based strategy in a fast-changing market but not in an existing and stable marketing. Our results also suggest technological uncertainty does not affect the speed-success relationship. The limitations, and future research related to these results, are discussed.

TE-04.2 [R] Approaches to Overcoming the Technology-Related Barriers to Innovation and Successful Product Development: The Micro-Company Perspective

Alan Lewis; University of Wales Institute, Cardiff, United Kingdom
Povl Larsen; University of Wales Institute, Cardiff, United Kingdom

Much attention in recent years has been focused on increasing the so-called 'innovation quotient' of national manufacturing economies. In consequence, a significant amount of research has been sponsored which has set out to identify means by which such an increase can be realised. In particular, there has been widespread interest in revealing and examining those barriers that impede innovation within a product development and manufacturing context. The suggestion underlying this work, and indeed much received wisdom in this field, is that the removal or surmounting of such barriers constitutes a prerequisite for successful innovation. This study reports on the experiences of eight UK micro-companies who had received a national accolade (a UK Design Council 'Millennium Product' award) for a product showing a high degree of "groundbreaking" innovation. The clear implication of such an award is that these companies had successfully overcome the barriers to innovation, which they had faced. This in turn holds out the hope that these companies offer insights into good practice in addressing these barriers. However, the work reported here shows that very small companies are as likely to ignore barriers as they are to address them. Living with a barrier (as an alternative to overcoming or removing it) is clearly an acceptable strategy for a number of these award winners. This paper focuses particularly on those barriers that related to the implementation of the various technological tools and processes, which underpinned the development of the individual millennium products by the micro-companies in question.

TE-04.3 [R] Managing Knowledge in the Global New Product Development Process

Edward F McDonough III; Northeastern University, United States
Nicholas Athanassiou; Northeastern University, United States
Francis Spital; Northeastern University, United States

The competitive advantage of companies that successfully develop new products globally lies in their ability to effectively manage knowledge across national boundaries. When it comes to global innovation, it is the dynamic creation, accessing and transfer of knowledge – explicit and tacit - that makes the difference between success and failure. Yet, we have a limited understanding of how global firms create, access, and transfer knowledge that is scattered worldwide to develop new products. This study uses a grounded theory approach to explore how social capital is leveraged to access knowledge by managing complex interdependencies that arise in global innovation. Based on the findings from our two-year investigation of the global product development effort of an international organization, we suggest that successful new product innovation for the global marketplace depends on people's ability to create, nurture and leverage social capital to tap into knowledge that is necessary to achieve their goals. We identified how knowledge flows and the interdependence among collaborating entities engaged in the global innovation process—internal and external to the firm—affect the formation of different kinds of social capital. Our study suggests that such knowledge may be located in any part of the organization or its environment around the world.

In addition, we identified three different phases of the innovation process and how the role of key boundary spanners located in the core network changes from one phase to the next. We also suggest a set of propositions to guide thinking and research about the ways firms develop global knowledge processes that support successful product innovation.

TE-04.4 [A] The Role of the Complexity of Platform Projects on the Capacity to Launch New Products

Paulo S Figueiredo; University of Sao Paulo, Brazil
Abraham Oih S Yu; University of Sao Paulo, Brazil

This research addresses the determinant factors of the composition of portfolios of product development projects, and the influence of these factors on the innovation management systems of firms. Specifically, this empirical research explores, for a certain period, the connections between the complexity of projects of new platforms and the number of new platforms developed in each firm. This work expands the research made by Yu and Nascimento (2000), which studied three American firms: Boeing, Diebold and Intel. The results obtained by them are presented here, together with new data, collected in three Brazilian firms of different industrial segments: Embraer (airplanes), Sadia (food) and Caloi (bicycles). The main assumption of this work is that a more complex product platform demands more investment and more time to be developed. Consequently, it is expected that for a given budget for product development, it is possible to have more projects simultaneously, when the products are less complex, and less projects when the products are more complex. The collected data confirmed this assumption. For the purposes of this research, a new, comprehensive definition of product platform was developed. This innovative concept may be used to compare product development performance across firms in different industries.

TE-05 Technology Transfer: 3
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Kum Kang I**
Chair(s): Hae-Young Oh; STEPI

TE-05.1 [R] Software Companies' Expectations for Regional Co-operation with an Academic Institute

Jari Leppäniemi; Tampere University of Technology, Finland
Timo Varkoi; Tampere University of Technology, Finland
Timo Mäkinen; Tampere University of Technology, Finland
Hannu Jaakkola; Tampere University of Technology, Finland

In order to support local software companies in Western Finland in the Satakunta region, a 20-month project was established by Tampere University of Technology (TUT) in late 2003. The objective is to create a service platform that can support business and public administration in the region by producing up-to-date and reliable information on technological development and on the demands imposed by an innovative working environment and transfer and use of technological information. We describe the regional characteristics, present the needs and expectations of the regional software development companies, and provide an analysis of the results. The preliminary expectations are gathered with a survey. A detailed understanding of the needs is formulated by additional interviews with a selected set of the enterprises following an analysis of the results. In this paper we describe preliminary results of the first enquiry, research methodology and the project phases.

TE-05.2 [A] Technology Transfer: A SENAI-RS, SEBRAE-RS and Laboratory for Machine Tools and Production Engineering – WZL / Aachen University Case

Alexandre V Barros; SENAI RS, Brazil
Marta F Pastorino; SEBRAE, Brazil

Competitiveness is shown as a vital element for the survival of companies. In the production area, investments in technology favor the acquisition of machinery, equipment, and the development of processes and products. Emphasis on innovation management and technological development optimizes the innovation cycle of industries: anticipating problems and using the inventive process in the creation and improvement of products, processes and systems. Initially, National Industrial Learning Service of the State of Rio Grande do Sul - SENAI-RS and Brazilian Micro and Small Business Support Services of the State of Rio Grande do Sul - SEBRAE-RS evaluated some international methodologies, deciding for the customization of three of them: Theory of Inventive Problem Solving - TRIZ; Quality Gates Systematic - QGS; Process-Structure Matrix – PSM in partnership with the Laboratory for Machine Tools and Production Engineering – WZL / Aachen University. The goal of this work is to describe an international case of technology transfer, the method that was used, as well as to present the perception of the leaderships involved, the opinion of the PSM methodology recipient company, of the consultants involved in the implementation of this methodology and the conclusions.

TE-05.3 [R] Technology Assessment of E-Commerce in Hong Kong

Ricky Ma, Hong Kong Polytechnic University, Hong Kong

Currently, Hong Kong is amongst the territories in the world that has the highest readiness to engage in e-commerce activities. Hong Kong has world-class information infrastructure, free flow of information, an open regulatory framework, and a competitive marketplace for companies to run their e-businesses. However, the reality is despite all these favorable factors, e-commerce is still unpopular in Hong Kong. While some large enterprises have already integrated e-commerce into their business operations, only a small fraction of local SMEs have prepared themselves for the age of e-commerce. Whilst almost every government recognizes the importance of both SMEs and e-commerce to the future development of its economy, there are various approaches to bring them together.

This assessment report examines the issue of e-commerce on industries, what it is, what are the hurdles, how it has been applied, and what its potential and its consequence might be on industries in Hong Kong. It also recommends a sector-specific e-commerce strategy for the manufacturing industry to be undertaken by the Government which helps leapfrog the e-commerce development in Hong Kong. The assessment model could be adopted for other industrial sectors in order to assess how e-commerce may help improve competitiveness of each sector.

TE-06 Telecommunications Industry: 3
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Kum Kang II**
Chair(s): Seung Koog Lee; ETRI

TE-06.1 [R] Regenerating Breakthrough Product Innovation in the UK Telecoms Sector: A Resource-Based Perspective

Scott Wilson; University of Cambridge, United Kingdom
David R Probert; Cambridge University, United Kingdom

In today's turbulent telecoms sector, many mature companies are facing threats to their competitive advantage from a proliferation of disruptive technologies, which are often delivered to the market by smaller, more entrepreneurial firms. Consequently, this can lead to competition being defined on the basis of a firm's ability to continuously develop breakthrough innovation. By examining this issue from the perspective of a UK telecoms firm, this paper aims to offer new insight into the challenge of regenerating breakthrough innovation faced by large enterprises operating in such dynamic environments. In doing so, the main research analysis is focused on identifying the key capabilities, routines and resources required to structure the invention phase of the innovation cycle. Moreover, by taking a resource-based perspective, a model is developed that illustrates the routines and processes the firm assimilated into a proven capability for developing novel product innovation. In conclusion, analysis of the model reveals that the majority of the initiatives that took place were rooted in technology entrepreneurship. Hence, by recognising a paucity of empirical research in this area, this exploratory study begins to address a current limitation of the resource-based theory: a lack of empirical work surrounding the building of firm innovation capabilities.

TE-06.2 [A] Review on the Convergence Trend and Services of Telecommunications and Broadcasting: Focused on Korean Satellite Digital Multimedia Broadcasting Services

Yeong Wha Sawng; ETRI, Korea, South
Sung-sik Shin ; ETRI, Korea, South

John David Kim; OVUM, Korea, South

In this paper, we first summarize key components of converged services of telecommunications and broadcasting. Definitions and typology of these services are organized through comprehensive analysis of recent trends in the convergence of telecommunications and broadcasting sectors. Various regulatory, cultural and technical issues related to convergence are identified. Furthermore, we deal with satellite DMB (digital media broadcasting) service, which is one of the technical culminations of telecommunications and broadcasting services. The focus of the analysis has been made on policy implications, and a comparative study has been done with other similar services which fall in the same category. Finally, we suggest the perspectives on forthcoming satellite DMB(digital media broadcasting) service developments, and implications to cope with this emerging technological breakthrough.

TE-06.3 [R] Technology Convergence under a Nonlinear Specification

Kwang-Sun Lim; ETRI, Korea, South
Sang Sup Cho; ETRI, Korea, South
Hoe-Kyung Lee; Graduate School of Management, KAIST, Korea, South

The purpose of this study is to analyze whether or not technology convergence exists by considering the possibility of nonlinearity relations rather than the currently subscribed linearity relations. For the purpose of analysis, the stationarity of technology gap between Korea and the United States in the sectors of grand total, manufacturing, and service during the 30-year period (1970-2000) has been examined from the perspective of long-term relations. The results of the analysis can be summarized in the following three theses: (1) We could identify the nonlinearity relations in the technology gap between Korea and the United States in the manufacturing sector, even though the existence of linearity relations in the service sector could not be denied. (2) If the data generating process is Lag1 in the analysis of the technology gap in the service sector, the technology convergence between the two countries in the service sector could be identified. However, with other data generating processes, the technology convergence between these two countries in the service sector could not be identified. (3) Lastly, there was a correspondent relationship between the existence of the technology convergence in the grand total and that in the manufacturing sector. In other words, in the case of the Korean economy, the manufacturing sector can be considered as the major factor deciding whether or not technology convergence exists in the entire economy.

TE-07 PANEL: MOT As an Interdisciplinary Education Field
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Kum Kang III**

Moderator(s): Alexandre Repkine, Seoul National University, Korea
Panelist(s): Sunyang Chung, Sejong University, Korea
Yongtae Park, Seoul National University, Korea
John O. Aje, University of Maryland, United States
Marthinus W. Pretorius, University of Pretoria, South Africa

TE-08 Technology Assessment and Evaluation: 3
Tuesday, 8/3/2004, 16:00 - 17:30 **Room: Kum Kang IV**
Chair(s): Seongsoo Seol; Hannam University

TE-08.1 [R] A Technology Assessment for Reducing the Digital Divide

Audrey M Alvear Báez; Portland State University, United States
Dundar F Kocaoglu; Portland State University, United States

In this paper, we attempt to identify information and communication technologies (ICT), technology applications and sectors, and their impacts on the reduction of the digital divide in a developing country, Costa Rica. The method used is AHP, and the proposed model is based on the UNDP report titled "Creating a Development Dynamic: Final Report of the Digital Opportunity", additional literature and the comments of an expert panel.

TE-08.2 [A] Risk Assessment Modeling for Information Technology Management

Leonid B Preiser; National University, United States

Risk assessment remains one of the IT industry's greatest challenges due to the unique factors associated with IT projects, such as higher risks, uncertain business benefits, needs for periodical upgrades, and requirements for parallel support of new and legacy systems. The proposed Risk Assessment Model quantifies the risk factor through interaction of the two variables, F and CM. In particular, probability of failure, F, would account for anticipated problems with major elements of IT infrastructure, such as hardware, software, database, web and security design, network architecture, and information reporting systems, whereas the change management factor, CM, would be associated with the consequences of incomplete strategies, under- or overestimated user needs, cost variations, alterations in IT tools and programming languages, emerging interfacing problems, changing protocols and standards, reassessed staffing support requirements, user training needs, and deviations from conceptual and logical design. A mathematical template is constructed as the union of two sets, F and CM, allows for accountability of a variety of technological, managerial, logistical and business factors in evaluating the expected risk factor, and could be easily applied toward establishing measurable objectives for IT project risk management. During the last several years, this approach has been tested in conjunction with capstone projects in Information Technology, Information Systems, and E-Business academic programs at National University.

TE-08.3 [A] Alternative Technologies for Wired Home Environment

Bassam Abu-khater; Portland State University, United States
Samir Said; Portland State University, United States
Turki Alsudiri; Portland State University, United States

This paper is a technology assessment research analysis on the intricacies of emerging wireless technologies as alternative technologies for wired home environments in the United States. Technical, organizational, and personal (TOP) perspectives are the tools used in this research to analyze the current problems with wired technologies (i.e. convenience, aesthetics and mobility are the key enablers for the wireless home environment). Technology gaps and the technology requirements are then identified. Decision-making methodologies such as the expert panel methodology and scoring measurement methodology are applied to the TOP methodology in order to identify wireless candidate technologies and recommend the best alternative solution for the wired home environment. At the end of the session, recommended marketing strategies are introduced to help in the diffusion of the recommended candidate technology or technology(s).

WA-01 PLENARY SESSION – 4

DATE: WEDNESDAY, AUGUST 4
TIME: 09:00 – 10:30
ROOM: BALLROOM

Session Chair: Dr. Kiyoshi Niwa, Professor, University of Tokyo, Japan

KEYNOTE – 1
Dr. Nam Suh, Professor, MIT, USA

"Development of Large Complex Systems Based on Axiomatic Design and Complexity Theory"

In industry, it is well known that it is extremely difficult to predict the cost and the schedule of complex product development, the reliability and performance of resulting engineering systems, and the economic impact of making major changes to complex systems. All of these difficulties may be attributed to the ad hoc nature of current engineering and development practice, which often involves a lengthy recursive idesign/build/testî cycle until the product satisfies its functional requirements. The unpredictability and unreliability of the product development process erodes the competitiveness of industrial firms, especially when a product is being developed for the first time.

In this keynote paper, a strategy for the systematic development of new complex products will be presented. This strategy, which is based on axiomatic design theory and complexity

theory, provides a structured way of developing new products and processes that significantly reduces the cost and time necessary for product development. It also increases the reliability of products developed and allows systematic modifications of products and processes. The theoretical framework for the strategy will be briefly introduced, followed by examples of innovative product development.

KEYNOTE – 2

Dr. Robert Phaal, Professor, University of Cambridge, UK

"Technology Roadmapping - Linking Technology Resources to Business"

The technology roadmapping technique is used widely in industry to support strategic technology planning. Roadmaps can take various forms, but the most flexible and generic type comprises a multi-layered time-based chart that links technology and product developments to market needs. In recent years the approach has been used in sector-level foresight programmes in North America, Asia and Europe.

This presentation will provide an overview of the technology roadmapping approach, focusing on the development and application of a process for supporting the rapid initiation of the technique in organisations. The application of the method will illustrated by means of an automotive sector-level case study (the UK Foresight Vehicle technology roadmapping initiative), which highlights issues associated with customisation of the roadmapping approach, and the related communication and network development benefits.

WB-01 Innovation Management: 6
Wednesday, 8/4/2004, 11:00 - 12:30 **Room: Ballroom I**
Chair(s): Deok S Yim; STEPI

WB-01.1 [A] Innovation through Technology Fusion: Perception and Possibility

Kongrae Lee; STEPI, Korea, South

Today, new products and services are increasingly complex, requiring a variety of technological knowledge in developing and producing them. Trends such as miniaturization of devices, advances in digitizing and encoding techniques and advances in materials technology increase complexity of products and services. Fusion of different technological knowledge has been widely acknowledged for generating complex products and services. It also plays a critical role in the innovation of next generation products to gain competitive advantage. This paper aims to explore how Korean firms perceive and approach this fusion of technologies, and to what extent do they see the possibility of technological innovation by fusion. Eighty two firms in Korea responded to our survey, and results of the analysis were revealed as follows. The first finding is that the possibility of fusion with information technologies is relatively high in electronics, telecommunications, textiles, metal and machinery industry. The fusion with biotechnologies appeared to have high possibility in the bio industry itself and textile industries. The possibility of fusion with nano technologies is high in the metal and machinery industry, electronics and telecommunications industry. It was found that Korean firms regard information technology as the most important one to integrate with their traditional technologies. The second finding is that the majority of Korean firms have been to some degree involved in innovation through technology fusion: 29.6% of respondents replied that they organized permanent R&D teams composed of necessary researchers with different technological background in order to do fusion research; 28.4% of respondents revealed that they organized temporary teams like task force teams; and 21% of respondents replied that they have permanent fusion teams on concentrated fields and outsource R&D for other fields. Firms that do not separately organize fusion teams but request existing R&D teams to do fusion research accounted for 18.5% of total respondents.

WB-01.2 [R] Total Innovation Management (TIM): Strategy-Oriented Innovation Management

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

Innovation management is the key activity for a company and takes on strategic significance for any innovation-based company pursuing competitive advantage and sustainable value added. In the 21st century, the mode and contents of innovation management have been more and more complex and gradually shaped into a managerial pattern of total innovation, which not only calls for innovation synergy between technology elements and non-technology elements (such as marketing, organization and institution) and all employees involved into the process of innovation in any time and all places, but also intensifies the relationship between innovation and strategy for long-term growth and survival, especially for the robust competitiveness in the global marketplace. With the development of innovation management, more and more researchers focus on innovation system linkage to organizational strategy. But how to integrate all elements, all employees and all time-space dimensions involved in innovation management oriented to business strategy into a analytical framework is still far to be done well. Therefore, based on ecosystem thinking of innovation management and some case studies of the firms in China and abroad, this article advances the former TIM theoretical framework, which had been put forward by Qingrui Xu and studied at the beginning phase, to highlight the strategy-oriented in the TIM. It introduces the theoretical framework of TIM, and presents a strategy-oriented tri-dimensional innovation model including all elements of innovation, all innovators and all time-space innovation to aim at value creating. The paradigm of TIM provides a basis for an upgraded, more unified, and better-attuned view on the innovation management field for the companies competing in the 21st century.

WB-01.3 [A] Innovation Intensive Service as Actors of Platform Strategy Adapted to Emerging Industry Development

Hsiao-Chi Chen; National Chiao Tung University, Taiwan
Joseph Z. Shyu; National Chiao Tung University, Taiwan

This investigation develops a new idea of the Innovation Intensive Service model (IIS) to push innovation in embryonic industries and to prove the practicability of the new model based on case study research. Strategies of technology and product development are critical issues in an emerging industry. Dispersive resource, environment uncertainty and innovation are the conspicuous characteristics of an emerging industry; those make industry dynamic and unpredictable. We cannot analyze it with general methods. However, platform strategy can integrate dispersive resource and innovation effects on an interchangeable interface. It is suitable for government policy planning and business strategy in an emerging industry. This paper proposes an applied framework that offers insight into the strategic planning of innovation that is evident in the evolution of one company. The platform model includes application market, network effect, technological system, policy, et al. Strategy planning considers an overall environment and needs to foster system thinking in an emerging industry. Then, we suggest an Innovation Intensive Service model as actors of platform strategy to promote emerging industry development. Innovation intensive service model is one system of the knowledge-intensive business service, especially to investigate the service framework of the innovation process.

WB-02 Project/Program Management: 4
Wednesday, 8/4/2004, 11:00 - 12:30 **Room: Ballroom II**
Chair(s): Zong Tae Bae; KAIST

WB-02.1 [R] Antecedences of Decision Quality in Early NPD Project Termination

Thomas G Lechler; Stevens Institute of Technology, United States
Holger Ernst; WHU – Otto Beisheim Graduate School of Management , Germany

In this article we propose that the quality of early new product development (NPD) project termination decisions is directly or indirectly influenced by executive champions. Organizations are facing the dilemma that the personal engagement of executive champions is needed to assure project success. But this personal engagement could lead in a course of failure to an escalation of commitment and in its consequence to delayed or inhibited NPD terminations. Based on the current literature we develop a framework proposing interactions between organizational structures and behaviors supporting or preventing the termination of NPD projects. Using data from 40 R&D units of pharmaceutical companies

located in Germany, we test with structural equation modeling the direct and indirect effects of executive champions on the termination decision quality. The results suggest that the occurrence of executive champions significantly lowers the probability of early termination decisions. The derived causal model explains 77 percent of the variance of the termination decision quality variable. The resulting model extends the current research focus of NPD project termination analysis into the direction of multilevel models including organizational and behavioral components. The results also suggest how organizations could counter-balance the needed engagement of executive champions by defining multi-personnel termination decision processes related to predefined termination criteria.

WB-02.2 [R] An Integer-Programming Model for Assigning Projects to Project Managers

Peerasit Patanakul; Portland State University, United States
Dragan Milosevic; Portland State University, United States
Timothy Anderson; Portland State University, United States

This study proposes an integer-programming model as a systematic methodology for assigning projects to project managers (project manager assignments). This model is a valuable extension of the existing methodologies in the literature since it considers the strategic elements of an organization and organizational/personal limitations in project manager assignments in addition to project requirements and competencies of project managers as being considered in the existing methodologies. By using this proposed model, management can assign projects to project managers in a way that contributes to the project and organizational performance.

WB-02.3 [A] New Procedures for Projects Deadline Adjust and Its Application for Determining Premium and Penalty Between the Contractor and the Contracted

Michitoshi Oishi; UPIS - Integrated Faculties, Brazil
Israel Brunstein; POLI/USP, Brazil
Miriam C Oishi; FECAP University / UNISA University, Brazil

This study aims to adapt or adjust the deadline of a previously established project due to changes in basic conditions using a new approach based on the kinematics concept seen in physics for being able to attempt the acceleration or deceleration on the execution rhythm. It also presents a model of development improvement through the reduction of the project execution time, an establishment agreement between the contractor and the contracted parts with a premium for anticipation or a penalty for delay. It is a new procedure of deadline adjustment/control that aims at continuity, elevation or reduction on the project execution rhythm.

WB-02.4 [R] The Effect of the Manager and Team Profiles on Projects of Organizations with Different Project Management Maturity Levels

Isak Kruglianskas; University of Sao Paulo, Brazil
Renato Moraes; University of Sao Paulo, Brazil

The paper presents some of the results of an empirical research conducted with the purpose of contributing to the elaboration of a PhD dissertation at the University of Sao Paulo. The objective of the research was to study how some of the characteristics of the Project Manager (PM) and of the project teams influence the performance of Information Technology (IT) Projects at different levels of organizational project management maturity. Shenar´s proposals for project performance evaluation, a combination of the CMM (Capability Maturity Model) and the PMBOK project processes, were used as conceptual references. After sending more than 4000 questionnaires, it was possible to establish a sample of 130 cases that was used to perform the research. The data was analyzed using multivariate analysis techniques, like factor analysis, multiple correlation and canonical correlation analysis. Among other findings, the results of the study suggest that there is a stronger association between the profile of the PM and the satisfaction of the client organization than between the PM profile and the time and costs targets. It was also found that this last mentioned fact is more intensively perceived in organizations that present a higher maturity level to manage projects. But the other side the characteristics of the project team seem to always influence client satisfaction, independently of the level of maturity of the executing organization.

WB-03 Semiconductor Industry: 1
Wednesday, 8/4/2004, 11:00 - 12:30 **Room: Sorak II**
Chair(s): Tugrul Daim; Intel Corp.

WB-03.1 [A] Business Process Automation for Semiconductor Yield Engineering

Manu Rehani; LSI Logic, United States
Nathan Strader; LSI Logic, United States
Jeff Hanson; LSI Logic, United States
Ian Johnson; Oregon State University, United States

When one thinks of Business Process Management, the last thing that comes to mind is the ivory tower of the Semiconductor Yield Engineer. In the business community the literature is rife with case studies where business processes were automated or re-engineered in pure play forms processing workflows a.k.a. “paperwork elimination projects” and close to home one can find no dearth of effort in automating semiconductor material management. But, as soon as you bring up the topic of managing the business process of Yield Engineering and you’re accosted with a slew of reasons why the geniuses in this ivory tower should be left alone – “the work requires scanning multiple sources of data,” “you have to interpret data based on what you have learned,” “you need to know all the data sources you have to access,” “you need to share information among peers,” “you need to know how to run twelve different software packages,” “every problem has it's own quirks,” “it requires engineering judgment,” “it’s a creative job” – and the list goes on. On the face of it that looks like a good list of reasons to stay away from attempting to automate the yield engineers business process. On the other hand the same list can provide a good motivation for doing just that, i.e. the yield engineers business processes can and should be automated for the very reasons that seem to indicate it’s impossible. Wouldn’t it be more efficient if multiple data sources were collated automatically? Wouldn’t it be beneficial if organizational learning were accessible to all peers? Wouldn’t life be easy if you did not have to learn twelve different software packages for your daily tasks? And would it be better if the majority of your data collation and interpretation were done for you, leaving more time for creative engineering judgment to be focused on the unique quirks of the problems at hand? In this paper we present a case study in deploying a Business Process Automation solution for Semiconductor Yield Engineering in a high-mix ASIC environment. We will present a description of the situation prior to deployment, a window into the development process and a valuation of the benefits.

WB-03.2 [R] Strategic Evaluation of Emerging Technologies in the Taiwan Semiconductor Foundry Industry

Jonathan C Ho; Portland State University, United States
Dundar F Kocaoglu; Portland State University, United States

The Integrated Circuit (IC) manufacturing technologies have been evolving continuously since their invention. The semiconductor foundry industry, whose core business is IC manufacturing, is greatly influenced and shaped by the flow of these newly arriving technologies. This research applies the Analytic Hierarchy Process (AHP) model to evaluate the strategic impact of new IC manufacturing technologies in the semiconductor foundry industry in Taiwan, where the industry is in a global leadership position. The model incorporates the levels of overall competitive success, competitive goals, technology strategies and emerging technologies. Relative impacts of elements in one level on its upper level are obtained by utilizing the inputs from experts of Taiwan's semiconductor foundry industry. The results show the relative importance of competitive goals in the semiconductor foundry industry. Each competitive goal is aligned to the technology strategies as well as emerging technologies in the prioritized orders.

WB-03.3 [A] Economies of Scope: A Major Challenge to High Technology Manufacturing

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

An empirical study, which examines the economic relationship between integrated circuit manufacturing and mask making in the semiconductor industry, concludes that managing economies of scope may become a major challenge in high-technology manufacturing. The cost of photomasks, the primary source of product differentiation in the semiconductor industry, is growing at a rate that only few semiconductor manufacturers can amortize. Profitability in semiconductor manufacturing is increasingly tied to producing a few 'best sellers' rather than plethora of designs. Preliminary results of the study predict a wave of consolidation among photomask manufacturers, a trend towards vertical integration of mask-making capability and a bifurcation of Moore's Law.

WB-03.4 [R] Sources of Innovation in the Semiconductor Manufacturing Industry in Taiwan

Tzung-wen Chen; IEP de Paris & National Chengchi University, Taiwan

The formation of semiconductor foundry in Taiwan could be regarded as an evolutionary result of organizational routines that originated from the first semiconductor integrated circuit manufacturing factory, or fabrication facilities (fabs), established in the late 1970s. The organizational routines, embedded in each module that serves as a building block of the fabs, are complex collectivities of machines and skilled engineers. Characterized by organically connected and context-dependent machine/engineer combination within the module, the organizational routines are difficult to imitate but easy to reproduce in a company to establish a series of fabs. As the routines are modified from generation to generation along with successive creation of new fabs, the foundry evolves rapidly with technological progress. The module also acts as connecting part of the foundry to suppliers and clients, thus spanning an innovative network. In the case of TSMC, the first and largest foundry in Taiwan, the routines embedded in each module as well as those required to integrate all the modules of a fab are one of the very critical factors to its rapid growth. The foundry is therefore a strategic outcome realized by proper arrangement of human resources in accordance with social and technological contexts.

WB-04 Software Process Management: 1

Wednesday, 8/4/2004, 11:00 - 12:30 **Room: Sorak III**

Chair(s): Timo Varkoi; Tampere University of Technology

WB-04.1 [R] Knowledge Diffusion Model: An Empirical Study of Software Development

Atsushi Inuzuka; Japan Advanced Institute of Science and Technology, Japan

The distinction between technology management and its communication pattern has plenty of gray areas. We are concerned with two aspects of organizational communication. The first is the knowledge diffusion pattern that depicts knowledge inflows and outflows. On this matter, we found a unique network that differs from the linear-process model. The second concern is media use. From the actual patterns of it, we confirmed the process of knowledge conversion and of embodying customer knowledge into products. And through evaluating effectiveness of media use for gaining knowledge, we discussed the impact of inter-organizational coordination and found the effective knowledge passes to be enforced.

WB-04.2 [R] A process for Sourcing Software for Embedding in Products

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

Increasing numbers of product creators have to decide how to obtain the embedded software that provides much of their products' functionality. This is an important decision since it can have long-term implications. It is also often a difficult decision. This paper reports preliminary results from a research project developing a process to help companies make these embedded software sourcing decisions. It reviews the literature on sourcing in general and software sourcing in particular, and blends this with observations from two case studies. From this a list of relevant criteria is proposed and preliminary process for sourcing software is developed. This process currently focuses on sourcing software at the operational rather than the strategic level.

WB-04.3 [R] Determination and Accounting of Software Cost

A. Seetharaman; Multimedia University, Malaysia
Manivannan Senthilvelmurugan; Multimedia University, Malaysia
Rajan Periyanayagam; Multimedia University, Malaysia

Many organizations today invest a huge sum of money to develop and launch information systems. These costs include labor-related consultation and software development plus design fees, as well as software and hardware expenditures. However, with the subjective nature of software development, the estimation of software cost is usually inaccurate. Such organizations generally consult a software vendor to deliver these information systems based on a set of specific user requirements. However, many times deterministic approaches to software development cost are often miscalculated and the end result is usually higher investment for the customer. The scope of the study is limited to the fundamentals of software cost estimation approaches and how the results of these cost models are used to determine software cost. This paper is not a software engineering model. It focuses on only a subset of the software development life cycle (SDLC) pertaining to the estimation of software size and cost. This paper highlights the issues of determining the size of software and how this relates to the accounting and budgeting of software cost through the estimation of various software metrics that are able to empirically predict the cost involved before such development efforts start. The paper also discusses how project and software costs are derived from the results obtained from the cost metrics. For this purpose, a practical approach is derived and shown using a six-step approach. Finally, the limitations are discussed and a conclusion is given.

WB-05 Technology Transfer: 4

Wednesday, 8/4/2004, 11:00 - 12:30 **Room: Kum Kang I**

Chair(s): Hannu Jaakkola; Tampere University of Technology

WB-05.1 [R] RIKEN: A Research Institute that Lead a Large Industrial Group in Japan

Masayuki Kondo; Yokohama National University, Japan

There are and have been many research institutes in the world. However, there has been only one research institute that is a core of an industrial group in a market economy, as far as the author knows. It was the Institute of Physical and Chemical Research (RIKEN) in Japan; and its industrial group, called the RIKEN Industrial Group, consisted of 63 companies. RIKEN was established as a nonprofit foundation at the initial stage of Japan's industrialization in 1917 and was dissolved by the occupied allied force in 1948 after the end of the Second World War. RIKEN was excellent in both basic research and product development. On one hand, it constructed two synchrotrons and conducted research on the structure of an atom. Two Nobel Prize Laureates from Japan, Dr. Yukawa and Dr. Tomonaga, were once researchers at RIKEN. On the other hand, RIKEN developed, for example, new processes to produce vitamins, piston rings, photosensitive papers, gas microanalyzers, and light and strong aluminum cookware called Alumite.

WB-05.2 [A] Integrated Collaborative Research Program at RIKEN

Eiichi Maruyama; RIKEN, Japan

Technology transfer from universities or public research institutes to industrial sectors is one of the key problems of the recent R&D system in Japan. Japanese universities, in general, have not been accustomed with the procedures of technology transfer into industry until recently. Technology Licensing Organizations (TLO) seems to be not fully functioning yet since they are based on the "Linear Model". RIKEN proposes a new type of technology transfer system based on the "Parallel Model," which will be actually starting in this year. This will be called as "Integrated Collaborative Research Program"(ICRP). The ICRP is composed of several technology transfer projects whose targets are proposed by the industry side. The project leaders are expected to come from industry with enough information about the images of the final products as well as their market. RIKEN offers the platform of the collaboration projects as well as technology seeds, R&D facilities and technological support. The infor-

mation exchange between industry and public sectors on this platform will facilitate effective technology transfer.

WB-05.3 [A] Making Use of Offset Program to Promote Industrial Development-- A Case of Technology Transfer by ITRI

Hsin-Hann Tsai; National Chiao Tung University, Taiwan
Hsiao-Cheng Yu; National Chiao Tung University, Taiwan

Offset Program is a mechanism for compensating the unbalance of international trade between two countries. It is often a counter trade requirement in the procurement contracts of multi-national corporations by the governments of developing or under-developed countries. The main purpose is to improve the industrial development of the procuring country. High-tech industries have played an important role in supporting Taiwan's economy. Hence, transferring technologies from developed countries is very critical for local industries to remain competitive. The quota of offset program can be utilized to pursue this purpose. This research describes how ITRI (Industrial Technology Research Institute) of Taiwan made use of this resource to transfer a key technology in Liquid Crystal Display. The experience of ITRI could serve as a reference to other developing countries in making good use of Offset Program to facilitate international technology transfer.

WB-06 Telecommunications Industry: 4
Wednesday, 8/4/2004, 11:00 - 12:30 **Room: Kum Kang II**
Chair(s): Kwang-Sun Lim; ETRI

WB-06.1 [A] Empirical Analysis on Marketing Strategy Factors for the Development of Korea's Portable Internet Service Market

Kyoung-yong Jee; ETRI, Korea, South
Moon-koo Kim; ETRI, Korea, South
Sang-min Lim; ETRI, Korea, South
Jane J Kang; ETRI, Korea, South

Despite the evolution and introduction of innovative telecommunication services since the 1990s, only a minor number of services currently maintains a stable size of subscribers necessary for its business. Like many other products and services, new telecommunication service experiences low possibility for its success and hence portable Internet (PI) service will need a structured market demand analysis before its success in the new market. In other words, the key success factors for a new telecommunication service will include integration of not only a technological-push but a demand-pull by customers' needs. For a successful market entrance and service promotion of Korea's portable Internet service, customer-oriented marketing strategies and service provisioning strategies will be necessary. Thus this study aims to establish service provisioning strategies of customers that are willing to use portable Internet service with an appropriate market survey. The market survey consisted of groups of individuals and business or government users. Users' attitude, stage of use, influential factors, willingness to pay, preferred price plans, preferred devices, and preferred specific services of portable Internet service were studied. Based on the results, evaluation of customers' adoption of the service was analyzed in detail, and portable Internet services' killer services and the markets of each customer groups were derived. Finally, business strategies for the establishment of a portable Internet service market were developed.

WB-06.2 [A] Evaluation of Technology Related Market Regulation with Real-Option's Approach: The Case of MVNO (Mobile Virtual Network Operator)

Junseok Hwang; Seoul National University, Korea, South
Jong-Eun Oh; Seoul National University, Korea, South

Increasingly, several technology and policy issues have been emerging to cause significant reconsideration about how the radio frequency spectrum should be managed. The spectrum has been treated and recognized as a technically, economically and politically scarce resource, which leads to the problems of excessive costs. It has been an on-going debate worldwide whether or not the traditional system of governmentally allocated spectrum rights would lead to innovation and competition. In recent Korean wireless PCS industry, the 3G wireless spectrum policy issue has been a big debate along with the potential adoption of MVNO (Mobile Virtual Network Operator). In this paper, we conducted an empirical case study of dealing with such adoption policy of market-based spectrum management for the future Korean 3G wireless markets using real-option modeling and analysis. In the developed real-option model, we used parameters for the specialized uncertainty characteristics for MVNO policy, spectrum regulation, inter-operator interconnection and access charges, and market prices for 3G mobile services in service-based competition environment based on recent Korean 3G policy procedural and regulation information and market data. Using the real-option model, we present empirical economic findings and their implications to MVNO adoption policy with various competition scenarios.

WB-06.3 [A] A Study on the Criterions and Methods for Determining Access Costs in Mobile Network Costing Models

Eunjin Cho; ETRI, Korea, South
Jaeho Byun; ETRI, Korea, South

The access costs have a huge effect on interconnection charges, and it comes to be the most important process to determine access costs. The national regulation agency and research institutes have set up the criterion on determining the access costs in conventional fixed network costing models. However, it comes out that there are some problems with those previous standards being applied to mobile networks. In this paper, we clarify the differences with fixed and mobile network in costing models. We put in order the three types of methods to determine access costs in mobile networks. Those methods are a coverage basis, traffic non-sensitive costs basis, and functional equivalent facility basis between fixed and mobile network. We derive the application of determining access cost subject to the Korean domestic market situation.

WB-07 R&D Management: 1
Wednesday, 8/4/2004, 11:00 - 12:30 **Room: Kum Kang III**
Chair(s): Hans J Thamhain; Bentley College

WB-07.1 [R] R&D Project Portfolio Allocations in an Engineering Research Center Planning Process

Zbigniew J Pasek; University of Michigan, United States

In the current practice of industrial research and development (R&D), formal management tools are playing an increasingly important role in providing quantifiable data for decision-making support. These management tools can provide, for example, answers to critical resource allocation questions that arise in the management of an engineering research center (ERC). The growing need for alignment of R&D project outcomes with various quantifiable objectives (e.g., industrial relevance, research value, or educational impact) is the driver for employing portfolio management techniques. This paper explores use of a financial portfolio management approach as a tool enabling effective allocation of resources to R&D projects applicable to academic research center situations.

WB-07.2 [R] Volume vs. Efficiency: R&D Management Capabilities of Korean Electronics Part Firms

Jeonghwa Kim; Korea Research Council of Fundamental S&T, Korea, South
Sungwoo Lee; Korea Research Council of Fundamental S&T, Korea, South
Sungbok Cho; Korea Research Council of Fundamental S&T, Korea, South
Hyuna Park; Sejong University, Korea, South
Sunyang Chung; Sejong University, Korea, South

Because technology is the only competition weapon, most firms in any countries have been increasing their R&D investment continuously. It is the same case for Korean firms. Such increases in R&D investment are very important for a firm's competitiveness. More important is the efficient use of such R&D resources. According to the generation model, R&D management capabilities have evolved in several stages. This paper aims at investigating the level of R&D management capabilities of the Korean electronics part industry. To accomplish this purpose, we discuss the generation model of R&D management capabilities. Based on this model, we investigate the R&D management capabilities of Korean electronics part firms. According to our study, Korean electronics part companies adopt 2.8th to 3.0th gen-

eration of R&D management. Finally, we identify some strategic implications to improve a firm's R&D management capabilities.

WB-07.3 [R] Identifying Critical Resources in Simultaneous R&D Projects

Yongyi Shou; Zhejiang University, China

When an organization carries out several simultaneous R&D projects, the resource scarcity could play an important role in the success of R&D projects. These simultaneous R&D projects normally share a pool of limited resources, such as experimental equipment and key research staff. It is typical that some projects demand the same resource at the same time and the projects with lower priorities have to be postponed to avoid resource conflict. To speed up these simultaneous R&D projects, it is important to identify which are the critical resources for these projects. If the critical resources can be identified successfully, the project managers can aim to schedule these resources more effectively or to improve their capacities by further investment. In order to identify the critical resources in simultaneous projects, a novel method is suggested to measure the resource criticality index of each resource. An example is adopted to demonstrate the proposed method's capability in identifying the critical resources in simultaneous projects.

WB-08 TUTORIAL: Collaborative Technology Roadmapping
Wednesday, 8/4/2004, 11:00 - 12:30 Room: Kum Kang IV
Chair(s): Robert Phaal, Professor, University of Cambridge

Technology roadmapping is widely used to align technology and application development with market requirements, at the firm and sector levels. This tutorial describes a process for the rapid initiation of roadmapping within a workshop environment, based on more than 50 industrial applications. The workshop format supports communication, consensus building and network development. Design and facilitation of such workshops is described, supported by case examples at both firm and sector levels.

WD-01 Innovation Management: 7
Wednesday, 8/4/2004, 14:00 - 15:30 Room: Ballroom I
Chair(s): Mary Mathew; Indian Institute of Science

WD-01.1 [R] The Role of Technological Management in Technological Innovation in Chinese Enterprises

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

Any company needs technological competence in order to add value to products and processes. On the other hand, companies need to develop technological management in order to improve efficiency and competitiveness. In this paper, a basic framework for the successful implementation of a technological strategy and technological management is developed, consisting of four elements: technological strategy, technological management, technological competence and technological innovation. The model is empirically tested using the data of 200 Chinese companies acquired by interviews and surveys. The results show that technological management and technological competence have a significant positive impact on a company's technological innovation. On the other hand, technological strategy has no direct effect on technological innovation. Furthermore, we conclude with a discussion of the implications of this research and suggestions for management.

WD-01.2 [R] The Strategy of Technology Innovation in Chinese SMEs

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

The shift towards the "knowledge economy" has placed greater emphasis on innovation as a source of competitive advantage. But technology innovation activities are unpredictable and their processes are also full of all kinds of traps, so that firms often drive themselves into "the war of innovative attrition" and have to face innovation's dilemma. How to manage technology innovation well and enhance innovative effectiveness has been one of the most difficult questions for Chinese SMEs. As an effective way of managing technology innovation, strategy of technology innovation (STI) has attracted more and more the attention of theorists and empiricists. What is the level of emphasis put on STI by Chinese small and medium-sized enterprises (SMEs)? How do they implement their STI? What is the effectiveness of STI in Chinese SMEs? This article proposes some answers to these questions based on the initial results of an ongoing one-year study. From interviews of some senior managers, we find that more and more Chinese SMEs pay greater attention to the employment of effective STI in managing technology innovation well, and the study of STI is imperative for Chinese SMEs.

WD-01.3 [R] Technological Innovation in Brazilian's Firms

Marisalvo Silva; Bank of Brazil, Brazil
José Joaquim Ferreira; University of Sao Paulo, Brazil

Over the past years, most organizations have been confronted with sharper competition, increased customer demands and a reduction of the life cycles of their products. Organizations that want to survive in these conditions are forced into continuous innovation of their products, services and production processes. In recent years, many Brazilian companies have engaged in the pursuit of excellence and competitive advantage. The first innovation survey in Brazil collected information about new or significantly improved products or processes and related activities in manufacturing industries during the period 1998-2000. This paper intends to describe the results, current status and possible future of technological innovation in 10,300 Brazilian firms.

WD-01.4 [R] Management Innovation in Small and Medium Business Exporters in Mexico

Maria del Carmen Domínguez Rios; Benemérita Universidad Autónoma de Puebla, Mexico

This presentation shows the exporter behavior based on a sample of small and medium size businesses (S&MBs) in the Mexican Industry. Export business is explained as a process in several stages. The roles played by the top management, the suppliers, the organizational behavior of the exporter, the government sponsorship of the programs, and management innovation are studied in each stage. Innovation strategies used by the S&MBs are explained, and the positive impact of the policies of the Mexican government on innovation, productivity and competitiveness is discussed. The study suggests that the strategies of the S&MBs evolve as a consequence of the process and the innovation environment. It is underlined that the S&MBs are crucial pieces of technology development and their success depends heavily on public policies on innovation.

WD-03 Productivity Management: 1
Wednesday, 8/4/2004, 14:00 - 15:30 Room: Sorak II
Chair(s): John O. Aje; University of Maryland

WD-03.1 [A] Measuring the Performance of Venture Companies with DEA

Seogwon Hwang; STEPI, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South
Eui-seong Kim; Seoul National University, Korea, South
Yunyoung Kim; Seoul national university, Korea, South

This paper develops tools for evaluating the performance of Korean venture companies listed in KOSDAQ, the Korean analogue of NASDAQ. Although one can choose among many measures of performance, most of these measures are not multi–factor measures. This study evaluates the performance of Korean venture companies by employing the multi–factor measures of company performance by means of data envelopment analysis (DEA) and suggests a new indicator that allows one to identify undervalued companies based on the MPR (marketability-profitability ratio) for the company. Since our analysis of the firms' performance measures implies that Korean KOSDAQ companies exhibit fairly low levels of profitability and marketability, we conclude that the KOSDAQ market is in need of substantial restructuring and the strengthening of market discipline. Our methodology allows us to identify portfolios of firms characterized by low MPRs. These portfolios turn out to yield higher returns compared to the market portfolio. We therefore conclude that the MPR measure can

be used for identifying the undervalued companies, rendering it useful for designing investment strategies.

WD-03.2 [A] IDEA with FMOP Method for Evaluating the Performance of Budget-Accounting & Statistics Departments of ROC Air Force

Yu-Yuan Tsou; National Defense University, Taiwan
Hua-Kai Chiou; National Chiao Tung University, Taiwan
Gwo-Hshiung Tzeng; National Chiao Tung University, Taiwan

Keeping the Air Force competitive is the most keynote of modern war. How to handle its performance evaluation to adjust, maintain, or even excel the existing competitive strength is also the important issue. In this paper we select the Accounting & Statistics Departments of the ROC Air Force to be the decision making units (DMUs), and try to construct an Imprecise Data Envelopment Analysis (IDEA) with Fuzzy Multiple Objective Programming (FMOP) model for performance evaluation. Since Data Envelopment Analysis (DEA) provides an appropriate method for use in evaluating not-for-profit entities, and the real data of those multiple-outputs and inputs may mix with imprecisely and exactly known data, we turn to deal the topic with Imprecise Data Envelopment Analysis (IDEA). And for the purpose of more precise IDEA efficiency ratings, we introduce the model with Fuzzy Multiple Objective Programming (FMOP), a set of common multipliers (inputs and outputs weights) to calculate the efficiency achievement for those DMUs. After the main rating is done, we utilize a Sensitive Analysis to take a deeper look into the meanings of specific input or output in the performance evaluating activities, and discuss more information for relative application. Through this study, we successfully demonstrate the proposed model appropriate for performance evaluation, especially for coping with imprecise data of decision variables.

WD-03.3 [R] Externality Effect of IT Capital Stock

Myung-Hwan Rim; ETRI, Korea, South
Chun-geol Mun; ETRI, Korea, South
Sang Sup Cho; ETRI, Korea, South

The object of this study is to measure and compare externalities of IT capital among different Korean industry sectors using inter-industry relations tables. To do this, a comparative analysis was conducted on the externality effect of IT capital stock in 9 industries using inter-industry relations tables from 1985, 1990, 1995 and 2000. We investigate externality of IT capital stock in the following two types of inter-industry dynamic: backward linkage and forward linkage. Backward externality is a measure of what additional amount in IT capital stock is required in a given industry for an increase in final demand by one unit in another industry. Forward externality is a measure of how much an IT capital stock increase by one unit in a given industry drives up the output value in another industry. The results obtained by this study are the following: First, we observed continuous capital intensification in the 9 industries investigated during the period between 1985 and 2000. Second, IT capital backward multipliers, which indicate the amount of increase in IT capital stock required for a given increase in final demand, were the highest in the manufacturing industry. As for inter-industry externalities, indirect backward multipliers - which exclude intra-industry backward multiplier effect appreciated within an industry - appeared also the most elevated in the manufacturing industry. Third, the forward multiplier effect of IT capital was the strongest in the construction industry during the 1980's, and thereafter, in the manufacturing industry. As for indirect backward multipliers, excluding inter-industry externalities, they proved to be the highest in the construction industry until 1995, and subsequently during the 2000's, in the manufacturing industry. Finally, the externality effect as a ratio of the multiplier effect by a given industry on other industries to its intra-industry multiplier was the strongest in the wholesale & retail and restaurant & hospitality industry in backward effect; and in the electricity, gas and water industry and the construction industry in forward effect.

WD-03.4 [R] The Measurement Model for Sustaining Strength of Regional Innovation System to Regional Economy

Baomin Hu; Hebei University of Technology, China
Xinkai Yu; Hebei University of Technology, China
Lili Wang; Hebei University of Technology, China

In this paper we first put forward the concept of sustaining strength for regional innovation system (RIS) to region economy, and establish corresponding evaluation index system. And then, with the theory of variable weight synthesizing, the index model is given to measure the RIS' sustaining strength to regional economy. This model not only shows the un-substitutability of innovation system's scale and development speed, but also reflects the un-substitutability of scale index and contribution index. The measurement result shows the development status of RIS, as well as its sustaining degree to regional economy. At last we take all the provinces and cities of China for empirical study, and present the result analysis and draw some suggestions on policy making for Hebei's RIS.

WD-04 Software Process Management: 2

Wednesday, 8/4/2004, 14:00 - 15:30 **Room: Sorak III**
Chair(s): Robert Harmon; Portland State University

WD-04.1 [R] Software Platform Policy and IT Education

Hannu Jaakkola; Tampere University of Technology, Finland
Timo Mäkinen; Tampere University of Technology, Finland
Timo Varkoi; Tampere University of Technology, Finland

Modern software development architecture is based on reuse solutions and open architectures. The new trends affect IT education: pressure to replace general components in IT curricula by more technology-oriented ones is coming from industry. The main goal of university education, however, is to provide permanent and generic skills applicable over technology trends. There are two opposite views on the: industry demands for ready-trained technology users, but universities should provide skills applicable over the fast-changing technology trends. The paper discusses current software trends and their effect in university education. Solutions based on the well-working academy and industry cooperation are discussed.

WD-04.2 [R] Communication Model of a Software Process Improvement Network

Timo K Varkoi; Tampere University of Technology, Finland
Timo K Mäkinen; Tampere University of Technology, Finland
Hannu Jaakkola; Tampere University of Technology, Finland

A Software Process Improvement Network concentrates in transferring knowledge about software engineering, software process models and assessments to its members. Knowledge transfer in the network consists of multiple information flows between the producers, consumers and maintainers of information. On the whole these information flows and the use of the information create a communication model. In this paper we present a communication model that has developed during 6 years of networked process improvement related activities. The coordinator of the network is a university and other members are mainly small software companies. The network has packaged its process improvement knowledge into expert service products and a training program. We study the roles and experiences of the network partners in the information exchange and identify strengths and weaknesses of the communication model. The aim is to describe prerequisites that new elements for communication can be built upon. Knowledge management provides a potential framework to develop innovative services for the network. As a conclusion we recommend steps for the future to enhance the effectiveness of knowledge transfer within the software process improvement network.

WD-04.3 [R] The Development Processes of Global Software Products and Information Systems: A Comparative Analysis

Nazmun Nahar; University of Jyväskylä, Finland
Najmul Huda; Tallinn Technical University, Estonia
Prosenjit S Deo; S.N. Bose National Centre for Basic Sciences, India

Increasingly, software products development and customized information systems (IS) development are making a transition from local development to global development, in which multi-cultural teams collaborate across national borders. There are significant differences between global software products (GSP) development and customized IS development. Very limited literature exists dealing specifically with the GSP development process. Developers

cannot get an appropriate guideline that is suitable for their GSP development projects. Due to the lack of an explicit GSP development process, and the highly complicated and demanding nature of the GSP development, the GSP projects commonly encounter unexpected barriers and fail to achieve the expected goals. The research questions addressed in this study are: What are the similarities and dissimilarities between the development processes of GSP and IS? How are these processes executed? This research was executed through reviewing literature, interviewing researchers and practitioners, and carrying out a multi-site case study method. It contributes to the scientific understanding of the development processes of both GSP and IS. The research will guide companies, who are involved in the development of GSP and customized IS, to follow the appropriate processes, to make the right decisions, and to achieve the goals efficiently and effectively. The study also suggests future research directions.

WD-07 R&D Management: 2
Wednesday, 8/4/2004, 14:00 - 15:30 **Room: Kum Kang III**
Chair(s): Zbigniew J Pasek; University of Michigan

WD-07.1 [A] Evolution & Development Directions of the Planning & Management Systems of the National R&D Programs in Korea - A comparative Analysis Based on Research Types

Young-Il Park; Ministry of Science and Technology, Korea, South

The purpose of this study is to look into the key changing patterns of planning and management systems of national R&D programs in Korea and to suggest policy tasks for improving the national science and technology. In 2003, Korea was ranked tenth in scientific and technological competitiveness among countries with a population over 20 million mainly due to the intensive investment in the national R&D programs over the past 20-30 years. The driving force behind the advancement is thought to be the timely government R&D policy, programs, and budget allocation reflecting the changing economic, industrial, and societal needs. Considering this, the planning and management systems of the national R&D programs are regarded as one of the key success factors. Against this backdrop, firstly, the evolutionary features of planning and management systems of the national R&D programs were analyzed with respect to the government's R&D policy, programs and budget. Secondly, the characteristics of the national R&D programs were analyzed based on research types such as basic, applied and development research, and commercialization of research results. Thirdly, the planning and management systems of the major national R&D programs were compared and analyzed. Finally, through this retrospective approach, policy tasks and implications for enhancing the planning and management systems of the national R&D programs were explored.

WD-07.2 [R] Patent Claim Map Using Text Mining and Network Analysis

Juneseuk Shin; Seoul National University, Korea, South
Yongtae Park; Seoul National University, Korea, South

Though patents have been under intensive scrutiny for years, patent claim, the most ample source of information, has been relatively unexplored. Claims basically express the patent rights, and the overlaps of them by subsequently granted patents indicate the erosion of rights. Therefore, they are closely related with valuation of patents. On the other hand, claims could be used to recognize technology relatedness. In this research, using text-mining and network analysis mainly, we propose an exploratory method to handle patent claims. Firstly, applying text mining and domain expert knowledge, we construct the claim overlap profile to grasp the claims overlapped with a specific patent. Secondly, network analysis is used to generate three kinds of patent claim maps. They could help researchers, R&D managers and policy makers to evaluate patents more properly, analyze competitors more precisely and develop patent strategy more efficiently. More broadly, it also could contribute to technology management including new technology development, strategic positioning of technology and technology alliance.

WD-07.3 [R] Knowledge Management in Pharmaceutical Industry in Mexico

Rocío Cassaigne; National Autonomous University of Mexico, Mexico

Knowledge Management (KM) allows one to transfer basic information from one entity to another, and decision makers must be aware of what this practice really means for their corporations. Today, the key to a successful operation is no longer having information, but converting it into profits. The pharmaceutical industry (PhInd) is not an exception to this practice, and therefore, as the main companies are international, or totally foreigners in Mexico, KM remains a target for their managers. Restricted to few documents containing the minimum data, information is addressed selectively to high top technical people, frequently as part of the management of technology process. This involves innovation activities, transfer of technology and patenting documents. The information retrieving in optimal conditions is the main problem in Mexican industries. However, the innovation process, and lately, the introduction of a new drug into the market, being a very long process, is the most expensive activity in PhInd, and documents issued a very valuable asset. Usually, this innovation process is restricted to the headquarters, but production or even distribution to other regional sites requires technical information, confidential technologies, and the very precise description of the general performance expected from the new product. A model of KM practices is presented in order to demonstrate how KM contributes to the management of technology among Mexican PhInd plants.

WD-08 TUTORIAL: Technology Development Envelope – A New Approach to Managing Emerging Technologies
Wednesday, 8/4/2004, 14:00 - 15:30 **Room: KumKang IV**

Speaker(s): Dundar Kocaoglu, Professor, Portland State University
Nathasit Gerdsri, Ph.D., Portland State University

Technology Development Envelope (TDE) is a new concept and methodology for identifying the optimum path in developing technology strategies and combining them with business strategies. 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 method combines the judgments of technology developers and technology implementers to assure that the technology strategies are in full support of corporate goals and objectives. This tutorial explains the methodology and processes used in the formation of TDE. An example is presented for a detailed application of the TDE concept to emerging technologies in the computer industry.

WE-02 PANEL: PICMET '05 and '06 Planning Session
Wednesday, 8/4/2004, 16:00 - 17:30 **Room: Ballroom II**

Panelist(s) : Timothy Anderson; Portland State University
Dundar F Kocaoglu; Portland State University
Dragan Z Milosevic; Portland State University
Kiyoshi Niwa; University of Tokyo
Liono Setiowijoso; Portland State University
Charles M Weber; Portland State University
Ann White; Portland State University

Please join us in providing feedback on PICMET '04 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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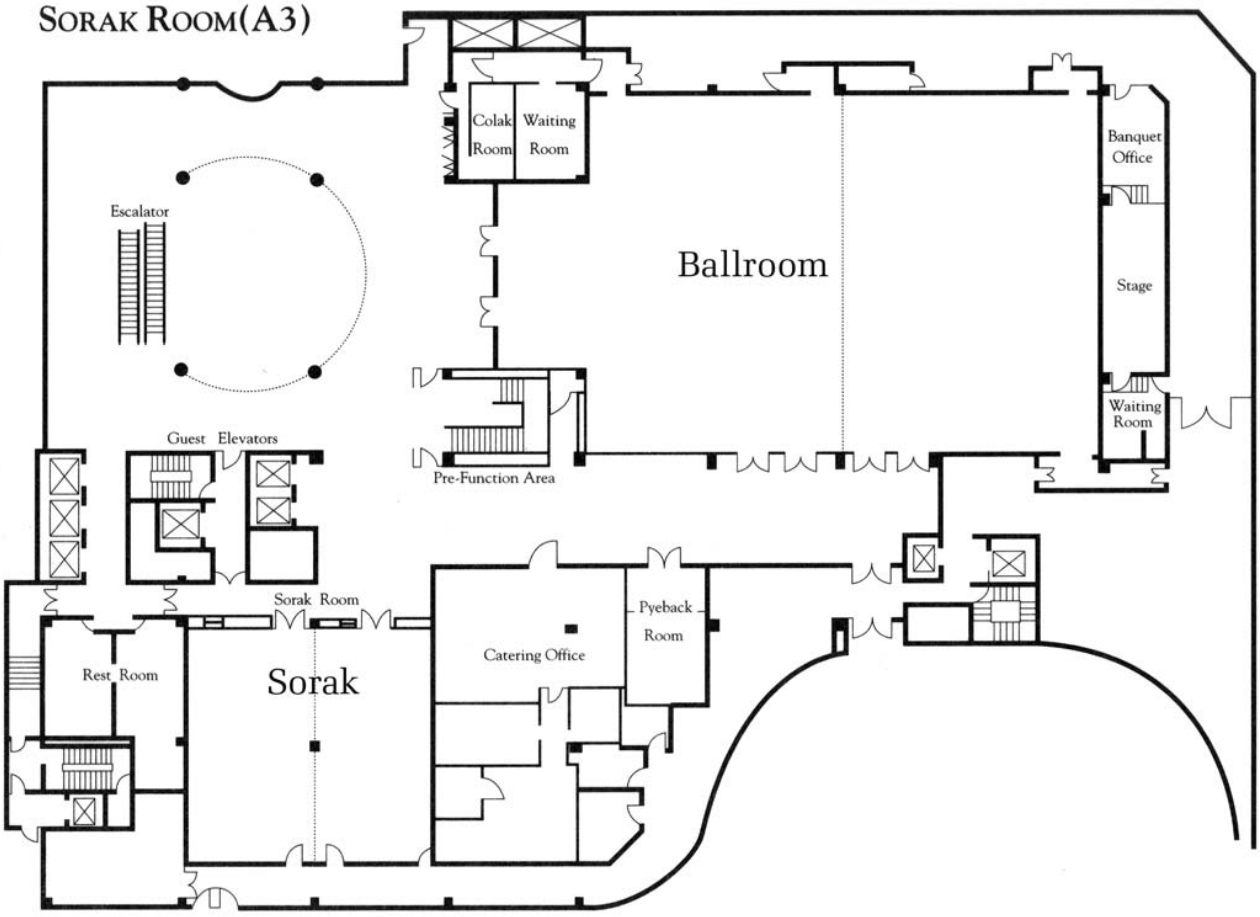
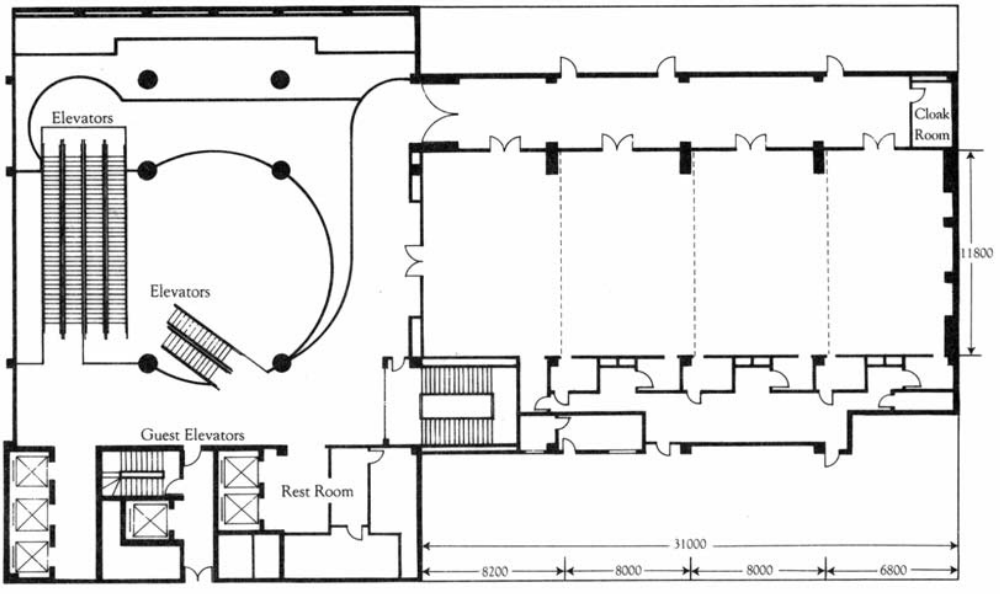
Ritz Carlton Floor Layout

THE RITZ-CARLTON BALLROOM(A3)
SORAK ROOM(A3)



KUMKANG ROOM(A1)



It is not too early to start
planning for

PICMET '05

July 31-August 4, 2005
Portland Hilton and Executive Tower
Portland, Oregon—USA

You are invited to participate
in the PICMET '05 Planning Session

Wednesday, August 4th, 2004
4:00 – 5:30
Ballroom II