

# TABLE OF CONTENTS

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## PICMET '14

Message from the President and CEO of PICMET .....	2-3
Executive Committee .....	4-5
Organized By .....	5
Hosted By .....	5
Supported By .....	5
Cooperating Societies .....	5
Advisory Council .....	5-6
Panel of Reviewers .....	6-7
Past LTM Award Recipients .....	7-8
Past Medal of Excellence Award Recipients .....	8-9
Fellows .....	9-10

## PICMET '14 AWARDS

Student Paper Awards .....	11-12
LTM Awards .....	13-14

## GENERAL INFORMATION

Conference Focus .....	16
Who Should Attend .....	16
Program .....	16
Publications .....	16
Registration Policy .....	16
Session and Paper Designations .....	17
Presentation Guidelines .....	17
Audio/Visual Equipment .....	17
Wireless Access .....	17
Dress Code .....	17
PICMET Volunteers .....	17

## THE PICMET EXPERIENCE..... 18

## KANAZAWA

Kanazawa Guide .....	19
About Kanazawa .....	19
History .....	19
Climate .....	19
Location .....	19
Population .....	20
Sightseeing .....	20
Higashi Chaya District .....	20
Kanazawa Castle Park and Ishikawa-Mon Gate .....	20
Kenrokuen Garden .....	20
21st Century Museum of Contemporary Art .....	20
Traditional Performing Arts .....	20
Nagauta (Geisha Dance) .....	20
Noh Drama .....	20
“Shishimai” Lion Dance .....	21
“Taiko” Drum Performance .....	21
City of Crafts .....	21
Kaga Yuzen Silk (Kimono) Dyeing .....	21
Shamisen Playing .....	21

Gold Leaf Application .....	21
Making Japanese Green Tea .....	21
Maki-e Decoration on Lacquerware .....	21
Making Wagashi-Japanese Sweets .....	21

## OPTIONAL TOURS

Hokkaido Three-Day Tour from Tokyo .....	22
Kanazawa Half-Day Sightseeing Tour .....	23
Hida-Takayama and Shirakawa-Go Full Day Tour from Kanazawa .....	24
Nara-Kyoto Two-Day Tour from Kanazawa to Tokyo .....	25
Dynamic Tokyo – One-Day Tour in Tokyo .....	26
Mt. Fuji and Hakone One-Day Tour from Tokyo .....	26
Nikko World Heritage One-Day Tour from Tokyo .....	27
Tokyo Skytree Observation Deck and Asakusa – Half-Day Tour in Tokyo .....	27
Sunrise Express Kyoto Tour – One-Day Kyoto Tour from Tokyo (Standard Class) .....	28

## SOCIAL EVENTS

Reception / Buffet .....	29
Dinner in Japan .....	29
Awards Banquet .....	29

## SITE VISITS

Nikko Company .....	30
PFU Limited and Fujitsu IT Products Limited .....	30
Awazu Plant of Komatsu Limited .....	30-31

## TECHNICAL PROGRAM

Program Overview .....	32
The Papers .....	32
The Schedule .....	32
Monday Schedule .....	33
Tuesday Schedule .....	34
Wednesday Schedule .....	35
Thursday Schedule .....	36
Schedule of Sessions by Date .....	37-40
Schedule of Sessions by Room .....	41-44
Personal Schedule .....	45

## SPECIAL SESSIONS IN THE JAPANESE LANGUAGE..... 46

## PLENARY SESSIONS .....

## PHD COLLOQUIUM..... 54

## TUTORIALS..... 55-57

## PANELS .....

## SESSIONS..... 60-133

## AUTHOR INDEX..... 134-141

## ANA CROWNE PLAZA FLOOR LAYOUT .....

# PICMET '14

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## PICMET

Dear PICMET Guests:

**We are pleased to welcome you to the PICMET '14 Conference.**

Service industries are playing a dominant role as the engine of economic growth in both developed and developing countries, with technology being the driving force behind it. The society's infrastructure, including energy, the health sector, manufacturing, financial institutions, governments, and educational institutions, is increasingly more dependent on services throughout the world.



PICMET defines the primary role of Technology Management as the management of technologies to assure that they work for the betterment of humankind. Using this definition, technology management has a critical role to play in the proper utilization of technology in services to support the infrastructure. It is the responsibility of the Technology Management community to guide technology effectively to integrate infrastructure and services to meet the world's needs.

This is a big challenge for the leaders and future leaders in the Technology Management field. Recognizing this challenge, the PICMET '14 Conference explores the role of technology management in the integration of infrastructure and services.

More than 800 papers were submitted to PICMET '14. After they were subjected to a double-blind refereeing process, 386 were included in the conference. The referees were from around the world. The authors represent more than 200 academic institutions, industrial corporations and government agencies in 28 countries.

**The PICMET '14 Conference has two outputs:**

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

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

- Technology Management Framework
- Strategic Management of Technology
- Science and Technology Policy
- Collaborations for Technology Management
- Competitiveness in Technology Management
- Science and Technology Communication
- Decision Making
- Emerging Technologies
- E-Business
- Disruptive Technologies
- Innovation Management
- Commercialization of Technology
- Entrepreneurship/Intrapreneurship
- Intellectual Property
- Educational Issues
- Cultural Issues in Technology Management
- Environmental Issues
- Outsourcing Issues
- Information Management
- Knowledge Management
- Productivity Management
- Management of Communication Technologies
- Enterprise Management
- New Product Development
- Manufacturing Management
- Management of People and Organizations
- Project/Program Management
- R&D Management
- Software Process Management
- Quality Management
- Sustainability
- Technological Changes
- Technology Assessment and Evaluation
- Technology Forecasting
- Technology Roadmapping
- Technology Acquisition
- Technology Adoption
- Technology Diffusion
- Technology Marketing
- Technology Transfer
- Technology Management in the Service Sector
- Technology Management in Government
- Technology Management in Transportation
- Technology Management in the Health Sector

# PICMET '14

- **Technology Management in the Energy Sector**
- **Technology Management in Biotechnology**
- **Technology Management in Semiconductor Industry**

A large number of colleagues around the world contributed to the success of the PICMET '14 Conference.

Kiyoshi Niwa and Yasuo Ikawa as co-chairs and Yuriko Sawatani and Kunio Shirahada as coordinators of the LAC (Local Arrangements Committee) provided leadership in bringing PICMET to Kanazawa and coordinating the local activities for the success of the conference. Members of the LAC were Masami Asai, Keizo Iwashita, Naoshi Uchihira, Kenichiro Ota, Hiroshi Osada, Toshinori Kajiura, Shotaro Kohtsuki, Koichi Sumikura, and Tomoo Yamamoto. Their work included fund raising, identifying and negotiating with local vendors, developing strategies for all of the local activities, inviting speakers, organizing tours and site visits, printing the *Bulletin*, and preparing the signage, posters and banners.

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

Kenny Phan, as the Executive Director of PICMET, coordinated the overall planning for the conference; Liono Setiowijoso designed, maintained and managed the information systems, and formatted the papers for the *Proceedings* and the *Bulletin*; Ann White, as the Executive Director Emeritus, edited the *Bulletin* and prepared the front end materials. Dongjoon Lim and Caroline Mudavadi managed the registration process; Songphon Munkongsujarit and Inthayuth Mahaphol coordinated the on-site activities; Noppadon Vannaprapa managed the documentation, and Jeff Birndorf developed graphic arts for the conference. Antonie Jetter was the Director of Student Relations, and Charles Weber was the Director of Awards.

Timothy Anderson, Tugrul Daim, Kiyoshi Niwa, Dilek Cetindamar Kozanoglu and Gary Perman conducted the review process for the papers as the Associate Editors; 160 colleagues from around the world constituted the Panel of Reviewers. They each reviewed up to 10 papers submitted to PICMET '14. Each paper was reviewed by two or more reviewers to assure a very high quality. Timothy Anderson also did the scheduling of the accepted papers for presentation at the conference. Dongjoon Lim, Byung-Sung Yoon, Caroline Mudavadi, Inthayuth Mahaphol, Jiali Ju, Shabnam Jahromi and Noshad Rahimi were the Editorial Assistants to check and verify that the finalized papers included all the revisions recommended by the reviewers.

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

The Country Representatives, under the leadership of Kiyoshi Niwa and Dilek Cetindamar Kozanoglu, provided linkages between PICMET and the regions they represent.

The sponsors of PICMET '14 made this conference possible. We extend special thanks to all of them: Japan Ministry of Economy, Trade and Industry (METI), Ishikawa Prefecture, City of Kanazawa, Hitachi, Toshiba, PFU, East Japan Railway Company, Komatsu, Daikin, Takenaka, Mitani Sangyo, EIZO, Nakamura-Tome Precision Industry, I-O Data Device, Hokusho, Komatsu Wall Industry, JMA Consultants, Matsumoto Machine, Asahi Electric, Quad Vision Research Institute, MANZAIKAKU, Houju Memorial Hospital, RB Controls, NIKKO Company, Tohshin Group, Komatsu Electronics, Motorashi Seisakusho, Ishikawa IT Human Resource Development Center, Hokkoku Bank, Betsukawa, Public Central Hospital of Matto Ishikawa, and Toray Industries.

PICMET Japan Chapter and JAIST (Japan Advanced Institute of Science and Technology) are hosting PICMET '14. JSSPRM (Japan Society for Science Policy and Research Management), Japan MOT Society, Society for Serviceology, Hitotsubashi University Institute of Innovation Research, Japan Techno-Economics Society, and the Japan MOT Association are participating in the conference.

We acknowledge the support of all of these organizations, colleagues and hundreds of others who contributed to PICMET's success, and express our gratitude to all. Our special thanks go to the Hokkoku Shimbun and Nikkei newspapers.

We believe the PICMET '14 *Bulletin* and *Proceedings* contain some of the best knowledge available on Technology Management for addressing the challenges and opportunities in a world where services and infrastructure are being integrated. We hope they will contribute to the success of technology managers and emerging technology managers throughout the world.



Dundar F. Kocaoglu  
President and CEO, PICMET



# PICMET '14

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### Conference Co-chair and LAC Co-chair

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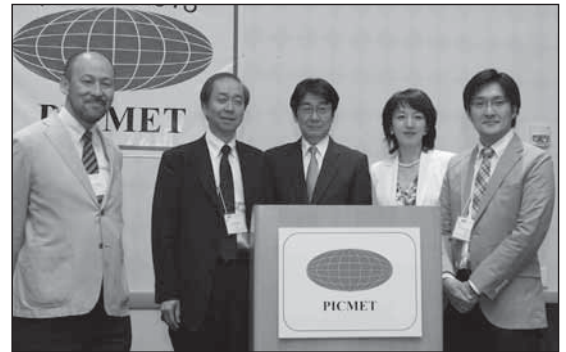
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Caroline Mudavadi, Portland State University



Noshad Rahimi, Portland State University

Byung-Sung Yoon, Portland State University

### LAC Co-coordinator

Yuriko Sawatani, Waseda University



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## DEDICATION

*PICMET '14 is dedicated to all researchers, educators and practitioners of Technology Management who are contributing to the establishment and growth of this field throughout the world.*

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# PICMET '14

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## **LAC Co-coordinator**

Kunio Shirahada, JAIST

## **LAC Members**

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Keizo Iwashita, Takenaka Corp.  
Toshinori Kajiura, Hitachi Ltd.  
Shotaro Kohtsuki, Ritsumeikan University  
Hiroshi Osada, TITECH  
Kenichiro Ota, JATES  
Koichi Sumikura, GRIPS  
Naoshi Uchihira, JAIST  
Tomoo Yamamoto, JAIST

## **ORGANIZED BY**

Portland State University (PSU) Department of  
Engineering & Technology Management

## **HOSTED BY**

PICMET Japan Chapter  
JAIST (Japan Advanced Institute of Science and  
Technology)

## **SUPPORTED BY**

Portland State University Maseeh College of  
Engineering & Computer Science

## **COOPERATING SOCIETIES**

IEEE Technology Management Council - Oregon Chapter  
IEEE Technology Management Council - Japan Chapter

## **ADVISORY COUNCIL**

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

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Dr. Nuket Yetis, Former President, TUBITAK, Turkey  
Dr. Oliver Yu, Executive in Residence, College of Business, San Jose State University, USA

## PANEL OF REVIEWERS

Papers submitted to PICMET conferences are subjected to a double-blind review process. Each paper included in the PICMET '14 conference was reviewed by two or more members of the Panel of Reviewers to assure a very high quality. The panel had 160 members from around the world. They are listed below in alphabetical order by last name.

Fatima Albar  
Joe Amadi-Echendu  
Muhammad Amer  
Hacer Ansal  
Masami Asai  
Jean-Pierre Auffret  
Murat Ayabakan  
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Yaeko Mitsumori  
Kumiko Miyazaki  
Martin Moehrle  
Kirankumar Momaya  
Songphon Munkongsujarit  
Katy Murphy  
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Wayne Wakeland  
Steve Walsh  
Andrew Walters  
Bing Wang  
Seiichi Watanabe  
Charles Weber  
Richard Weeks  
Calvin Weng  
Dietmar Winzker  
Brent Zenobia

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## PICMET LEADERSHIP IN TECHNOLOGY MANAGEMENT (LTM) AWARD RECIPIENTS

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

The Award was established in 1991. The recipients between 1991 and 2013 with their affiliations and positions at the time of the award are listed below.

### 1991

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

### 1997

Mr. Norman Augustine,  
Chairman of Lockheed  
Martin, USA

### 1999

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

### 2001

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



### 2003

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

### 2004

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

### 2005

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

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## 2006

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

## 2007

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

## 2008

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

## 2009

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

## 2010

HRH Princess Maha Chakri Sirindhorn, Thailand

## 2011

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

## 2012

Dr. Daniel Berg, Distinguished Research Professor of Engineering, the University of Miami, USA  
Dr. Nam P. Suh, President, Korea Advanced Institute of Science and Technology (KAIST), Korea

## 2013

Dr. Robert JT Morris, VP Global Labs, IBM Research, USA  
Dr. James M. Utterback, David J. McGrath jr (1959) Professor of Management and Innovation, MIT Sloan School of Management; and Professor of Engineering Systems, School of Engineering, Massachusetts Institute of Technology, USA

## PICMET MEDAL OF EXCELLENCE AWARD RECIPIENTS

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

The award was instituted in 2004. The recipients between 2004 and 2013 with their affiliations and positions at the time of the award are listed below.

## 2004

Dr. Daeje Chin, Minister of Information and Communications, Seoul, Korea

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

## 2005

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

## 2006

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





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## 2007

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

## 2009

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

## 2010

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

## 2011

Mr. Alejandro Cruz, Minister of Science and Technology, Costa Rica

## 2013

Dr. Eliezer Geisler, Distinguished Professor, Stuart School of Business, Illinois Institute of Technology, USA  
Dr. Hans Georg Gemuenden, Professor, Berlin University of Technology, Germany



## PICMET FELLOWS

The PICMET Fellow Award was established in 2011 to commemorate PICMET's 20th Anniversary. It is bestowed upon those who have excelled in the technology management field by making a significant impact in one or more of the following six areas:

- 1. Technology Management Research** as demonstrated by the research conducted and supervised, research results published in refereed journals, and research grants received from funding agencies or industry.
- 2. Technology Management Education** as demonstrated by technology management programs/courses developed, taught or managed, PhD students supervised, and new educational initiatives taken.
- 3. Technology Management Implementation** as demonstrated by management of technology-based projects, programs and organizations in industry or government.
- 4. Technology Management Consulting** as demonstrated by consulting activities with high impact on the improvement of technology management practice.
- 5. Technology Management Policy Making** as demonstrated by the role played in policy making levels for effective utilization of technology management concepts and processes.
- 6. Technology Management Leadership** as demonstrated by the book(s) published, journal(s) edited, technology management organization(s) established or managed.

The PICMET Fellows and the year they received the Fellow Award are listed in alphabetical order below.

Mr. Charles Allcock, PGE, USA (2011)  
Dr. Daniel Berg, Rensselaer Polytechnic Institute (RPI), USA (2011)  
Dr. Frederick Betz, Portland State University, USA (2011)  
Dr. Joseph Bordogna, University of Pennsylvania, USA (2011)  
Dr. Klaus Brockhoff, WHU – Otto Beisheim School of Management, Germany (2013)  
Dr. Youngrak Choi, Korea (2011) University, Korea (2011)  
Dr. Robert Colwell, DARPA, USA (2011)  
Dr. Joseph Cox, Distinguished Public Service Professor and Chancellor Emeritus, OUS, USA (2011)  
Ms. Charmagne Ehrenhaus, Portland Community

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College, USA (2011)  
Dr. Antonie de Klerk, University of Pretoria, South Africa (2013)  
Dr. Norman G. Einspruch, University of Miami, USA (2013)  
Mr. Les Fahey, Fahey Ventures, USA (2011)  
Dr. Gunnar Hambræus, Royal Swedish Academy of Engineering Sciences, Sweden (2011)  
Dr. Dunder Kocaoglu, Portland State University, USA (2011)  
Mr. Thomas Lipscomb, The Center for the Digital Future, USA (2011)  
Dr. Tom Long, Tektronix Vice President, Retired, USA (2011)  
Dr. Joseph P. Martino, Yorktown University, USA (2013)  
Mr. John McDougall, Alberta Research Council, Canada (2011)  
Dr. Graham Mitchell, University of Pennsylvania, USA (2011)

Dr. Seiichi Watanabe, Terumo Corporation, Japan (2011)  
Dr. Rosalie Zobel, European Commission, Belgium (2011)



Dr. Kiyoshi Niwa, The University of Tokyo, Japan (2011)  
Mr. Terry Oliver, Bonneville Power Administration, USA (2013)  
Dr. Alan L. Porter, Search Technology, Inc., USA (2013)  
Dr. Kwan Rim, Samsung Corporation, Korea (2011)  
Dr. Frederick Rossini, George Mason University, USA (2011)  
Mr. Terry Rost, The Franchise Group, USA (2011)  
Dr. Albert H. Rubenstein, Northwestern University, USA (2013)  
Dr. James C. Spohrer, IBM, USA (2013)  
Dr. David M. Steele, San Jose State University, USA (2013)  
Dr. Nam Suh, KAIST, Korea (2011)  
Dr. Nejat Veziroglu, University of Miami, USA (2011)  
Dr. Eric von Hippel, MIT, USA (2011)



# STUDENT PAPER AWARD

## PICMET NAMES ITS OUTSTANDING STUDENT PAPER AWARD

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

### AWARD CRITERIA

The **Brad W. Hosler PICMET Outstanding Student Paper Award** is bestowed upon a paper based on the student's research toward a graduate degree in the area of Engineering and Technology Management. Eligibility is restricted to currently enrolled students and those who have received their master's or doctorate degrees after July 31, 2011. The paper is nominated by the advising professor and selected by the Awards Committee. The award consists of \$1,000, complimentary conference registration and a plaque for the student, as well as a plaque and complimentary registration for the nominating professor. The winner may not be nominated again for the same award in subsequent years.

### ABOUT BRAD W. HOSLER

Brad Hosler passed away on August 31, 2007, at his home in Portland, Oregon, after several years of battling cancer. He received his undergraduate degree from Bucknell



University and completed his graduate studies at Carnegie Mellon University. Brad joined Intel in 1980 to work on the architecture and implementation of the I/O subsystem and had key roles in the Plug & Play BIOS definition and its implementation on Intel's first PCI chipset, Saturn. He formed the Compliance Workgroup to establish the PC industry's first

multi-vendor I/O compliance program. The innovative methods and practices that he architected and implemented have become the benchmark for the computer industry. Brad was among the pioneers recognized for his

industry contributions at the 10-year anniversary of the PCI-SIG, which has a worldwide membership of about 900 companies.

Brad's signature accomplishments are associated with the Universal Serial Bus (USB) family of technologies. He received two Intel Achievement Awards, one in 2003 and another in 2006, for his outstanding work. The success of



the USB interface and market of platforms and peripherals that sell in multiple billion units today is a measure of his impact.

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

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



# STUDENT PAPER AWARDS

## BRAD W. HOSLER OUTSTANDING STUDENT PAPER AWARD

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



### AUTHOR

Seyyed Yaser Banihashemi

### ADVISOR & CO-AUTHOR

Dr. Li Liu

### UNIVERSITY

The University of Sydney, Australia

### PAPER TITLE

“Differentiating the Role of Ex-ante and Ex-post Relational Governance Mechanisms in Regulating Client-Contractor Relationships”

### ABSTRACT

Poor project governance is the main cause of project failures for complex projects. Historically, formal contracting has been the mainstay of project governance for outsourced projects. However, subsequent studies found that reliance on formal contracting typically results in adversarial relationships between clients and contractors in large construction projects, which exacerbates the chances of project failure by thwarting exchange of information, hindering collaboration and increasing hostility between the parties. Moreover, due to high levels of uncertainty and complexity in practice, it is often impossible or excessively expensive to construct “complete” contracts upfront, or the institutional structures needed to enforce the contract do not exist. Consequently, relational governance mechanisms have been proposed as an effective alternative in such situations. Subsequent literature has shifted to the effects of contractual and relational governance mechanisms on the performance of exchange relationships as well as the interactions between those mechanisms. In particular, the relationship between contractual and relational governance has been the focus of a substantial body of literature, and the findings are contradictory. Whilst some studies find the relationship to be

substitutive, others indicate it is complementary.

In this study, drawing from transaction cost economics (TCE), social capital theory, and social exchange theory, we re-examine the relationship by distinguishing two forms of relational governance, namely ex-ante and ex-post relational governance, and argue that the relationship between these two forms and contractual governance are substitutive and complementary, respectively, thereby reconciling the contradictory findings on the relationship.

Our conceptual model is validated using survey data collected from 40 client-contractor partnerships in large construction projects in Australia. Contributing to the literature, the results show that ex-ante relational governance has both a substitutive relationship as well as a complementary relationship (mediated by ex-post relational governance) with formal contracting, while ex-post relational governance has a complementary relationship with formal contracting. In addition, the results indicate that formal contracting has a direct effect on project performance, while ex-post relational governance has a direct effect on relationship performance.





# LTM AWARDS

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

## PICMET '14 AWARDEES

**Prof. Dr.-Ing. habil. Prof. e.h. mult. Dr. h. c. mult. Hans-Joerg Bullinger**  
*Senator of the Fraunhofer-Gesellschaft, Germany*

Dr. Hans-Joerg Bullinger was born in Stuttgart. He began his career working as a manufacturer for the Daimler-Benz company in Stuttgart, after which he obtained a degree at the University of Stuttgart, graduating with a master's degree and Ph.D. in manufacturing. After two years of lecturing at the University of Hagen, Dr. Bullinger was asked to become a full-time lecturer at the University of Stuttgart. Besides his role as chairman of the University, Dr. Bullinger was also the head of the Institute for Human Factors and Technology Management (IAT) and the Fraunhofer-Institute for Industrial Engineering (IAO). From October 2002 until October 2012, he was president of the Fraunhofer-Gesellschaft, Corporate Management and Research, and alternated afterwards to the Senate of Fraunhofer.



Dr. Bullinger received several honorary doctorates and awards such as the Knight Commander's Cross of the Order of Merit of the Federal Republic of Germany from the Federal President of Germany; he was awarded "Manager of the Year" by the German manager magazine in 2009; and he was honored with the Grashof Denkmünze by VDI (The Association of German Engineers) in 2011. Dr. Bullinger received the Leonardo - European Corporate Learning Award in 2012.

Dr. Bullinger is a member of several councils such as the Industry-Science Research Alliance of the Federal Ministry of Education and Research and the European Research and Innovation Area Board (ERIAB) of the European Commission. Dr. Bullinger is a Fellow of the UK's Royal Academy of Engineering.

At present, the Fraunhofer-Gesellschaft maintains more than 80 research units in Germany, including 67 institutes and research units. The majority of the 23,000 staff

are qualified scientists and engineers. With its clearly defined mission of application-oriented research and its focus on key technologies of relevance to the future, the Fraunhofer-Gesellschaft plays a prominent role in the German and European innovation process.

## Mr. Michael Joseph

*Director of Mobile Money, Vodafone Group Services Limited, UK; and Fellow, the World Bank*

Michael Joseph is employed by Vodafone Group Services Limited as the director of Mobile Money and is responsible for leading the strategic growth and development of the successful M-Pesa proposition. Michael is also Vodafone's Strategic Advisor appointed to the Boards of Vodacom Group South Africa, Vodacom Tanzania, Vodacom Mozambique and Safaricom Limited. He was appointed in March 2011 as the first World Bank Fellow to advise governments, regulators and other institutions on Mobile Money and other ICT initiatives. Previously, Michael was the CEO of Safaricom Limited, steering the company from a subscriber base of less than 20,000 to over 16.71 million subscribers at his retirement in November 2010. This phenomenal growth straddling nearly a decade was motored by the launch of many innovative products and services such as M-PESA. He has extensive international experience in company start-ups and the implementation



# LTM AWARDS

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and operation of large wireless and wire-line networks.

## **Professor Thomas L. Magnanti**

*President, Singapore University of Technology and Design (SUTD), Singapore; and Institute Professor and former Dean of Engineering, Massachusetts Institute of Technology (MIT), USA*

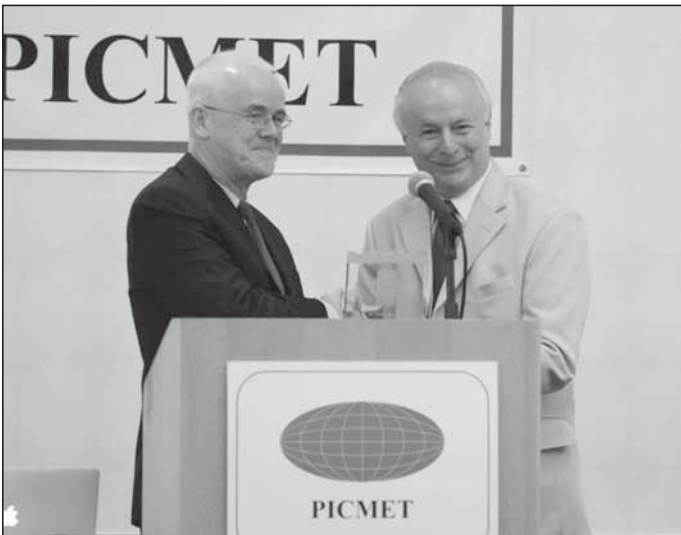
Thomas Magnanti is the founding President of the Singapore University of Technology and Design (SUTD), and Institute Professor and former Dean of Engineering at MIT. He has devoted much of his professional career to education that combines engineering and management, and to teaching and research in applied and theoretical aspects of large-scale optimization.



Professor Magnanti has a long association with programs in technology and in the management of technology.

At SUTD, he has led the development of a university whose mission is to advance knowledge and nurture technically grounded leaders and innovators to serve societal needs through a focus on design and an integrated multi-disciplinary curriculum and multi-disciplinary research.

At MIT he was the founding co-director of MIT's Leaders for Manufacturing and System Design and Management



Programs, and founding director of the Singapore-MIT Alliance for Research and Technology (SMART). As Dean, he was instrumental in creating the Deshpande Center for

Technological Innovation and was a strong advocate and supporter of programs in entrepreneurship such as the MIT 100K competition. He also headed one third of the Sloan School of Management for several years.

He has served as president of three major professional societies and as editor of the journal *Operations Research*. He has also served on a number of university, corporate and government boards and councils.

Professor Magnanti has received numerous educational and research awards including four honorary degrees. He is a member of the U.S. National Academy of Engineering and the American Academy of Arts and Sciences. He has an undergraduate degree in Chemical Engineering from Syracuse University, and masters' degrees in Statistics and in Mathematics as well as a Ph.D. in Operations Research, all from Stanford University.

## **Mr. Takeshi Uchiyamada**

*Chairman of the Board, Toyota Motor Corporation, Japan*

Mr. Takeshi Uchiyamada graduated from Nagoya University with a degree in applied physics in March 1969 and joined Toyota Motor Corporation (TMC) in April the same year.



In January 1994, Mr. Uchiyamada became project general manager of Vehicle Development Center 2. In January 1996, he became chief engineer of that center, which developed the Prius—the world's first mass-produced gasoline-electric hybrid car.

After being named to the Board of Directors in June 1998, Mr. Uchiyamada oversaw Vehicle Development Center 3. In June 2000, he became chief officer of Vehicle Development Center 2, and in June 2001, managing director and chief officer of the Overseas Customer Service Operations Center. Mr. Uchiyamada was made a senior managing director and also appointed chief officer of the Vehicle Engineering Group in June 2003. In June 2004, he became a chief officer of the Production Control & Logistics Group, and in June 2005, he became executive vice president and member of the board. Mr. Uchiyamada was appointed vice chairman of the board in June 2012. He became chairman of the board in June 2013. He is also vice chairman of Nippon Keidanren (Japan Business Federation) since June 2013.

# PICMET HAS GONE MOBILE!



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Redeem Code: "picmet14"

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# GENERAL INFORMATION

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## CONFERENCE FOCUS

Integration of services and infrastructure is a critical challenge both for developing countries in developing effectively, and for advanced countries in maintaining sustainable growth.

In the technology era, the vast majority of people are knowledge workers contributing to the society by providing services. It is important to explore and establish approaches to integrate services with the society's infrastructure in technology, manufacturing, transportation, information, health, education, government, energy and other sectors.

It is the responsibility of the Technology Management community to guide technologies effectively for the betterment of humankind. This is a big responsibility for the leaders and emerging leaders in the Technology Management field, but it is critical that they accept the responsibility and meet the challenges head on. The focus of the PICMET '14 Conference is on the integration of infrastructure and services. It is highlighted throughout the conference.

## WHO SHOULD ATTEND

Following the PICMET tradition, this high-impact symposium will set the stage for innovation management for decades to come. The world's leading experts from academic institutions, industrial corporations and government agencies will participate in the discussions. PICMET '14 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 '14 program consists of

- Ph.D. Colloquium, "Getting Your PhD....and Beyond," Sunday, July 27, 13:00 - 17:00, Zuiun-1 Room (3rd Floor)
- Plenary sessions by global leaders from industrial corporations, academic institutions and government agencies in the Ootori Ballroom (3rd Floor).
- Three special meetings:
  1. Panel of Reviewers Meeting for the reviewers of papers for the PICMET '14 Conference, Monday, July 28, 12:00-14:00, Astral Room (19th Floor)
  2. Country Representatives Meeting for the current PICMET Country Representatives and those who are interested in becoming Country Representatives, Wednesday, July 30, 12:00-14:00, Astral Room (19th Floor)
  3. PICMET '15 & '16 Planning Session for everybody who would like to discuss strategies for future PICMET conferences, Thursday, July 31, 16:00-17:30, Zuiun-1 (3rd Floor)
- 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 '14:

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

The publications will be available to PICMET '14 attendees at the registration desk.

## REGISTRATION POLICY

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

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



# GENERAL INFORMATION

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

## SESSION AND PAPER DESIGNATIONS

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

<b>First digit shows the day</b>	M: Monday T: Tuesday W: Wednesday H: Thursday
<b>Second digit shows the time</b>	A: 08:30-10:00 B: 10:30-12:00 C: 12:00-14:00 D: 14:00-15:30 E: 16:00-17:30
<b>Third and fourth digits show the room</b>	01: Ootori Ballroom-1 02: Ootori Ballroom-2 03: Ootori Ballroom-3 04: Zuiun-1 05: Zuiun-2 06: Toki 07: Shirasagi-1 08: Shirasagi-2 09: Hibari-1 10: Hibari-2 11: Chidori 12: Houmeiden 13: C'est La Vie

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 Zuiun-2.

## 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 a computer, an LCD projector and screen. The Kujiyaku-1 Room on the 4th Floor is designated as the Author's Room. If you need information about anything concerning the conference, volunteers in the registration area will try to help you.

## WIRELESS ACCESS

Wi-Fi for Internet connections will be provided in the foyer of the Ootori Ballroom (3rd Floor).

## DRESS CODE

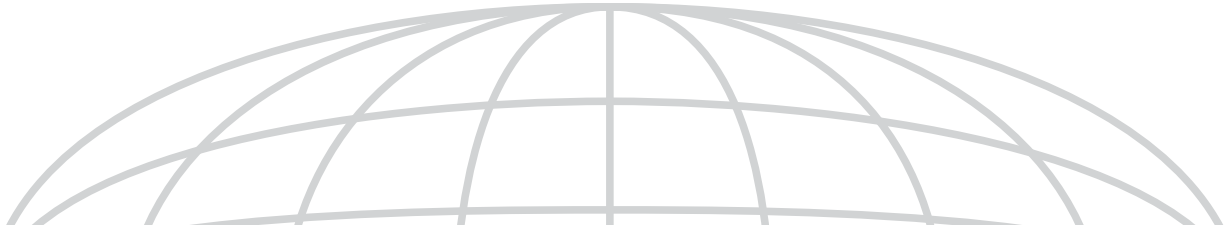
Hot and humid weather is expected during PICMET '14 in Kanazawa. Informal dress code (short-sleeve shirts with or without a tie, light trousers or shorts for male participants, light shirt or blouse and skirt, shorts or pants for female participants) is appropriate throughout the conference. The most formal event is the Awards Banquet on Tuesday evening, July 29. "Business smart" dress code with optional coat and tie is appropriate for the Banquet.

## PICMET VOLUNTEERS

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

# SHARE THE PICMET EXPERIENCE

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## THE PICMET EXPERIENCE

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

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# KANAZAWA

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*The following information is from the City of Kanazawa web site: [http://www.city.kanazawa.ishikawa.jp/index\\_e.html](http://www.city.kanazawa.ishikawa.jp/index_e.html)*

## KANAZAWA GUIDE

### ABOUT KANAZAWA

Kanazawa, the biggest city in the Hokuriku region, has a population of over 450,000 and is a castle town that was ruled over by the Maeda family for three centuries after the first lord Toshiie Maeda entered Kanazawa Castle in 1583.

The development of its special products like rice, sake, sweets, etc., was due to its temperate and rainy climate with heavy snow in winter.

The city is surrounded by the Japan Alps, Hakusan National Park and Noto Peninsula National Park. Two rivers run through the city; the Sai is said to be a lively masculine river and the Asano to be a sweet, feminine river. Such a natural background of great beauty gives the city a relaxed feeling.

Since the Kaga Clan invited many artists and craftsmen to this area, it achieved a high level of craftsmanship that continues to flourish to this day. Among the specialty items of this region are colorful Kutani pottery, earthy Ohi pottery, elegant Kanazawa lacquerware, glittering Kanazawa gold leaf, unique-to-Kanazawa Paulownia Craft, hand-painted Kaga-yuzen silk, Kaga zogan (metal inlay), Kaga embroidery, Kaga fishing flies, Mizuhiki, and Kanazawa Buddhist altars.

The buildings that gave birth to these traditions stand tranquilly and blend in with the modern atmosphere in Kanazawa to create a charming ancient castle town.



### HISTORY

The name Kanazawa is derived from the following story: A peasant named Imohori Togoro made his living digging potatoes. He washed gold dust from the potatoes into a well, now called Kinjo Reitaku, so the area was named Kanazawa, meaning “marsh of gold.”



About 500 years ago, the Ikko sect of Buddhism set up a religious government with its center at the Kanazawa Gobo temple, which later became the site of Kanazawa Castle. The temple was destroyed by an army led by Oda Nobunaga in 1580. Maeda Toshiie, one of his retainers, entered into Kanazawa in 1583, built a castle in its stead and ruled the district as the lord possessing the largest fief in Japan. He is known for producing a million koku of rice annually (one koku equals five bushels). The Maeda lords especially fostered arts and crafts, and Kanazawa became a cultural center like Tokyo (then known as Edo) and Kyoto.

After the Meiji Restoration in 1868, Kanazawa became the capital of Ishikawa Prefecture and has flourished as the hub of political, economic, educational, and cultural activities in the Hokuriku District.

### CLIMATE

The average high temperature in July is about 29°C (84°F) in July; the average low temperature is 18°C (64°F). Average humidity in July is 73 percent.

### LOCATION

Kanazawa is the prefectural capital of Ishikawa Prefecture and is located in the central part of the mainland of Japan. The southeast of the city area faces the mountains and the northwest area faces the Sea of Japan. The city area is located between the Saigawa River and the Asano River.



# KANAZAWA

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## POPULATION

Kanazawa has a population of 458,000 as of January 2010.

## SIGHTSEEING

Below are just a few of the many things to see and experience in and around Kanazawa. For additional ideas, please visit the “Tours” section of this Bulletin or talk to the JTB (Japan Travel Bureau) representative at the conference site.

The following is from the Kanazawa Convention Bureau web site: [http://www.kanazawa-cb.com/index\\_e.html](http://www.kanazawa-cb.com/index_e.html)



## HIGASHI CHAYA DISTRICT

Kanazawa has three tea houses districts: Higashi (east), Nishi (west) and Kazue-machi. Higashi Chaya District is the largest and still preserves an aspect of the Kanazawa of feudal times, expressing the picturesque atmosphere of the wooden lattice fronts of old geisha houses. In the evening, you may have a chance to hear the sound of the “shamisen” (three-stringed Japanese banjo) from lighted houses.

## KANAZAWA CASTLE PARK AND ISHIKAWA-MON GATE

Kanazawa Castle has been the residential castle of the Maeda family since 1583. All of the castle walls, except for Ishikawa-mon Gate, were destroyed by fire in 1881, but they were restored to their original form and made into a castle park in 2001. Ishikawa-mon Gate has been designated an Important National Cultural Property by the government.

## KENROKUEN GARDEN

Kenrokuen Garden is one of the three most beautiful Japanese landscape gardens in Japan and was awarded three stars by the Michelin Guide, the world-famous tourism guidebook, in 2009. This garden has been maintained since 1676, and it was the garden of the secondary residence of the feudal lord of that time. The name “Ken-roku” reflects the “roku” (six) aspects of a garden in the classic sense: spaciousness, seclusion, artificiality, antiquity, abundant water, and broad views.

## 21ST CENTURY MUSEUM OF CONTEMPORARY ART

This is a monument to modern art in a city dedicated to historical art. Circular in form, with a diameter of 112.5 meters, the building has no front or back, leaving it free to be explored from all directions. This building was designed by the architectural group SANAA (Sejima and Nishizawa and Associates), which was awarded the Pritzker Prize, the highest of honors in architecture, in 2010.

## TRADITIONAL PERFORMING ARTS

### NAGAUTA (GEISHA DANCE)

Nagauta is a kind of traditional Japanese music which accompanies the Kabuki theater. The Shamisen, a lute with three strings, is indispensable for Nagauta. A Shamisen player sings sitting on the floor. Beside them, geishas in beautiful dresses (Kimono) dance brilliantly.



### NOH DRAMA

Noh Drama is the classical Japanese dance theatre that has been performed since the 14th century. Many characters are masked, with men playing male and female roles.



# KANAZAWA

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## “SHISHIMAI” LION DANCE

Developed over time, the Chinese Lion Dance, the Kaga Shishimai, has been adapted to the culture of the Kaga region (present day Ishikawa). A huge, elegantly hand-carved cedar lion mask is brought to life by a man, while behind him the rest of his troupe, hiding under the lion's cloth hide, animate its body. Dancing and diving, leaping and prancing, the dancers create an energetic, vibrant, mythical beast.

## “TAIKO” DRUM PERFORMANCE

Taiko is the traditional Japanese drum performance for festival and ceremony. “Gojinjo Taiko” is a distinctive style of Taiko performance developed in Noto Peninsula, located in the north of Ishikawa Prefecture. Its unique costume and strong sound are derived from their ancestors who protected themselves from the enemy by playing Taiko, as they had no weapons.

## CITY OF CRAFTS

Kanazawa has a wide variety of traditional crafts including Kanazawa gold leaf, Kaga Yuzen dyed silk, Kutani ceramics and Kanazawa lacquerware. In addition, new creative activities such as glass art have been promoted. The city of Kanazawa was registered as a City of Crafts of UNESCO's Creative Cities Network in June 2009.

## KAGA YUZEN SILK (KIMONO) DYEING

Visitors to the Nagamachi Yuzen-Dyeing House have the opportunity to see displays of various silk products produced in Kanazawa as well as to observe the traditional dyeing process that is used in the making of the famous Kaga Yuzen silk. You can also try dyeing colorful Kimono cloth.



## SHAMISEN PLAYING

The Shamisen is an indispensable instrument in the Geisha district. You are offered a chance to play this three-stringed instrument in a time-honored shop. Green tea and dry confectionary will be provided after playing.

## GOLD LEAF APPLICATION

Gold leaf, or kinpaku, is micro-thin wafers (less than 1/10,000th of a mm thick) of gold, which is an essential element in the production of a variety of gifts ranging from dishes to vases and bowls. Using this material, you can try making your own chopsticks.

## MAKING JAPANESE GREEN TEA

In a traditional tea-ceremony room, you can make Japanese green tea on your own. Stirring your tea quietly makes your mind calm. Japanese confectionary, colorful sweet cakes, will be provided with it.

## MAKI-E DECORATION ON LACQUERWARE

Lacquerware is a traditional and high-quality product made in Japan. Kanazawa Lacquerware is fostered in the Kaga (ancient Kanazawa) region and is known for its unique design. The surface of lacquerware is decorated by sprinkling gold powder. This technique is called “Maki-e.”



## MAKING WAGASHI-JAPANESE SWEETS

Wagashi, Japanese sweets, made in Kanazawa are some of the most renowned in Japan. A workshop provides the opportunity for anyone to try creating their own wagashi in a casual atmosphere.

# OPTIONAL TOURS

Plenty of optional tours will be available before, during and after PICMET '14. They are offered by JTB (Japan Travel Bureau). There will be a JTB representative at the conference site, ANA Crowne Plaza Hotel, during the conference.

The following tours have been selected as a sample of tours that may be of particular interest to PICMET participants. Tour details and registration forms are available at the URL given under each tour. Reservations must be made directly with JTB. Please note that JTB offers many more tours and travel options. Please visit [www.picmet.org](http://www.picmet.org) (click on "Optional Tours") for a list of JTB offices and contact information in Japan and around the world.

**The contact information for JTB Kanazawa office is below:**

JTB Central Japan Corp., Kanazawa-office  
"PICMET '14 DESK"

30 Shimotsutsumi-cho, Kanazawa-shi, Ishikawa, Japan

FAX: +81-76-262-6156

Contact person: Ms. Takeuchi, [kanazawa-taikai@cub.jtb.jp](mailto:kanazawa-taikai@cub.jtb.jp)

## PRE-CONFERENCE

### **HOKKAIDO THREE-DAY TOUR FROM TOKYO**

**DATE:** July 24  
**TIME:** Starts at the airline check-in counter (SKY 871) Narita Airport at 8:00 a.m. on Thursday, July 24. Ends at the Kanazawa Station across from the ANA Crowne Plaza Hotel in Kanazawa on Saturday, July 26  
**COST:** ¥190,000 (about \$1,900) per person. *The price includes transportation, English speaking guide, entrance fees, two nights at the Keio Plaza Hotel in Sapporo, breakfast on Friday and Saturday, and lunch on all three days.*  
**DESCRIPTION:** [https://amarys-jtb.jp/NOZData/Img/FileUp/Honban/Upload/4351/amarys\\_Hokkaidotour.pdf](https://amarys-jtb.jp/NOZData/Img/FileUp/Honban/Upload/4351/amarys_Hokkaidotour.pdf)

**REGISTRATION** <https://amarys-jtb.jp/picmetcentral/>

Minimum 6 people required; maximum 40 people

This pre-conference tour will take you from Tokyo to beautiful Hokkaido, and from there to Kanazawa before PICMET '14 starts. You will visit the following sites.

#### **Hitsujigaoka Observation Hill**

This hill is located in Sapporo, the biggest city and the Prefectural city in Hokkaido. You can see the pastoral field from top of the hill.

#### **Shiroy Koibito Park**

Shiroy Koibito is the name of the famous souvenir cookies. In this park, you join the factory tour.

#### **Furano and Biei Areas**

The beautiful scenery area in Hokkaido. You can see the seasonal flowers and plants.

#### **Otaru Area**

Beautiful canal and classical building and shopping area.

#### **Nikka Whisky Yoichi Plant**

The major whisky plant in Japan, you will see the whisky-making process and enjoy a meal.

#### **The Old Aoyama Villa**

The historical Mansion in Hokkaido, you will see the gorgeous Japanese-style building.

#### **Notes:**

1. The itinerary is subject to change due to possible traffic complications.
2. The tour is canceled if less than 6 participants sign up for it. In that case, JTB will notify the participants who have signed up.
3. If the number of participants reaches 40, no new participants will be accepted.



# OPTIONAL TOURS

## DURING THE CONFERENCE

### KANAZAWA HALF-DAY SIGHTSEEING TOUR

**DATE:** July 27 and July 28  
**TIME:** 13:00—16:30 (starts and end at ANA Crowne Plaza Hotel)  
**COST:** ¥8,000 (about \$80) per person.  
The price includes transportation, English guide, and entrance fees.  
**REGISTRATION:** <https://amarys-jtb.jp/picmetKanazawatour/>

Kanazawa, the capital city of Ishikawa Prefecture located in the central part of the mainland of Japan, is a leading tourist city attracting about seven million visitors every year. This half-day tour will take you to three historical sites.

#### **Temple (Ninja Temple)**

While not actually associated with ninjas, the temple earned its nickname, Ninja Temple, because of its many deceptive defenses. Built in 1643, the temple looks like



a simple building with two floors from the outside. But once you enter the temple, you will discover that it has four floors, seven tiers, and a very complex architecture with 23 chambers and 29 staircases aimed to guard against intruders or attack. There are a total of 29 different contrivances to fool the enemy such as hidden chambers and stairs, completely unexpected and reversible trap-like doors and floor, and escape pits.

#### **Nagamachi Samurai Houses**

Nagamachi is the samurai district located at the foot of the former Kanazawa Castle, where samurai and their families used to reside. The area preserves a historic

atmosphere with its remaining samurai residences, earthen walls, private entrance gates, narrow lanes and water canals. One of the main attractions of the district is the centrally located Nomura-ke, a restored samurai residence displaying the lifestyle and artifacts of the era when samurai were prosperous.

#### **Tentokuin Temple**

Tentokuin Temple was erected in 1623 during the Kaga Region Reign by Maeda Toshitsune, the third Lord of the Maeda family, who had this temple built after his



wife Tamahime's untimely death. Her marriage was promised at the age of just three, and she died at the age of 24, leaving behind three sons and five daughters. In 1693 a gateway was built inside the grounds. Once inside the garden, the gateway sits before the temple at the center of the grounds. Inside the temple visitors can view an ancient paper doll, which was a treasured toy of Tamahime, and also enjoy a performance of Karakuri dolls which tells the story of Tamahime.





# OPTIONAL TOURS

## DURING AND POST-CONFERENCE

### HIDA-TAKAYAMA AND SHIRAKAWA-GO FULL-DAY TOUR FROM KANAZAWA

**DATE:** July 27 and August 1  
**TIME:** Starts and ends at ANA Crowne Plaza Hotel  
**COST:** ¥13,000 (about \$130) per person.  
*The price includes transportation, English guide, entrance fees, and a buffet-style lunch at a hotel in Takayama.*

**REGISTRATION:** <https://amarys-jtb.jp/picmethida/>

#### Hida-Takayama

A short distance from Kanazawa, Hida-Takayama is located in Gifu Prefecture, almost at the center of the Japanese archipelago, where narrow valleys stretch between countless steep mountains dotted with villages. One of the widest basins here is the Takayama Basin. A peculiarity of the climate is the vast difference in temperature between night and day during the winter. With a heavy snowfall, the winter is extremely cold, and temperatures have been known to reach 15 degrees below freezing. On summer days, the dazzling sunlight is often potent, but because the humidity is low, you



can savor a sense of refreshment, and nights are cool. There are beautiful views of nature everywhere, with mountains in the 3,000-meter class.

The town village still stands on the east side of the Miyagawa River flowing through Takayama, and in the middle of it is Sanmachi, where Edo period (1603-1868) houses remain. The rich atmosphere of Takayama castle town still lingers, and you can see sake breweries and merchants' houses with latticed bay windows standing in a row. This district was designated as an area of important traditional buildings by the Japanese Government.

#### Shirakawa-go

Shirakawa-go, situated at the foot of Mt. Haku-san in northwestern Gifu Prefecture, is a quiet mountain village with rice fields and a river running through it. The village, which has 114 thatched roof buildings, was registered as a UNESCO World Heritage Site in 1995 and is famous for its traditional gassho-zukuri farmhouses, some of which are more than 250 years old. Gassho-

zukuri means “constructed like hands in prayer,” as the farmhouses’ steep thatched roofs resemble the hands of Buddhist monks pressed together in prayer. The architectural style devel-



oped over many generations and is designed to withstand the large amount of heavy snow that falls in the region during winter.



Near the village, the Gassho-zukuri Minka-en outdoor museum is made up of 27 thatched roof houses that have been relocated from various areas in Shirakawa-go. A temple, a coalhouse, and a horse paddock have been built, preserving the old scenery. There are live performances of traditional industrial arts like dyeing and weaving, and visitors can even try making these crafts themselves.



# OPTIONAL TOURS

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## POST-CONFERENCE

### **NARA-KYOTO TWO-DAY TOUR FROM KANAZAWA TO TOKYO**

**DATE:** August 1  
**TIME:** Starts at 6:50 a.m. on Friday, August 1, at the ANA Crowne Plaza Hotel in Kanazawa; ends at 7:36 p.m. on Saturday, August 2, at Shinagawa Station near Shinagawa Prince Hotel in Tokyo.  
**COST:** ¥110,000 (about \$1,110) per person. *The price includes transportation, English speaking guide, entrance fees, one night at the Kokusai Hotel in Kyoto, breakfast on Saturday, and lunch on both days.*  
**DESCRIPTION:** [https://amarys-jtb.jp/NOZData/Img/FileUp/Honban/Upload/4349/amarys\\_Narakyototour.pdf](https://amarys-jtb.jp/NOZData/Img/FileUp/Honban/Upload/4349/amarys_Narakyototour.pdf)  
**REGISTRATION:** <https://amarys-jtb.jp/picmetKyotoNara/>

Minimum 6 people required; maximum 40 people

This is an ideal tour at the end of the PICMET '14 Conference. It shows you the beauty of Nara and Kyoto and takes you to the following sites.

#### **Todaiji Temple/Nara Park**

Buddhist temple complex located in the city of Nara. Its Great Buddha Hall houses the world's largest bronze statue of the Buddha Vairocana, known in Japanese as Daibutsu. The temple also serves as the Japanese headquarters of the Kegon school of Buddhism, and is listed as a UNESCO World Heritage Site, together with seven other temples and shrines in the city of Nara, as part of "Historic Monuments of Ancient Nara."

#### **KasugaTaisha Shrine in Nara**

Established in 768 AD and rebuilt several times over the centuries, it is the shrine of the Fujiwara family. The interior is famous for its many bronze lanterns, as well as the many stone lanterns that lead up the shrine. Kasuga Shrine, and the Kasugayama Primeval Forest near it, are registered as a UNESCO World Heritage Site as part of the "Historic Monuments of Ancient Nara."

#### **Nara Nagomikan**

Located at a 15-minute walk from Todaiji Temple, Nara Nagomikan was built in the traditional Japanese style. You can buy souvenirs and enjoy lunch there. (Lunch is on your own.)

#### **Nijo Castle in Kyoto**

The Tokugawa shogun's Kyoto home stands in stark contrast to most of Japan's other remaining castles, which were constructed purely for defense. Ironically, it was from Nijo Castle that Emperor Meiji issued his 1868 decree abolishing the shogunate form of government.



#### **Kinkakuji Temple in Kyoto**

Officially named Rokuon-ji, it is designated as a National Special Historic Site and a National Special Landscape as one of 17 locations comprising the Historic Monuments of Ancient Kyoto World Heritage Site. It is also one of the most popular buildings in Japan, attracting a large number of visitors annually.

#### **Kiyomizudera Temple in Kyoto**

Officially, Otowa-san Kiyomizu-dera is an independent Buddhist temple in eastern Kyoto, and part of the Historic Monuments of Ancient Kyoto UNESCO World Heritage site. The main hall has a large veranda, supported by tall pillars, that juts out over the hillside and offers impressive views of the city. Large verandas and main halls were constructed at many popular sites during the Edo period to accommodate large numbers of pilgrims.

#### **Notes:**

1. The itinerary is subject to change due to possible traffic complications.
2. The tour is canceled if less than 6 participants sign up for it. In that case, JTB will notify the participants who have signed up.
3. If the number of participants reaches 40, no new participants will be accepted.

# OPTIONAL TOURS

## ANY TIME

### DYNAMIC TOKYO – ONE-DAY TOUR IN TOKYO

**DATE:** Any day (subject to availability)  
**TIME:** 09:00 – 17:10, Starts at Hamamatsucho Bus Terminal, ends at Tokyo station  
**COST:** ¥12,000 (about \$120) per person. *The price includes English-speaking guide, lunch, admissions and transportation.*

**REGISTRATION:** [http://www.japanican.com/en/tour/detail/A100\\_/?aff=GMT](http://www.japanican.com/en/tour/detail/A100_/?aff=GMT)

Enjoy a panoramic view of the city from Tokyo Tower before participating in a traditional Japanese tea ceremony at Happon Japanese gardens. Savor lunch at the beautiful former manor, the Chinzanso restaurant, and then take a stroll along the moat surrounding the Imperial Palace Plaza.

Board a cruise at Hinode Pier for a 40-minute trip up the Sumida River to Asakusa.

Browse the many colorful stores lining the Nakamise walkway leading up to Sensoji Temple, Tokyo's oldest and most famous Buddhist temple, before passing through Ginza, Japan's world-renowned shopping and entertainment district.



## ANY TIME

### MT. FUJI AND HAKONE ONE-DAY TOUR FROM TOKYO

**DATE:** Any day (subject to availability)  
**TIME:** 09:00 – 20:30, Starts at Hamamatsucho Bus Terminal, ends at Ginza  
**COST:** ¥13,000 (about \$130) per person. *The price includes a Japanese style lunch, and unlimited Wi-Fi on the bus tour.*

**DESCRIPTION & REGISTRATION:** <http://www.japanican.com/en/tour/detail/F880/>



This one-day guided tour takes you to majestic Mt. Fuji and Hakone. It includes a stop at the Fuji Visitor Center, a trip up to Mt. Fuji's 5th station at

an elevation of 2,300 meters, a cruise on pristine Lake Ashi, and a ride on the Komagatake Ropeway, which boasts great views of the surrounding Hakone National Park.



The tour includes transportation to/from Mt. Fuji and Hakone by chartered bus and lunch. However, there are a variety of transportation and meal options available, including return by Shinkansen (a more expensive choice).



# OPTIONAL TOURS

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## ANY TIME

### NIKKO WORLD HERITAGE ONE-DAY TOUR FROM TOKYO

DATE: July 23, 25; August 1, 3, 4, 6, 8  
(subject to availability)

TIME: 09:00 – 20:00, Starts at  
Hamamatsucho Bus Terminal,  
ends at Ginza (Sukibayashi  
intersection)

COST: ¥14,000 (about \$140) per person.  
*The price includes lunch, and  
unlimited Wi-Fi on the bus tour.*

#### DESCRIPTION &

REGISTRATION: [http://www.japanican.com/en/  
tour/detail/F300/?typecd=TOU&  
deptcd=TYO&destcd=M06&pn=1&  
cpn=0](http://www.japanican.com/en/tour/detail/F300/?typecd=TOU&deptcd=TYO&destcd=M06&pn=1&cpn=0)

This one-day guided tour from Tokyo takes you to some of Nikko's most popular sightseeing spots such as the World Heritage-registered Toshogu Shrine and beautiful Kirifuri Falls.

The tour also visits Nikko Tamozawa Imperial Villa, an important national cultural property, which boasts its beautiful structure.



## ANY TIME

### TOKYO SKYTREE OBSERVATION DECK & ASAKUSA – HALF-DAY TOUR IN TOKYO

DATE: Any day (subject to availability)

TIME: 13:40 – 19:30, Starts at  
Hamamatsucho Bus Terminal,  
ends at Tokyo Station

COST: ¥6,500 (about \$65) per person.  
*The price includes English-  
speaking guide, admission fees  
and transportation.*

#### DESCRIPTION &

REGISTRATION: [http://www.japanican.com/en/  
tour/detail/A050\\_/?typecd=TOU&  
deptcd=TYO&destcd=M03&pn=1  
&cpn=0](http://www.japanican.com/en/tour/detail/A050_/?typecd=TOU&deptcd=TYO&destcd=M03&pn=1&cpn=0)



This is a half-day, afternoon Tokyo tour that includes a visit to the observatory of Tokyo Skytree, a new Tokyo landmark, and sightseeing in Asakusa.



# OPTIONAL TOURS

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## ANY TIME

### **SUNRISE EXPRESS KYOTO TOUR – ONE-DAY KYOTO TOUR FROM TOKYO (STANDARD CLASS)**

**DATE:** Any day (subject to availability)  
**TIME:** 9:00 – 22:00, Starts at  
Hamamatsucho Bus Terminal,  
ends at Tokyo Station  
**COST:** ¥39,900 (about \$399) per person.  
*The price includes English  
guide, lunch, admission fees and  
transportation.*  
**REGISTRATION:** [http://www.japanican.com/en/  
tour/detail/QT1A/?typecd=TOU&  
deptcd=TYO&destcd=M19&pn=1  
&cpn=0](http://www.japanican.com/en/tour/detail/QT1A/?typecd=TOU&deptcd=TYO&destcd=M19&pn=1&cpn=0)

Ride the Shinkansen, Japan's famous bullet train, to Kyoto to experience its 1,200 years of rich history.

Have lunch after arriving, and then spend the afternoon



visiting some of the ancient capital's most famous places including Sanjusangen-do Temple, Heian Jingu Shrine, and Kiyomizu-dera

Temple. Return to Tokyo by bullet train in the evening.

Recommended for those who cannot miss Kyoto but who have no time to spare.





# SOCIAL EVENTS

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## RECEPTION/BUFFET

DATE: SUNDAY, JULY 27  
TIME: 19:00—22:00  
LOCATION: OOTORI BALLROOM  
(3RD FLOOR OF THE HOTEL)  
DRESS: INFORMAL

Meet other conference attendees, renew old acquaintances, and begin new friendships and collaborations at this opening reception/buffet in the Ootori Ballroom on the 3rd floor of the hotel. Included in the regular registration fee.\*



## AWARDS BANQUET

DATE: TUESDAY, JULY 29  
CASH BAR: 18:30—19:00  
IN THE BALLROOM FOYER  
BANQUET: 19:00—22:00  
LOCATION: OOTORI BALLROOM  
DRESS: BUSINESS ATTIRE

This is the premier social event of the conference. The PICMET '14 Leadership in Technology Management, Outstanding Student Paper, and PICMET Fellow awards will be presented at the banquet. Included in the registration fee.\*

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

## “DINNER IN JAPAN”

DATE: MONDAY, JULY 28  
TIME: 19:00—21:30  
LOCATION: OOTORI BALLROOM  
(3RD FLOOR OF THE HOTEL)  
DRESS: INFORMAL

Enjoy a sumptuous Japanese and Western buffet in the Ootori Ballroom on the 3rd floor of the hotel. Included in the regular registration fee.\*



# SITE VISITS

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**Site visits to the following companies are offered during PICMET '14. Seating is limited, so sign up early. The registration fee is \$50 for each site visit.**

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

## NIKKO COMPANY

**MONDAY, JULY 28, 13:15-17:00**

In the more than 100 years since it was founded in 1908, Nikko has been refining its technology and skills in order to create more comfortable living for people throughout the country and around the world. Based on this experience, Nikko will continue developing new technologies to meet the further needs of the times. Nikko Company operates three business divisions: the Tabletop Division, the Housing & Environmental Equipment Division, and the Functional Ceramics Product Division.



## PFU LIMITED AND FUJITSU IT PRODUCTS LIMITED

**TUESDAY, JULY 29, 13:15-17:00**

PFU Limited, a subsidiary of Fujitsu, is a \$1 billion global enterprise that designs, develops, manufactures, sells and maintains computer hardware, peripheral products, enterprise software and systems.

PFU Limited has been engaged in the document imaging scanner business for over 20 years.

Fujitsu IT Products Limited, headquartered in Kahoku, Ishikawa, was established in 2002 as a main factory of Fujitsu computer section. Fujitsu IT Products Limited mainly manufactures high-reliability and high-performance computers and ships them all over the world. Fujitsu IT

also manufactured the “K computer” at RIKEN institute, the supercomputer system ranked as the world’s fastest computer in 2011. Fujitsu IT products are used in many aspects of our life and business, such as mission-critical systems to support the social infrastructure or business activities, research of new drug development and disaster prevention.



Fujitsu IT Products Limited has been working on the improvement of the entire process, not only the manufacturing process but also parts purchasing and logistics, since its establishment. Fujitsu IT is sincerely looking forward to the visit of those who are interested in Fujitsu IT activities.

## AWAZU PLANT OF KOMATSU LIMITED

**WEDNESDAY, JULY 30, 13:15-17:00**

Komatsu Awazu Plant, one of the manufacturing operations of Komatsu Ltd., is located in Komatsu City where Komatsu was founded. Komatsu City is a nature-rich city located in Ishikawa Prefecture and is home not only to Awazu Plant but also to Komatsu-no-Mori, which includes KOMATSU Way Global Institute, Techno Training Center and Waku-waku Komatsu Kan (children’s museum), as well as many of Komatsu’s partner companies, with Komatsu playing a significant role in the city’s development.

Awazu Plant commenced operations in 1938 as the second plant of Komatsu following Komatsu Plant (currently, Komatsu-no-Mori). Starting from the production of tractors for agricultural use, the plant also manufactured the first bulldozers in Japan.

# SITE VISITS

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Awazu Plant mainly manufactures small- to medium-sized bulldozers (crawler dozers), hydraulic excavators (crawler excavators), wheel loaders and a full line-up of motor graders. In 2014, the assembly shops will be integrated as a new shop that not only raises productivity but also places a greater emphasis on the environment and energy. Plans call for setting up two production lines for crawler products and wheeled products, respectively, in one building.



In addition to the above-mentioned production, Awazu Plant is the hub for the development and production of transmissions, which are a key component. All transmissions equipped in Komatsu products are being produced at this plant and supplied throughout the world.

This site visit includes a tour of the newly built assembly line for wheel-type machines.





# TECHNICAL PROGRAM

## PROGRAM OVERVIEW

The PICMET '14 technical program consists of 131 sessions including 5 plenaries, 3 special sessions, 3 tutorials, 3 panel discussions, and 117 paper sessions.

The plenaries are scheduled from 08:30 to 10:00 every morning, Monday, July 28, through Thursday, July 31; and on Wednesday, July 30, from 14:00-15:30, in Ootori Ballroom. They are described in the "Plenaries" section of this Bulletin.

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

## THE PAPERS

Research papers and applications-oriented papers are explicitly identified in this conference. Separate evaluation criteria were used, and different referees were selected for each category to make sure that appropriate papers were included in the conference for the "Research" and "Application" categories. We emphasized research methodology, the use of the research literature, the theory behind the paper, the sample size, and the impact on the research community for the "Research Papers." The important evaluation criteria for "Industry Applications" were the usefulness of the application, the importance of the case being discussed, the generalizability of the concepts presented, and the impact of the paper on the users of technology management. The "Research Papers" included in PICMET '14 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 68 percent are in the [R] category, and the rest are in the [A] category.

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

## THE SCHEDULE

The plenary is the only session in the 08:30-10:00 time

slot. After that, there are up to 13 break-out sessions throughout the day, Monday through Thursday.

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

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

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

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

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

We hope these will help you to take full advantage of the richness of the technical program at PICMET '14.





# DAILY SCHEDULE

MONDAY, JULY 28, 2014

	01 Ootori 1	02 Ootori 2	03 Ootori 3	04 Zuiun 1	05 Zuiun 2	06 Chidori	07 Shirasagi 1	08 Shirasagi 2	09 Hibari 1	10 Hibari 2	11 Toki	12 Houmeiden	13 C'est la Vie
<b>MA</b> 08:30-10:00	Plenary - 1												
<b>MB</b> 10:30-12:00	Innovation Management-1	Technology Management Framework-1	Intellectual Property-1	Technology Management in Biotechnology-1	Technology Marketing-1	Knowledge Management - 1	Strategic Management of Technology-1	Outsourcing-1	Enterprise Management-1	E-Business-1	Technology Management in Government-1	Productivity Management-1	
<b>MC</b> 12:00-14:00	Lunch Break												
<b>MD</b> 14:00-15:30	Innovation Management-2	PANEL Meet the Editors	Intellectual Property-2	Software Process Management-1	Project/Program Management-1	TUTORIAL The World of Business Games	Manufacturing Management-1	Competitiveness in Technology Management-1	Technological Changes-1	Disruptive Technologies-1	Technology Diffusion-1	Technology Adoption-1	
<b>ME</b> 16:00-17:30	Innovation Management-3	Knowledge Management-2	Intellectual Property-3	Technology Management in the Service Sector-1	Technology Assessment and Evaluation-2	Entrepreneurship / Intrapreneurship-1	Emerging Technologies-2	Competitiveness in Technology Management-2	PANEL Managing Technology in Knowledge-Intensive Industries	Special Session In Japanese language - 1	Technology Management in Transportation-1	Decision Making-1	Quality Management-1

# DAILY SCHEDULE

TUESDAY, JULY 29, 2014

	01 Ootori 1	02 Ootori 2	03 Ootori 3	04 Zuiun 1	05 Zuiun 2	06 Chidori	07 Shirasagi 1	08 Shirasagi 2	09 Hibari 1	10 Hibari 2	11 Toki	12 Houmeiden	13 C'est la Vie
<b>TA</b> 08:30-10:00	Plenary - 2												
<b>TB</b> 10:30-12:00	Innovation Management-4	New Product Development-1	Intellectual Property-4	Technology Management in the Service Sector-2	Technology Transfer-1	Entrepreneurship/ Intrapreneurship-2	Cultural Issues in Technology Management-1	Sustainability-1	Technology Acquisition-1	Technology Roadmapping-1	Technology Diffusion-2	Enterprise Management-2	Technology Adoption-2
<b>TC</b> 12:00-14:00	Lunch Break												
<b>TD</b> 14:00-15:30	Innovation Management-5	New Product Development-2	Intellectual Property-5	Collaborations for Technology Management-1	Technology Forecasting-1	Management of People and Organizations-1	Technology Marketing-2	The Innovation Database Platform for evidenced based science, technol- ogy and innova- tion policy by NISTEP, MEXT	Commercialization of Technology-1	Technology Management in Semiconductor Industry-1	Science and Technology Policy-1	Environmental Issues-1	Decision Making-2
<b>TE</b> 16:00-17:30	Innovation Management-6	New Product Development-3	Intellectual Property-6	Collaborations for Technology Management-2	Technology Forecasting-2	Management of People and Organizations-2	Strategic Management of Technology-2	Project/Program Management-2	Management of Communication Technologies-1	Special Session In Japanese language - 2	Technology Management Education-1	Technology Management in the Energy Sector-1	Decision Making-3

# DAILY SCHEDULE

WEDNESDAY, JULY 30, 2014

	01 Ootori 1	02 Ootori 2	03 Ootori 3	04 Zuiun 1	05 Zuiun 2	06 Chidori	07 Shirasagi 1	08 Shirasagi 2	09 Hibari 1	10 Hibari 2	11 Toki	12 Houmeiden
<b>WA</b> 08:30-10:00	Plenary - 3											
<b>WB</b> 10:30-12:00	Technology Management Education-2	New Product Development-4	Intellectual Property-7	Technology Management in the Service Sector-3	TUTORIAL Introduction to Open Source Technology Forecasting Tools	Collaborations for Technology Management-3	R&D Management-1	Manufacturing Management-2	Science and Technology Policy-2	Technology Management in the Health Sector-1	Management of Communication Technologies-2	Technology Management in the Energy Sector-2
<b>WC</b> 12:00-14:00	Lunch Break											
<b>WD</b> 14:00-15:30	Plenary - 4											
<b>WE</b> 16:00-17:30	Innovation Management-7	New Product Development-5	Intellectual Property-8	Technology Management in the Service Sector-4	Knowledge Management-3	Science and Technology Communication-1	R&D Management-2	Collaborations for Technology Management-4	Decision Making-4	Special Session in Japanese language - 3	Science and Technology Policy-3	Competitiveness in Technology Management-3

# DAILY SCHEDULE

THURSDAY, JULY 31, 2014

	01 Ootori 1	02 Ootori 2	03 Ootori 3	04 Zuiun 1	05 Zuiun 2	06 Chidori	07 Shirasagi 1	08 Shirasagi 2	09 Hibari 1	10 Hibari 2	11 Toki
<b>HA</b> 08:30-10:00	Plenary - 5										
<b>HB</b> 10:30-12:00	Innovation Management-8	New Product Development-6	Intellectual Property-9	Technology Adoption-3	Project/Program Management-3	Science and Technology Communication-2	Environmental Issues-2	Daikin Industries - Next Generation's Innovation Management	Information Management-1	Technology Management in the Health Sector-2	
<b>HC</b> 12:00-14:00	Lunch Break										
<b>HD</b> 14:00-15:30	Innovation Management-9	Strategic Management of Technology-3	Entrepreneurship / Intrapreneurship-3	Technology Management in the Service Sector-5	Project/Program Management-4	Science and Technology Communication-3	Environmental Issues-3	Collaborations for Technology Management-5	Management of Communication Technologies-3	R&D Management-3	Technology Management Education-3
<b>HE</b> 16:00-17:30	Innovation Management-10	Technology Management in the Health Sector-3	Enterprise Management-3	PICMET 2015 Planning Session	Technology Transfer-2						



# SCHEDULE OF SESSIONS

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## SCHEDULE OF SESSIONS BY DATE

### MONDAY, JULY 28, 2014

Session	Number	Day	Time	Room	Session Title
MA	00	Monday	08:30 - 10:00	Ootori	PLENARY: "Plenary - 1"
MB	01	Monday	10:30 - 12:00	Ootori 1	"Innovation Management-1"
MB	02	Monday	10:30 - 12:00	Ootori 2	"Technology Management Framework-1"
MB	03	Monday	10:30 - 12:00	Ootori 3	"Intellectual Property-1"
MB	04	Monday	10:30 - 12:00	Zuiun 1	"Technology Management in Biotechnology-1"
MB	05	Monday	10:30 - 12:00	Zuiun 2	"Technology Marketing-1"
MB	06	Monday	10:30 - 12:00	Chidori	"Knowledge Management-1"
MB	07	Monday	10:30 - 12:00	Shirasagi 1	"Strategic Management of Technology-1"
MB	08	Monday	10:30 - 12:00	Shirasagi 2	"Outsourcing-1"
MB	09	Monday	10:30 - 12:00	Hibari 1	"Enterprise Management-1"
MB	10	Monday	10:30 - 12:00	Hibari 2	"E-Business-1"
MB	11	Monday	10:30 - 12:00	Toki	"Technology Management in Government-1"
MB	12	Monday	10:30 - 12:00	Houmeiden	"Productivity Management-1"
MD	01	Monday	14:00 - 15:30	Ootori 1	"Innovation Management-2"
MD	02	Monday	14:00 - 15:30	Ootori 2	PANEL: "Meet the Editors"
MD	03	Monday	14:00 - 15:30	Ootori 3	"Intellectual Property-2"
MD	04	Monday	14:00 - 15:30	Zuiun 1	"Software Process Management-1"
MD	05	Monday	14:00 - 15:30	Zuiun 2	"Project/Program Management-1"
MD	06	Monday	14:00 - 15:30	Chidori	TUTORIAL: "The World of Business Games"
MD	07	Monday	14:00 - 15:30	Shirasagi 1	"Manufacturing Management-1"
MD	08	Monday	14:00 - 15:30	Shirasagi 2	"Competitiveness in Technology Management-1"
MD	09	Monday	14:00 - 15:30	Hibari 1	"Technological Changes-1"
MD	10	Monday	14:00 - 15:30	Hibari 2	"Disruptive Technologies-1"
MD	11	Monday	14:00 - 15:30	Toki	"Technology Diffusion-1"
MD	12	Monday	14:00 - 15:30	Houmeiden	"Technology Adoption-1"
ME	01	Monday	16:00 - 17:30	Ootori 1	"Innovation Management-3"
ME	02	Monday	16:00 - 17:30	Ootori 2	"Knowledge Management-2"
ME	03	Monday	16:00 - 17:30	Ootori 3	"Intellectual Property-3"
ME	04	Monday	16:00 - 17:30	Zuiun 1	"Technology Management in the Service Sector-1"
ME	05	Monday	16:00 - 17:30	Zuiun 2	"Technology Assessment and Evaluation-2"
ME	06	Monday	16:00 - 17:30	Chidori	"Entrepreneurship / Intrapreneurship-1"
ME	07	Monday	16:00 - 17:30	Shirasagi 1	"Emerging Technologies-2"

# SCHEDULE OF SESSIONS

ME	08	Monday	16:00 - 17:30	Shirasagi 2	“Competitiveness in Technology Management-2”
ME	09	Monday	16:00 - 17:30	Hibari 1	PANEL: “Managing Technology in Knowledge-Intensive Industries”
ME	10	Monday	16:00 - 17:30	Hibari 2	SPECIAL SESSION: “Special Session in Japanese language - 1”
ME	11	Monday	16:00 - 17:30	Toki	“Technology Management in Transportation-1”
ME	12	Monday	16:00 - 17:30	Houmeiden	“Decision Making-1”
ME	13	Monday	16:30 - 17:00	C'est la Vie	“Quality Management-1”

## TUESDAY, JULY 29, 2014

TA	00	Tuesday	08:30 - 10:00	Ootori	PLENARY: “Plenary - 2”
TB	01	Tuesday	10:30 - 12:00	Ootori 1	“Innovation Management-4”
TB	02	Tuesday	10:30 - 12:00	Ootori 2	“New Product Development-1”
TB	03	Tuesday	10:30 - 12:00	Ootori 3	“Intellectual Property-4”
TB	04	Tuesday	10:30 - 12:00	Zuiun 1	“Technology Management in the Service Sector-2”
TB	05	Tuesday	10:30 - 12:00	Zuiun 2	“Technology Transfer-1”
TB	06	Tuesday	10:30 - 12:00	Chidori	“Entrepreneurship / Intrapreneurship-2”
TB	07	Tuesday	10:30 - 12:00	Shirasagi 1	“Cultural Issues in Technology Management-1”
TB	08	Tuesday	10:30 - 12:00	Shirasagi 2	“Sustainability-1”
TB	09	Tuesday	10:30 - 12:00	Hibari 1	“Technology Acquisition-1”
TB	10	Tuesday	10:30 - 12:00	Hibari 2	“Technology Roadmapping-1”
TB	11	Tuesday	10:30 - 12:00	Toki	“Technology Diffusion-2”
TB	12	Tuesday	10:30 - 12:00	Houmeiden	“Enterprise Management-2”
TB	13	Tuesday	10:30 - 12:00	C'est la Vie	“Technology Adoption-2”
TD	01	Tuesday	14:00 - 15:30	Ootori 1	“Innovation Management-5”
TD	02	Tuesday	14:00 - 15:30	Ootori 2	“New Product Development-2”
TD	03	Tuesday	14:00 - 15:30	Ootori 3	“Intellectual Property-5”
TD	04	Tuesday	14:00 - 15:30	Zuiun 1	“Collaborations for Technology Management-1”
TD	05	Tuesday	14:00 - 15:30	Zuiun 2	“Technology Forecasting-1”
TD	06	Tuesday	14:00 - 15:30	Chidori	“Management of People and Organizations-1”
TD	07	Tuesday	14:00 - 15:30	Shirasagi 1	“Technology Marketing-2”
TD	08	Tuesday	14:00 - 15:30	Shirasagi 2	“The Innovation Database Platform for evidenced based science, technology and innovation policy by NISTEP, MEXT”
TD	09	Tuesday	14:00 - 15:30	Hibari 1	“Commercialization of Technology-1”
TD	10	Tuesday	14:00 - 15:30	Hibari 2	“Technology Management in Semiconductor Industry-1”
TD	11	Tuesday	14:00 - 15:30	Toki	“Science and Technology Policy-1”
TD	12	Tuesday	14:00 - 15:30	Houmeiden	“Environmental Issues-1”

# SCHEDULE OF SESSIONS

TD	13	Tuesday	14:00 - 15:30	C'est la Vie	"Decision Making-2"
TE	01	Tuesday	16:00 - 17:30	Ootori 1	"Innovation Management-6"
TE	02	Tuesday	16:00 - 17:30	Ootori 2	"New Product Development-3"
TE	03	Tuesday	16:00 - 17:30	Ootori 3	"Intellectual Property-6"
TE	04	Tuesday	16:00 - 17:30	Zuiun 1	"Collaborations for Technology Management-2"
TE	05	Tuesday	16:00 - 17:30	Zuiun 2	"Technology Forecasting-2"
TE	06	Tuesday	16:00 - 17:30	Chidori	"Management of People and Organizations-2"
TE	07	Tuesday	16:00 - 17:30	Shirasagi 1	"Strategic Management of Technology-2"
TE	08	Tuesday	16:00 - 17:30	Shirasagi 2	"Project/Program Management-2"
TE	09	Tuesday	16:00 - 17:30	Hibari 1	"Management of Communication Technologies-1"
TE	10	Tuesday	16:00 - 17:30	Hibari 2	SPECIAL SESSION: "Special Session in Japanese language - 2"
TE	11	Tuesday	16:00 - 17:30	Toki	"Technology Management Education-1"
TE	12	Tuesday	16:00 - 17:30	Houmeiden	"Technology Management in the Energy Sector-1"
TE	13	Tuesday	16:00 - 17:30	C'est la Vie	"Decision Making-3"

## WEDNESDAY, JULY 30, 2014

WA	00	Wednesday	08:30 - 10:00	Ootori	PLENARY: "Plenary - 3"
WB	01	Wednesday	10:30 - 12:00	Ootori 1	"Technology Management Education-2"
WB	02	Wednesday	10:30 - 12:00	Ootori 2	"New Product Development-4"
WB	03	Wednesday	10:30 - 12:00	Ootori 3	"Intellectual Property-7"
WB	04	Wednesday	10:30 - 12:00	Zuiun 1	"Technology Management in the Service Sector-3"
WB	05	Wednesday	10:30 - 12:00	Zuiun 2	TUTORIAL: "Introduction to Open Source Technology Forecasting Tools"
WB	06	Wednesday	10:30 - 12:00	Chidori	"Collaborations for Technology Management-3"
WB	07	Wednesday	10:30 - 12:00	Shirasagi 1	"R&D Management-1"
WB	08	Wednesday	10:30 - 12:00	Shirasagi 2	"Manufacturing Management-2"
WB	09	Wednesday	10:30 - 12:00	Hibari 1	"Science and Technology Policy-2"
WB	10	Wednesday	10:30 - 12:00	Hibari 2	"Technology Management in the Health Sector-1"
WB	11	Wednesday	10:30 - 12:00	Toki	"Management of Communication Technologies-2"
WB	12	Wednesday	10:30 - 12:00	Houmeiden	"Technology Management in the Energy Sector-2"
WD	00	Wednesday	14:00 - 15:30	Ootori	PLENARY: "Plenary - 4"
WE	01	Wednesday	16:00 - 17:30	Ootori 1	"Innovation Management-7"
WE	02	Wednesday	16:00 - 17:30	Ootori 2	"New Product Development-5"
WE	03	Wednesday	16:00 - 17:30	Ootori 3	"Intellectual Property-8"
WE	04	Wednesday	16:00 - 17:30	Zuiun 1	"Technology Management in the Service Sector-4"
WE	05	Wednesday	16:00 - 17:30	Zuiun 2	"Knowledge Management-3"
WE	06	Wednesday	16:00 - 17:30	Chidori	"Science and Technology Communication-1"
WE	07	Wednesday	16:00 - 17:30	Shirasagi 1	"R&D Management-2"

# SCHEDULE OF SESSIONS

WE	08	Wednesday	16:00 - 17:30	Shirasagi 2	“Collaborations for Technology Management-4”
WE	09	Wednesday	16:00 - 17:30	Hibari 1	“Decision Making-4”
WE	10	Wednesday	16:00 - 17:30	Hibari 2	SPECIAL SESSION: “Special Session in Japanese language - 3”
WE	11	Wednesday	16:00 - 17:30	Toki	“Science and Technology Policy-3”
WE	12	Wednesday	16:00 - 17:30	Houmeiden	“Competitiveness in Technology Management-3”

## THURSDAY, JULY 31, 2014

HA	00	Thursday	08:30 - 10:00	Ootori	PLENARY: “Plenary - 5”
HB	01	Thursday	10:30 - 12:00	Ootori 1	“Innovation Management-8”
HB	02	Thursday	10:30 - 12:00	Ootori 2	“New Product Development-6”
HB	03	Thursday	10:30 - 12:00	Ootori 3	“Intellectual Property-9”
HB	04	Thursday	10:30 - 12:00	Zuiun 1	“Technology Adoption-3”
HB	05	Thursday	10:30 - 12:00	Zuiun 2	“Project/Program Management-3”
HB	06	Thursday	10:30 - 12:00	Chidori	“Science and Technology Communication-2”
HB	07	Thursday	10:30 - 12:00	Shirasagi 1	“Environmental Issues-2”
HB	08	Thursday	10:30 - 12:00	Shirasagi 2	TUTORIAL: “Daikin Industries - Next Generation’s Innovation Management”
HB	09	Thursday	10:30 - 12:00	Hibari 1	“Information Management-1”
HB	10	Thursday	10:30 - 12:00	Hibari 2	“Technology Management in the Health Sector-2”
HD	01	Thursday	14:00 - 15:30	Ootori 1	“Innovation Management-9”
HD	02	Thursday	14:00 - 15:30	Ootori 2	“Strategic Management of Technology-3”
HD	03	Thursday	14:00 - 15:30	Ootori 3	“Entrepreneurship / Intrapreneurship-3”
HD	04	Thursday	14:00 - 15:30	Zuiun 1	“Technology Management in the Service Sector-5”
HD	05	Thursday	14:00 - 15:30	Zuiun 2	“Project/Program Management-4”
HD	06	Thursday	14:00 - 15:30	Chidori	“Science and Technology Communication-3”
HD	07	Thursday	14:00 - 15:30	Shirasagi 1	“ Environmental Issues-3”
HD	08	Thursday	14:00 - 15:30	Shirasagi 2	“Collaborations for Technology Management-5”
HD	09	Thursday	14:00 - 15:30	Hibari 1	“Management of Communication Technologies-3”
HD	10	Thursday	14:00 - 15:30	Hibari 2	“R&D Management-3”
HD	11	Thursday	14:00 - 15:30	Toki	“Technology Management Education-3”
HE	01	Thursday	16:00 - 17:30	Ootori 1	“Innovation Management-10”
HE	02	Thursday	16:00 - 17:30	Ootori 2	“Technology Management in the Health Sector-3”
HE	03	Thursday	16:00 - 17:30	Ootori 3	“Enterprise Management-3”
HE	04	Thursday	16:00 - 17:30	Zuiun 1	PANEL: “PICMET 2015 Planning Session”
HE	05	Thursday	16:00 - 17:30	Zuiun 2	“Technology Transfer-2”



# SCHEDULE OF SESSIONS

## SCHEDULE OF SESSIONS BY ROOM

Session	Number	Day	Time	Room	Session Title
MA	00	Monday	08:30 - 10:00	Ootori	PLENARY: “Plenary - 1”
TA	00	Tuesday	08:30 - 10:00	Ootori	PLENARY: “Plenary - 2”
WA	00	Wednesday	08:30 - 10:00	Ootori	PLENARY: “Plenary - 3”
WD	00	Wednesday	14:00 - 15:30	Ootori	PLENARY: “Plenary - 4”
HA	00	Thursday	08:30 - 10:00	Ootori	PLENARY: “Plenary - 5”
MB	01	Monday	10:30 - 12:00	Ootori 1	“Innovation Management-1”
MD	01	Monday	14:00 - 15:30	Ootori 1	“Innovation Management-2”
ME	01	Monday	16:00 - 17:30	Ootori 1	“Innovation Management-3”
TB	01	Tuesday	10:30 - 12:00	Ootori 1	“Innovation Management-4”
TD	01	Tuesday	14:00 - 15:30	Ootori 1	“Innovation Management-5”
TE	01	Tuesday	16:00 - 17:30	Ootori 1	“Innovation Management-6”
WB	01	Wednesday	10:30 - 12:00	Ootori 1	“Technology Management Education-2”
WE	01	Wednesday	16:00 - 17:30	Ootori 1	“Innovation Management-7”
HB	01	Thursday	10:30 - 12:00	Ootori 1	“Innovation Management-8”
HD	01	Thursday	14:00 - 15:30	Ootori 1	“Innovation Management-9”
HE	01	Thursday	16:00 - 17:30	Ootori 1	“Innovation Management-10”
MB	02	Monday	10:30 - 12:00	Ootori 2	“Technology Management Framework-1”
MD	02	Monday	14:00 - 15:30	Ootori 2	PANEL: “Meet the Editors”
ME	02	Monday	16:00 - 17:30	Ootori 2	“Knowledge Management-2”
TB	02	Tuesday	10:30 - 12:00	Ootori 2	“New Product Development-1”
TD	02	Tuesday	14:00 - 15:30	Ootori 2	“New Product Development-2”
TE	02	Tuesday	16:00 - 17:30	Ootori 2	“New Product Development-3”
WB	02	Wednesday	10:30 - 12:00	Ootori 2	“New Product Development-4”
WE	02	Wednesday	16:00 - 17:30	Ootori 2	“New Product Development-5”
HB	02	Thursday	10:30 - 12:00	Ootori 2	“New Product Development-6”
HD	02	Thursday	14:00 - 15:30	Ootori 2	“Strategic Management of Technology-3”
HE	02	Thursday	16:00 - 17:30	Ootori 2	“Technology Management in the Health Sector-3”
MB	03	Monday	10:30 - 12:00	Ootori 3	“Intellectual Property-1”
MD	03	Monday	14:00 - 15:30	Ootori 3	“Intellectual Property-2”
ME	03	Monday	16:00 - 17:30	Ootori 3	“Intellectual Property-3”
TB	03	Tuesday	10:30 - 12:00	Ootori 3	“Intellectual Property-4”
TD	03	Tuesday	14:00 - 15:30	Ootori 3	“Intellectual Property-5”
TE	03	Tuesday	16:00 - 17:30	Ootori 3	“Intellectual Property-6”
WB	03	Wednesday	10:30 - 12:00	Ootori 3	“Intellectual Property-7”
WE	03	Wednesday	16:00 - 17:30	Ootori 3	“Intellectual Property-8”

# SCHEDULE OF SESSIONS

HB	03	Thursday	10:30 - 12:00	Ootori 3	“Intellectual Property-9”
HD	03	Thursday	14:00 - 15:30	Ootori 3	“Entrepreneurship / Intrapreneurship-3”
HE	03	Thursday	16:00 - 17:30	Ootori 3	“Enterprise Management-3”
MB	04	Monday	10:30 - 12:00	Zuiun 1	“Technology Management in Biotechnology-1”
MD	04	Monday	14:00 - 15:30	Zuiun 1	“Software Process Management-1”
ME	04	Monday	16:00 - 17:30	Zuiun 1	“Technology Management in the Service Sector-1”
TB	04	Tuesday	10:30 - 12:00	Zuiun 1	“Technology Management in the Service Sector-2”
TD	04	Tuesday	14:00 - 15:30	Zuiun 1	“Collaborations for Technology Management-1”
TE	04	Tuesday	16:00 - 17:30	Zuiun 1	“Collaborations for Technology Management-2”
WB	04	Wednesday	10:30 - 12:00	Zuiun 1	“Technology Management in the Service Sector-3”
WE	04	Wednesday	16:00 - 17:30	Zuiun 1	“Technology Management in the Service Sector-4”
HB	04	Thursday	10:30 - 12:00	Zuiun 1	“Technology Adoption-3”
HD	04	Thursday	14:00 - 15:30	Zuiun 1	“Technology Management in the Service Sector-5”
HE	04	Thursday	16:00 - 17:30	Zuiun 1	PANEL: “PICMET 2015 Planning Session”
MB	05	Monday	10:30 - 12:00	Zuiun 2	“Technology Marketing-1”
MD	05	Monday	14:00 - 15:30	Zuiun 2	“Project/Program Management-1”
ME	05	Monday	16:00 - 17:30	Zuiun 2	“Technology Assessment and Evaluation-2”
TB	05	Tuesday	10:30 - 12:00	Zuiun 2	“Technology Transfer-1”
TD	05	Tuesday	14:00 - 15:30	Zuiun 2	“Technology Forecasting-1”
TE	05	Tuesday	16:00 - 17:30	Zuiun 2	“Technology Forecasting-2”
WB	05	Wednesday	10:30 - 12:00	Zuiun 2	TUTORIAL: “Introduction to Open Source Technology Forecasting Tools”
WE	05	Wednesday	16:00 - 17:30	Zuiun 2	“Knowledge Management-3”
HB	05	Thursday	10:30 - 12:00	Zuiun 2	“Project/Program Management-3”
HD	05	Thursday	14:00 - 15:30	Zuiun 2	“Project/Program Management-4”
HE	05	Thursday	16:00 - 17:30	Zuiun 2	“Technology Transfer-2”
MB	06	Monday	10:30 - 12:00	Chidori	“Knowledge Management-1”
MD	06	Monday	14:00 - 15:30	Chidori	TUTORIAL: “The World of Business Games”
ME	06	Monday	16:00 - 17:30	Chidori	“Entrepreneurship / Intrapreneurship-1”
TB	06	Tuesday	10:30 - 12:00	Chidori	“Entrepreneurship / Intrapreneurship-2”
TD	06	Tuesday	14:00 - 15:30	Chidori	“Management of People and Organizations-1”
TE	06	Tuesday	16:00 - 17:30	Chidori	“Management of People and Organizations-2”
WB	06	Wednesday	10:30 - 12:00	Chidori	“Collaborations for Technology Management-3”
WE	06	Wednesday	16:00 - 17:30	Chidori	“Science and Technology Communication-1”
HB	06	Thursday	10:30 - 12:00	Chidori	“Science and Technology Communication-2”
HD	06	Thursday	14:00 - 15:30	Chidori	“Science and Technology Communication-3”
MB	07	Monday	10:30 - 12:00	Shirasagi 1	“Strategic Management of Technology-1”
MD	07	Monday	14:00 - 15:30	Shirasagi 1	“Manufacturing Management-1”

# SCHEDULE OF SESSIONS

ME	07	Monday	16:00 - 17:30	Shirasagi 1	“Emerging Technologies-2”
TB	07	Tuesday	10:30 - 12:00	Shirasagi 1	“Cultural Issues in Technology Management-1”
TD	07	Tuesday	14:00 - 15:30	Shirasagi 1	“Technology Marketing-2”
TE	07	Tuesday	16:00 - 17:30	Shirasagi 1	“Strategic Management of Technology-2”
WB	07	Wednesday	10:30 - 12:00	Shirasagi 1	“R&D Management-1”
WE	07	Wednesday	16:00 - 17:30	Shirasagi 1	“R&D Management-2”
HB	07	Thursday	10:30 - 12:00	Shirasagi 1	“Environmental Issues-2”
HD	07	Thursday	14:00 - 15:30	Shirasagi 1	“Environmental Issues-3”
MB	08	Monday	10:30 - 12:00	Shirasagi 2	“Outsourcing-1”
MD	08	Monday	14:00 - 15:30	Shirasagi 2	“Competitiveness in Technology Management-1”
ME	08	Monday	16:00 - 17:30	Shirasagi 2	“Competitiveness in Technology Management-2”
TB	08	Tuesday	10:30 - 12:00	Shirasagi 2	“Sustainability-1”
TD	08	Tuesday	14:00 - 15:30	Shirasagi 2	“The Innovation Database Platform for evidenced based science, technology and innovation policy by NISTEP, MEXT”
TE	08	Tuesday	16:00 - 17:30	Shirasagi 2	“Project/Program Management-2”
WB	08	Wednesday	10:30 - 12:00	Shirasagi 2	“Manufacturing Management-2”
WE	08	Wednesday	16:00 - 17:30	Shirasagi 2	“Collaborations for Technology Management-4”
HB	08	Thursday	10:30 - 12:00	Shirasagi 2	TUTORIAL: “Daikin Industries - Next Generation’s Innovation Management”
HD	08	Thursday	14:00 - 15:30	Shirasagi 2	“Collaborations for Technology Management-5”
MB	09	Monday	10:30 - 12:00	Hibari 1	“Enterprise Management-1”
MD	09	Monday	14:00 - 15:30	Hibari 1	“Technological Changes-1”
ME	09	Monday	16:00 - 17:30	Hibari 1	PANEL: “Managing Technology in Knowledge-Intensive Industries”
TB	09	Tuesday	10:30 - 12:00	Hibari 1	“Technology Acquisition-1”
TD	09	Tuesday	14:00 - 15:30	Hibari 1	“Commercialization of Technology-1”
TE	09	Tuesday	16:00 - 17:30	Hibari 1	“Management of Communication Technologies-1”
WB	09	Wednesday	10:30 - 12:00	Hibari 1	“Science and Technology Policy-2”
WE	09	Wednesday	16:00 - 17:30	Hibari 1	“Decision Making-4”
HB	09	Thursday	10:30 - 12:00	Hibari 1	“Information Management-1”
HD	09	Thursday	14:00 - 15:30	Hibari 1	“Management of Communication Technologies-3”
MB	10	Monday	10:30 - 12:00	Hibari 2	“E-Business-1”
MD	10	Monday	14:00 - 15:30	Hibari 2	“Disruptive Technologies-1”
ME	10	Monday	16:00 - 17:30	Hibari 2	SPECIAL SESSION: “Special Session in Japanese language - 1”
TB	10	Tuesday	10:30 - 12:00	Hibari 2	“Technology Roadmapping-1”
TD	10	Tuesday	14:00 - 15:30	Hibari 2	“Technology Management in Semiconductor Industry-1”

# SCHEDULE OF SESSIONS

TE	10	Tuesday	16:00 - 17:30	Hibari 2	SPECIAL SESSION: “Special Session in Japanese language - 2”
WB	10	Wednesday	10:30 - 12:00	Hibari 2	“Technology Management in the Health Sector-1”
WE	10	Wednesday	16:00 - 17:30	Hibari 2	SPECIAL SESSION: “Special Session in Japanese language - 3”
HB	10	Thursday	10:30 - 12:00	Hibari 2	“Technology Management in the Health Sector-2”
HD	10	Thursday	14:00 - 15:30	Hibari 2	“R&D Management-3”
MB	11	Monday	10:30 - 12:00	Toki	“Technology Management in Government-1”
MD	11	Monday	14:00 - 15:30	Toki	“Technology Diffusion-1”
ME	11	Monday	16:00 - 17:30	Toki	“Technology Management in Transportation-1”
TB	11	Tuesday	10:30 - 12:00	Toki	“Technology Diffusion-2”
TD	11	Tuesday	14:00 - 15:30	Toki	“Science and Technology Policy-1”
TE	11	Tuesday	16:00 - 17:30	Toki	“Technology Management Education-1”
WB	11	Wednesday	10:30 - 12:00	Toki	“Management of Communication Technologies-2”
WE	11	Wednesday	16:00 - 17:30	Toki	“Science and Technology Policy-3”
HD	11	Thursday	14:00 - 15:30	Toki	“Technology Management Education-3”
MB	12	Monday	10:30 - 12:00	Houmeiden	“Productivity Management-1”
MD	12	Monday	14:00 - 15:30	Houmeiden	“Technology Adoption-1”
ME	12	Monday	16:00 - 17:30	Houmeiden	“Decision Making-1”
TB	12	Tuesday	10:30 - 12:00	Houmeiden	“Enterprise Management-2”
TD	12	Tuesday	14:00 - 15:30	Houmeiden	“Environmental Issues-1”
TE	12	Tuesday	16:00 - 17:30	Houmeiden	“Technology Management in the Energy Sector-1”
WB	12	Wednesday	10:30 - 12:00	Houmeiden	“Technology Management in the Energy Sector-2”
WE	12	Wednesday	16:00 - 17:30	Houmeiden	“Competitiveness in Technology Management-3”
ME	13	Monday	16:30 - 17:00	C'est la Vie	“Quality Management-1”
TB	13	Tuesday	10:30 - 12:00	C'est la Vie	“Technology Adoption-2”
TD	13	Tuesday	14:00 - 15:30	C'est la Vie	“Decision Making-2”
TE	13	Tuesday	16:00 - 17:30	C'est la Vie	“Decision Making-3”





# PERSONAL SCHEDULE

	<b>Sunday July 27, 2014</b>	<b>Monday July 28, 2014</b>	<b>Tuesday July 29, 2014</b>	<b>Wednesday July 30, 2014</b>	<b>Thursday July 31, 2014</b>
<b>08:00 – 08:30 Bright Start (Breakfast)</b>					
<b>08:30 – 10:00 (A)</b>		Plenary - 1 (Ootori)	Plenary - 2 (Ootori)	Plenary - 3 (Ootori)	Plenary - 5 (Ootori)
<b>10:00 – 10:30 Coffee Break</b>					
<b>10:30 – 12:00 (B)</b>					
<b>12:00 – 14:00 Lunch Break</b>					
<b>14:00 – 15:30 (D)</b>				Plenary - 4 (Ootori)	
<b>15:30 – 16:00 Coffee Break</b>					
<b>16:00 – 17:30 (E)</b>					PICMET '15 & '16 Planning Session (Zuiun-1)
<b>19:00 – 22:00</b>	Welcome Reception (Ootori)	Dinner in Japan (Ootori)	Awards Banquet (Ootori)		

# SPECIAL SESSIONS IN THE JAPANESE LANGUAGE

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Ishikawa MOT School has been operated for 10 years by Ishikawa IT Human Resource Development Center in collaboration with JAIST (Japan Advanced Institute of Science and Technology), with various supports from Ishikawa Prefecture and around 30 regional companies. Approximately 200 people completed the course. People who participated in the course have established the “MOT reform-practice community,” which pursues a knowledge science approach to achieve human, organizational and entrepreneurial creation. From Monday through Wednesday, at the same session time each day, successful cases of such practices will be reported by the leading 12 companies/organizations, and application of “Quad Vision Thinking Methodology,” which was developed by being inspired by the SECI model of Professor Nonaka, an author of *The Knowledge Creating Company*, will be described in each presentation.

## SPECIAL SESSION - 1

DATE: MONDAY, JULY 28  
TIME: 16:00-17:30  
ROOM: HIBARI-2

**Session Chairs:** Dr. Shuuji Kondou, Quad-Vision  
Research Institute and Japan Advanced  
Institute of Science and Technology  
(JAIST), Japan

Dr. Yasuo Ikawa, Japan Advanced  
Institute of Science and Technology  
(JAIST), Japan

### “MOT Reform-Practice Community: Cases of Manufacturing Industries”

In this session, PFU will present “From mind-innovation to process-innovation - A case of ScanSnap SV600 development”; EIZO will present “Toward Business Transformation for Professional Workers’ Well-Being: A Case of Technology Based Servitization in Japanese Monitor Maker”; Komatsu Electronics will present “Ultra-pure water system development as a brand strategy”; and NIKKO will present “Establishing a brand as a pottery manufacturer based on more than 100-year history.”

## SPECIAL SESSION - 2

DATE: TUESDAY, JULY 29  
TIME: 16:00-17:30  
ROOM: HIBARI-2

**Session Chairs:** Dr. Shuuji Kondou, Quad-Vision  
Research Institute and Japan Advanced  
Institute of Science and Technology  
(JAIST), Japan

Dr. Yasuo Ikawa, Japan Advanced  
Institute of Science and Technology  
(JAIST), Japan

### “MOT Reform-Practice Community: Cases of In-house MOT Academy Activities”

In this session, Matsumoto Machine will present “All members play leading roles to have higher motivation resulting in better company performance”; BETSUKAWA will present “Cases of Betsukawa human resource development - Is MOT implemented in Betsukawa?”; Tohshin Group will present “Enthusiasm, fun and accomplishment through tutoring school activities”; and RB Controls will present “Reform-practice by way of three layer organizational structure - a golden matrix of 3 by 3.”

## SPECIAL SESSION - 3

DATE: WEDNESDAY, JULY 30  
TIME: 16:00-17:30  
ROOM: HIBARI-2

**Session Chairs:** Dr. Shuuji Kondou, Quad-Vision  
Research Institute and Japan Advanced  
Institute of Science and Technology  
(JAIST), Japan

Dr. Yasuo Ikawa, Japan Advanced  
Institute of Science and Technology  
(JAIST), Japan

### “MOT Reform-Practice Community: Cases of Traditional Craft Industries, Inter-company Academy Activities and Medical MOT Model”

In this session, Asahi Electric will present “Japanese Traditional Craft’s MOT Season 7 - Beyond Cool Japan Policy”; NOMI Apparatus Cooperative will present “Tutoring school activities at NOMI Apparatus Cooperative - Application of Quad Vision Thinking Methodology”; Public Central Hospital of Matto Ishikawa will present “Branding of medical enterprise - Achieving a regional alliance”; and Houju Memorial Hospital will present “Nobi Nobi Nomi; Creation of Health Care Community - MOT Innovation Saves Health Care in Our Community.” “Nobi Nobi Nomi” means Nomi city will be growing up.”

# PLENARIES

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## PLENARY SESSION—1

DATE: MONDAY, JULY 28, 2014  
TIME: 08:30-10:00  
ROOM: OOTORI

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

## KEYNOTE-1

**Mr. Masaki Ogata, Vice-Chairman, East Japan Railway Company, Japan**

### **“Management and Technical Innovation of Railway as Social Infrastructure Can Make Higher Quality of Life”**

The level of infrastructure is considered to be the index most correlated with a nation's competitiveness. In this context, transportation as infrastructure plays an important and indispensable role in society. In particular, the railway in the center of public transportation reduces significantly traffic jams by its characteristics of large capacities and high efficiency. It also has various characteristics such as environmental superiority and short trip time, greatly contributing to economic growth and regional development.



JR East holding infrastructure of the railway system operates and maintains various categories of rail transport including Shinkansen, metropolitan, suburban, and regional trains together with manufacturing of rolling stock. We also manage life-style businesses such as station space utilization, shopping centers, hotels, and so on, and at the same time operate a micropayment business. Thus, we sustainably diversify in the multiple businesses described above, which has been and will be mostly accomplished by management and technical innovation. We believe that this sustainable innovation of transportation can raise people's quality of life.

JR East is the overall customer service industry with the integrated technology. Today, we strongly promote the management & technical innovation and globalization. Towards the future, it is extremely important to adapt to the rapidly changing management environment such as shrinking market caused by low birth-rate and an aging society, strongly interrelated global economy, development of ICT, advancement of globalization, envi-

ronmental issues like the greenhouse effect, and frequent occurrences of natural disasters. This adaptation will enhance our company to grow and raise the satisfaction of our customers as well as contribute to society. Through these activities, we strive to also contribute to Japan's competitive edge in the world.

*Mr. Masaki Ogata joined Japanese National Railways (JNR) in 1974 and then JR East when JNR was divided and privatized in 1987.*

*He established the basic policy of customer service based on customer satisfaction, which has been one of the most significant issues since the start of JR East. He became the Director of the Transport Safety Dept. in 1997 and was engaged in drafting the “safety middle term plan,” and now he is considered as a leader in the field of safety within the company. He was appointed as Executive Vice President and Head of Railway Operations Headquarters in 2008. He was in charge of the daily operation of the railway, which 1.7 million passengers use daily, and led the preparations for the opening of the Tohoku Shinkansen between Hachinohe and Shin-Aomori on 4 December 2010 and the increase in its operating speed to 300 km/h since 5 March 2011.*

*Mr. Ogata has been responsible for overseas related affairs since June 2010, first as Executive Vice President, and as Vice-Chairman since June 2011. Also, he was in charge of IT and service quality from June 2010 to June 2012, and he has been in charge of technology in general since 2012.*

## KEYNOTE-2



**Mr. Tetsuji Ohashi, President & CEO,  
Komatsu Ltd., Japan**

### **“Promoting GEMBA (workplace) Innovation”**

Mr. Ohashi will start the presentation by introducing the KOMATSU Way, which has been passed on as the “DNA” of Komatsu's ways of manufacturing. He will then move on to DANTOTSU (unique and unrivaled) products, DANTOTSU service, and finally, DANTOTSU solutions, all of which are based on the KOMATSU Way. He will spotlight Komatsu Machine Tracking System (KOMTRAX) and Autonomous Haulage System (AHS) as the successful cases of DANTOTSU solutions. KOMTRAX enables the customers to remotely monitor, manage and analyze their machines' operating conditions, thereby helping them reduce ma-

# PLENARIES

chine lifecycle costs, such as maintenance, fuel and operator expenses. AHS, which Komatsu led the world in commercializing, frees truck drivers from a strenuous work environment at mines, therefore achieving an ultimate form of safety as well as reducing the running costs of trucks due to stable driving conditions of driverless trucks. He will introduce actual cases of service and solutions designed to create new customer values. He will finish the presentation by describing Komatsu's roadmap of product development for solutions and its efforts to make innovation as Komatsu looks into the advancement of technologies and changes of market needs.

*Mr. Ohashi joined Komatsu in 1977. After stints at Awazu Plant and Komatsu UK Ltd., he became Plant Manager of Mooka Plant in 2001. In 2004, he became President and COO of Komatsu America. He was appointed Senior Executive Officer of Komatsu Ltd. in 2008, Director of the company in June 2009, and has served as its President and CEO since April 2013.*

*Mr. Ohashi is a member of Keidanren and Keizai Doyukai. He also serves on several industrial associations including Japan Construction Equipment Manufacturers Association. He is a member of the Japan Institute of Invention and Innovation and Union of Japanese Scientists and Engineers.*

*Mr. Ohashi received a B.A. in Engineering (1977) from the University of Tokyo, Japan, and an M.S. in Operations Research (1984) and Industrial Engineering (1984) from Stanford University, USA.*

## PLENARY SESSION—2

**DATE:** TUESDAY, JULY 29, 2014

**TIME:** 08:30-10:00

**ROOM:** OOTORI

**Session Chair:** Dr. Dilek Cetindamar, Sabanci University, Turkey

## KEYNOTE-1

**Mr. Shinjiro Iwata, Representative Executive Officer, Executive Vice President and Executive Officer, Hitachi, Ltd., Japan**

### “The Hitachi Group’s Social Innovation”

Based on the belief that innovation will bring about a world where economic growth can be compatible with efforts to

solve the environmental, energy, and population problems faced by society, the Hitachi Group is putting all of its energy towards the Social Innovation Business.

The Hitachi Group utilizes various service innovations based on “human,” “IT” and “social infrastructures” to help give people comfortable lifestyles and to make a sustainable, prosperous society a reality.

In this speech, Mr. Iwata will introduce the Hitachi Group’s efforts to contribute globally to business and social innovations to realize this prosperous society.



*Mr. Shinjiro Iwata is the Representative Executive Officer, Executive Vice President and Executive Officer of Hitachi, Ltd.; and President and CEO of the Information & Telecommunication Systems Group.*

*Mr. Iwata began his career with Hitachi, Ltd., in 1972 in the Overseas Business Department. After holding positions of increasing responsibility, Mr. Iwata became Manager of the Business Planning Department for the Information Systems Group in 1996.*

*In 1997, Mr. Iwata joined Hitachi Data Systems (HDS), where he served as Executive Vice President. In 2000, Mr. Iwata returned to Hitachi, Ltd., and served as Deputy General Manager of the International Business Promotion Division. He was promoted to General Manager of the Global Business Development Division in 2001. Later that year, he returned to HDS as CEO. After leading HDS for almost five years, he returned to Hitachi, Ltd., to serve as Chief Marketing Officer (CMO) of the company's Information & Telecommunication Systems Group.*

*In 2006, Mr. Iwata joined Hitachi Global Storage Technologies (HGST) in San Jose, California, where he served as CMO. He was also a member of HGST's Board of Directors.*

*In 2009, Mr. Iwata returned to Hitachi, Ltd., as Vice President and Executive Officer, CEO of Service & Global Business, Information & Telecommunication Systems, Hitachi, Ltd. As CEO of Information & Telecommunication Systems, Mr. Iwata is credited with turning the company around and initiating a period of rapid growth and profitability.*

## KEYNOTE-2

**Dr. Oliver Yu, President and CEO, The STARS Group;**



# PLENARIES

**Executive in Residence, College of Business, San Jose State University, USA**

**“Total-System Innovation Management: An Overview with Applications to Creative Idea Generation”**



This presentation will introduce the concept of Total-System Innovation Management, which emphasizes both a total-system perspective of the innovation management process and a disciplined systematic approach to the development of the individual key elements of the process. The key elements of the innovation process include creative idea generation,

seeking and providing initial support, team formation and organization development, product or service development and marketing, external competition and cooperation, and ethical considerations. The presentation will also discuss the applications of the total-system approach to the key element of creative idea generation for the systematic development of a set of effective techniques for the ideation process.

*Dr. Oliver Yu, President and CEO of the STARS Group, a premier technology management strategy consulting firm spun off from SRI International (formerly Stanford Research Institute) in the year 2000, is an internationally recognized expert on technology and resource management strategy planning and analysis. He is also a Consulting Associate Professor of Management Science & Engineering at Stanford University and an Adjunct Full Professor on Technology Portfolio Planning for the MBA-MS Engineering Dual Degree Program, and since 2009 an Executive in Residence, at the College of Business of San Jose State University (SJSU) in California. Dr. Yu is an honorary professor at National Dong-Hwa University in Taiwan, and he taught special courses on innovation management for MBA programs at Zhejiang University and Dalian University of Technology in China and EMBA programs at National Chung-Hsin University and National Chi-Nan University in Taiwan. Between November 28, 2013, and February 28, 2014, he was invited to be a Visiting Professor on Asian Business Innovation Strategy at Kyushu University in Japan. He was invited twice to be a keynote speaker at the Asia-Pacific Technology Foresight Conference, once with Joe Martino and Alan Porter. Prior to founding the STARS Group, Dr. Yu was Director of Energy and Technology Strategies at SRI from 1989 to 2000, responsible for over 100 major projects on technology and resource management strategies throughout the world. Before that, Dr. Yu was for 15 years the Manager of Planning Analysis at the Electric Power Research In-*

*stitute (EPRI), responsible for energy industry analysis and EPRI-wide research planning. Dr. Yu holds a BSEE from Taiwan University, an MSEE from Georgia Institute of Technology, and an MS in Statistics and a PhD in Operations Research from Stanford. He was a Fulbright Fellow, and an officer as well as the 1984 General Chair of the national meeting, and the 1995 General Chair of the first international meeting of the Institute for Operations Research and Management Science (INFORMS). He has published over 80 technical papers and authored and co-authored five books on technology and resource strategy planning, including Technology Portfolio Planning and Management published by Springer in 2006, and Technology Management and Forecasting by Tsinghua University Press in China. He was the co-organizer of the Global Innovation Forum: Silicon Valley, jointly sponsored by SRI, IBM, and SJSU and held at SRI in 2010, and is the Executive Director of the Global Access Innovation Network (GAIN), for promoting global cooperation in innovation management. He also serves as Board Member and Director of Smart Grid Task Force of the US-China Green Energy Council, Managing Editor of the IEEE annual series on Advances in Innovation and Technology Management, Chapter Vice Chair of the IEEE Technology Management Council, and Ambassador of the International Society of Service Innovation Professionals (ISSIP).*

## PLENARY SESSION—3

**DATE:** WEDNESDAY, JULY 30, 2014  
**TIME:** 08:30—10:00  
**ROOM:** OOTORI

**Session Chair:** Dr. Yasuo Ikawa, Vice President, Japan Advanced Institute of Science and Technology (JAIST), Japan

## KEYNOTE-1

**Dr. Yuko Yasunaga, Deputy Director-general for Industrial Science and Technology, and Standards and Conformity Assessment, Ministry of Economy Trade and Industry, Japan**

**“Restructuring Japan’s Governmental R&D Policy toward a More Innovation-oriented Economy”**

The Ministry of Economy, Trade and Industry (METI) is now restructuring its R&D policy under the current situation surrounding Japan’s economy and industry. Japan has been facing serious deteriorations in the environment for enabling innovation, namely, a decrease in the input

# PLENARIES

of financial/human capital to R&D, the downward trend of the qualitative factor of academic research papers, continuing stagnations in the industrial competitiveness of many industrial sectors behind newly emerging



economies, and frustration that we have almost never seen “innovative” made-in-Japan products/services for more than a decade. METI just began restructuring its R&D policy in the following directions: i) to remodel its national laboratories—AIST (Research Institute of Advanced Industrial Science and Technology)—for more “bridging-oriented” organiza-

tions between basic research and commercial business, by applying a more German style such as Fraunhofer Research Institute, and ii) to remodel its funding and formulating procedures of NEDO (New Energy and Industrial Technologies Development Organizations) for further innovation-oriented manners, by involving more small/medium/start-up businesses and applying a more DARPA-like project management style.

METI also calls for schematic changes with MEXT (Ministry of Education and Science and Technology) to enable “cross-appointing” for researchers between national universities and national laboratories in a more comprehensive manner.

*Dr. Yuko Yasunaga joined The Ministry of International Trade and Industry (MITI) in 1986 after completing the master's degree program in Mineral Resource Development Engineering at the Graduate School of the University of Tokyo. From 1987-89, he was working for promotion of industrial application of space through satellite development projects for remote sensing and material experiments under micro-gravity. From 1989-91, he was working for the promotion of mineral resources development, and he was enrolled in the MS program in Mineral Economics at the Colorado School of Mines in 1991-93. After completing the MS program, he was promoted to the Deputy Director, International Affairs Division, Agency of Natural Resources and Energy in 1993. From 1995-1997 he worked for the Industrial Electronics Division, mainly for US-Japan Semiconductor Trade disputes and establishing R&D projects. From 1997-1999, he worked for the Southeast Asia and Pacific Area Division to tackle the Asian Economic Crisis, which took place in 1997, and he contributed to enhancing regional cooperation between ASEAN member countries and Japan. From 1999-2002, he worked for the Commerce Policy Division and contributed to promoting electronic-commerce from the legal and institutional point of view. In 2002, he joined the New Energy and Industrial Technology Development*

*Organization (NEDO) as a Director, Planning and Coordination Division, Planning and Coordination Department, and designed a new R&D funding mechanism and project management style for the organization. In 2005, he returned to METI as the Director, Research and Development Division, Industrial Science and Technology Policy and Environment Bureau, and was responsible for making new R&D projects. In 2007, he was assigned the Director, Gas Safety Division, Nuclear and Industrial Safety Agency, and worked to dramatically reduce the number of gas-oriented accidents. In 2009, he was assigned as the Director, Mineral and Natural Resources Division, ANRE, and travelled around the world to help Japanese private companies secure mineral resources both in the exploration stage and development stage. In 2013, he was promoted to his current position.*

## KEYNOTE-2

**Dr. Thomas L Magnanti, President, Singapore University of Technology and Design, Singapore; and Institute Professor, Massachusetts Institute of Technology, USA**

### “Educating Technology Leaders for Design-Driven Innovation”



Technology and design-driven innovation have always been vital to society's prosperity and well-being and will continue to be so in essentially all areas of importance to society, including the topic of service and infrastructure integration that is the theme of this conference. Education in this general arena has evolved over hundreds of years, with the emergence within engineering and management of particular disciplinary and departmental structures and teaching paradigms. Are these the best approaches in today's world? How should a contemporary technical-based university be structured? What degrees should it offer and how should it be delivering education? Using MIT and the development of the Singapore University of Technology and Design as reference points, Dr. Magnanti will touch upon these issues in the context of the changing landscape of higher education.

*Dr. Thomas Magnanti is the founding President of the Singapore University of Technology and Design (SUTD), and Institute Professor and former Dean of Engineering at MIT. He has devoted much of his professional career to education that combines engineering and management, and to teaching and research in applied and theoretical aspects of large-scale optimization.*

# PLENARIES

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*Professor Magnanti has a long association with programs in technology and in the management of technology.*

*At SUTD, he has led the development of a university whose mission is to advance knowledge and nurture technically grounded leaders and innovators to serve societal needs through a focus on design and an integrated multi-disciplinary curriculum and multi-disciplinary research.*

*At MIT he was the founding co-director of MIT's Leaders for Manufacturing and System Design and Management Programs, and founding director of the Singapore-MIT Alliance for Research and Technology (SMART). As Dean, he was instrumental in creating the Deshpande Center for Technological Innovation and was a strong advocate and supporter of programs in entrepreneurship such as the MIT 100K competition. He also headed one third of the Sloan School of Management for several years.*

*He has served as president of three major professional societies and as editor of the journal Operations Research. He has also served on a number of university, corporate and government boards and councils.*

*Professor Magnanti has received numerous educational and research awards including four honorary degrees. He is a member of the U.S. National Academy of Engineering and the American Academy of Arts and Sciences. He has an undergraduate degree in Chemical Engineering from Syracuse University, and masters' degrees in Statistics and in Mathematics as well as a Ph.D. in Operations Research, all from Stanford University.*

## PLENARY SESSION—4

**DATE:** WEDNESDAY, JULY 30, 2014

**TIME:** 14:00-15:30

**ROOM:** OOTORI

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

## KEYNOTE

**Dr. Hans J. Thamhain, Bentley University, USA**

**“The Changing Role of Management in Technology-Intensive Project Environments”**

The role of management is changing in our complex world. New technologies have radically transformed the

workplace and our global economy, focusing on effectiveness, value and speed. Project management has become increasingly important to many business activities and performance. It provides more sophisticated capabilities for cross-functional integration, resource mobility, effectiveness and market responsiveness, but also requires more sophisticated skill sets, both technically and socially, dealing effectively with a broad spectrum of contemporary challenges, such as conflict, change, risks and uncertainty. As a result of this paradigm shift, we have seen a change in managerial focus from efficiency to effectiveness, and from a focus on traditional performance measures to include a broader spectrum of critical success factors that support innovation, work integration, organizational collaboration, human factors, business process agility, and strategic objectives. Effective project leadership involves not only managing the work, but also building people relations across diverse organizational and cultural boundaries, support functions, suppliers, customers and partners. The presentation will explore the leadership lessons learned from this shifting paradigm, including the barriers, drivers, critical success factors, and the organizational conditions most conducive to managing project teams effectively in our complex business environment.



*Dr. Hans Thamhain specializes in R&D and technology-based project management. He is a Professor of Management and Director of MOT and Project Management Programs at Bentley University, Boston/Waltham, USA. His industrial experience includes 20 years of management positions with high-technology companies: GTE/Verizon, General Electric and ITT. Dr. Thamhain has written over 70 research papers and seven professional reference books on project and technology management: Managing Technology-Based Projects (2014), Linking Project Management to Business Strategy (co-authored with Shenhar, Milosevic and Dvir, 2007), Management of Technology (2005), Managing Effectively in Technology-Based Organizations (1997), Project Management Operating Guidelines (co-authored with Harold Kerzner, 1986), Project Management for Small and Medium-Size Businesses (co-authored with Harold Kerzner, 1985), and Engineering Program Management (1985). He was the recipient of the Distinguished Contribution Award from the Project Management Institute in 1998, the IEEE Engineering Manager of the Year 2000/2001 Award, and the Research Achievement Award from the Project Management Institute in 2006. He is profiled in Marquis Who's Who in America and certified as NPDP and PMP.*



# PLENARIES

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## PLENARY SESSION—5

DATE: THURSDAY, JULY 31, 2014  
TIME: 08:30-10:00  
ROOM: OOTORI

**Session Chair: Dr. Tugrul U. Daim, Portland State University, USA**

## KEYNOTE-1

**Prof. Dr. Hans-Joerg Bullinger, Senator of the Fraunhofer-Gesellschaft, Germany**

### **“Safeguarding Growth and Prosperity: What Successful Innovators Have in Common”**

In the future, people will need affordable medical care, mobility, access to modern communication technologies, green energy, security, and resource efficient methods for our planet. These are not only the major challenges for the 21st century, but also the prevalent opportunities for growth, employment, and wealth. Companies need to analyze and exploit major, observable strands of social, scientific, and technological development and long-term trends. The knowledge obtained about markets, customers, competitors, and technologies reduces innovation risks and makes a sustainable contribution to the company's strategic orientation, organizational structure, and workflow organization. Those who want to change the existing processes and procedures or to implement sustainable concepts into practice require vision and expertise. Companies are successful when they master the dynamic, rapidly changing markets of the future. For this to happen, companies must be quick to identify upcoming market trends and opportunities for innovative technologies, and incorporate them in their business strategy. Creative and passionate individuals who have knowledge of the requirements of the economy can acquire a vision for the future. From the laboratories of the Fraunhofer-Gesellschaft, Professor Bullinger gives fascinating insights on the development and outlines some secrets about what top innovators have in common.



Dr. Hans-Joerg Bullinger was born in Stuttgart. He began his career working as a manufacturer for the Daimler-Benz company in Stuttgart, after which he obtained a degree at the University of Stuttgart, graduating with a

master's degree and Ph.D. in manufacturing. After two years of lecturing at the University of Hagen, Dr. Bullinger was asked to become a full-time lecturer at the University of Stuttgart. Besides his role as chairman of the University, Dr. Bullinger was also the head of the Institute for Human Factors and Technology Management (IAT) and the Fraunhofer-Institute for Industrial Engineering (IAO). From October 2002 until October 2012, he was president of the Fraunhofer-Gesellschaft, Corporate Management and Research, and alternated afterwards to the Senate of Fraunhofer.

Dr. Bullinger received several honorary doctorates and awards such as the Knight Commander's Cross of the Order of Merit of the Federal Republic of Germany from the Federal President of Germany; he was awarded “Manager of the Year” by the German manager magazine in 2009; and he was honored with the Grashof Denkmunze by VDI (The Association of German Engineers) in 2011. Dr. Bullinger received the Leonardo - European Corporate Learning Award in 2012.

Dr. Bullinger is a member of several councils such as the Industry-Science Research Alliance of the Federal Ministry of Education and Research and the European Research and Innovation Area Board (ERIAB) of the European Commission. Dr. Bullinger is a Fellow of the UK's Royal Academy of Engineering.

At present, the Fraunhofer-Gesellschaft maintains more than 80 research units in Germany, including 67 institutes and research units. The majority of the 23,000 staff are qualified scientists and engineers. With its clearly defined mission of application-oriented research and its focus on key technologies of relevance to the future, the Fraunhofer-Gesellschaft plays a prominent role in the German and European innovation process.

## KEYNOTE-2

**Dr. Bulent Atalay, University of Mary Washington and the University of Virginia; Member, Institute for Advanced Study, Princeton, USA**

### **“Lessons from History: How the West Surged Ahead, and How the East Finally Caught Up”**

Five hundred years ago a number of conditions existed in Europe that enabled Western civilization to make unprecedented progress and to surge ahead of the rest of the world. While the empires of the East gained inertia and remained largely stagnant, relatively small countries in Europe — England, France, Spain, Portugal, and Holland



# PLENARIES

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— embarked on the Scientific Revolution, which eventually led to the Industrial Revolution of the eighteenth-century, fueled by an irreversible fusion of science and technology. Europeans colonized the New World, as well as Africa and Asia. By the mid-16th century the Ottoman Empire could have claimed the Mediterranean as the “Ottoman Lake.” It had reached its greatest extent and would soon begin a decline. Three hundred years later Czar Nicolas I of Russia would characterize the Ottoman Empire as “the sick man of Europe.” And by then, the English could claim, “The sun never sets over the British Empire.”



We will investigate the conditions that gave rise to the Scientific and Industrial Revolutions, and for the West to peak. The East — first Japan, and then Korea, and finally China — only after changing its operating system would accelerate and catch up with the West.

*Described by the Washington Post, Smithsonian Magazine, NPR and PBS as a “Modern Renaissance Man,” Dr. Bulent Atalay is a scientist, artist and author. He was born in Ankara, Turkey, and received his early education at Eton in England and St. Andrew’s School in Middletown, Delaware. His advanced education includes BS, MS, MA, PhD and postdoctoral studies, completed at Georgetown, Princeton, University of California-Berkeley, and Oxford University. For four decades he has been a professor of physics at the University of Mary Washington, and the University of Virginia, and a member of the Institute for Advanced Study at Princeton. Dr. Atalay lectures around the world on art, archaeology, astrophysics, and atomic physics.*

*He is an accomplished artist who has presented his works in one-man exhibitions in London and Washington, and his two books of lithographs — *Lands of Washington and Oxford* and *the English Countryside* — can be found in the permanent collections of Buckingham Palace, the Smithsonian, and the White House. Five years after its release by Smithsonian Books in April 2004, his best-selling book, *Math and the Mona Lisa*, has had numerous printings in English, and appeared in 13 languages. His last book, *Leonardo’s Universe*, co-authored with former student Keith Wamsley, was released by National Geographic Books in 2009. His website is at <http://www.bulentatalay.com>.*



# PHD COLLOQUIUM

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## GETTING YOUR PHD.... AND BEYOND

### *Critical Stages and Career Paths for the PhD Student*

DATE: SUNDAY, JULY 27  
TIME: 13:00—17:00  
LOCATION: ZUIUN-1 ROOM (THIRD FLOOR)  
REGIST: \$35

Through guest lectures and a workshop, we will share experiences in the following areas:

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

## GUEST SPEAKERS:

**Prof. Gloria Barcazk, Northeastern University, USA; Editor-in-Chief for the *Journal of Product Innovation Management***

**Prof. Jonathan Ho, Yuan Ze University, Taiwan**

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

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

Please contact Professor Antonie Jetter at [ajetter@pdx.edu](mailto:ajetter@pdx.edu) if you have any questions about the Colloquium.



# TUTORIALS

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## THE WORLD OF BUSINESS GAMES

DATE: MONDAY, JULY 28

TIME: 14:00-15:30

LOCATION: TOKI

**SPEAKERS:** Amnon Gonen, Holon Institute of Technology – HIT, Israel; Eyal Brill, Holon Institute of Technology – HIT, Israel

Business games are usually an improved way to learn, in an exciting, novel and competitive way, the business world. The participants can turn a business plan into real-time decisions, examine their decisions, and learn from their own success or failures in a competitive environment. The tutorial will introduce the business game's theory and methodology, using a website business game simulation called "Decision Makers" to present the business decisions of firms. Decision Makers is an Internet-based business learning simulator that enables participants to practice their ability to make business, technology and management related decisions in simulated real-life situations. It enables the instructor to individually monitor the progress of each group, to control the level of the simulation's complexity, and to intervene at crucial points. The tutorial's objective is to introduce new approaches in business games.

### AGENDA

- Introduction to the business game's methodology (20 minutes)
- Briefing on the market, principal assumptions, and business plan (10 minutes)
- Hands-on, running "Decision Makers" simulator step by step (20 minutes)
- Hands-on, running first period of "Decision Makers" by tutorial's participants (30 minutes)
- Debriefing of first period according to the statistics (10 minutes)

The timetable is tentative and can be adapted to other scheduling limitations.

There are two main objectives to the tutorial: company strategy and exploring the possible improvement in business management, and using an on-line business simulation to enhance business capabilities.

"Decision Makers" is an Internet-based business learning simulator. It enables participants to practice their ability to make business, technology and management related

decisions in simulated real-life situations. Decision Makers enables the instructor to individually monitor the progress of each group, to control the level of the simulation's complexity, and to intervene at crucial points in order to determine the study content. The simulation is held within the scope of "virtual" quarters. During each quarter, each group can conduct an unlimited number of simulations and obtain the results forecast for the quarter. The results of each simulation are affected by the group's decisions and by decisions made by other groups simultaneously (groups do not need to be connected to the server at the same time). At the end of the quarter, the teacher (simulation manager) runs a "binding" simulation, which determines the quarter's results and forms the basis for the next quarter. The firms compete in four different markets with distinct demographic and economic characteristics.

Each firm has to plan its production method, invest in advertising and marketing, set up its transport and quality control systems, and invest in R&D and quality control. The firms can trade with each other, alternatively. At the end of each quarter, each firm gets profit and loss statements as well as a periodic balance sheet. In addition to these goals, each firm gets a score according to the part it plays in pollution, in the Gini index, and its impact on macroeconomic variables (such as income distribution). The system automatically generates statistical reports and market surveys as information serving decision-making purposes. "Decision Makers" makes it possible to simulate "study events" according to a scenario predetermined by the instructor, such as supply chain management or strategic market planning in a growing firm. The simulator is used for teaching and research.

### PREPARATIONS

All participants in the conference are welcome to join the tutorial.

In order to experience hands on, please be sure Java version 7 Update 60 is installed on your laptop. Updates and installations are free at <https://www.java.com/en/download/>.

During the tutorial we will use Wi-Fi for on-line simulation runs. The simulation can run on Internet Explorer, Chrome or Firefox.

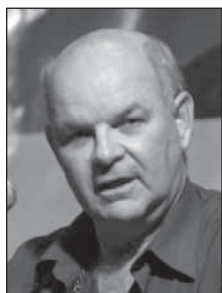
Security preparations are as follows: After Java is installed, go to Control panel/Java/Security and change the security to medium. Now, click Edit Site List, then click Add, and add <http://www.decisionmakers.biz> to trusted sites.

# TUTORIALS

If you use Internet Explorer, you should go to tools/internet options/security/trusted sites, click sites, and add again <http://www.decisionmakers.biz> and uncheck the box named “require server verification.”

You are now invited to try <http://www.decisionmakers.biz/Demo/>, login and have fun.

We will start all the laptops together and we will assist everyone with the security setup. For more details, visit [www.decisionmakers.biz](http://www.decisionmakers.biz).



**Dr. Amnon Gonen** was the Dean of the Management of Technology faculty at Holon Institute of Technology (HIT) from 2007 until 2013. Prior to that, he was the head of the Department of Management of Technology at HIT. His research areas include project management, risk management, applications of war games

technologies to civilian training, business gaming and simulation. Dr. Gonen graduated with his D.Sc. degree in Operations Research at the Technion, Haifa. He served for 25 years as an operations research analyst at government and private organizations. From 1992 to 2004 he served as CEO of his own operations research consultancy company, and he was chief scientist of a simulators company, BVR Systems. During the last 15 years he worked as a senior lecturer at Ruppin Academic Center and later at Holon Institute of Technology (HIT).



**Dr. Eyal Brill** holds a Ph.D. in Agricultural Economics from the Hebrew University, Faculty of Agricultural and Environment. His thesis introduced a new approach for the evaluation of the efficiency of water trading markets. Since returning from post-doc at the University of Maryland at College-Park, Dr. Brill has been involved for almost 20 years in both

academic research and commercial projects in the field of water and wastewater.

Between 2001 and 2008 he was the R&D manager and COO of Insyst Ltd, of Start-up Company which developed analysis tool for the identification of abnormality in industrial systems. Between 2009 and 2013 he co-developed with White Water Ltd. an online tool for the identification of water contamination events.

Parallel to his commercial activity, Dr. Brill has been in-

involved in academic life. Since 2013 he has held the position of Deputy Head of BSc program in the Faculty of Technology Management at Holon Institute of Technology (HIT).

Since November 2013, Dr. Brill has been the algorithm developer for the Leak Buster 3, an innovative product developed by Aqua-Rimat Ltd.

## INTRODUCTION TO OPEN SOURCE TECHNOLOGY FORECASTING TOOLS

DATE: WEDNESDAY, JULY 30  
TIME: 10:30-12:00  
LOCATION: ZUIUN-2

**SPEAKER: Timothy Anderson, Portland State University, USA; Scott W. Cunningham, Delft University of Technology, Netherlands; Dong-Joon Lim, Portland State University, USA**

Open source tools have made it easier to do sophisticated technology forecasting analyses. This tutorial session will provide an introduction to a variety of freely available tools for technology forecasting along with datasets that can be used for experimenting and teaching.

**Dr. Timothy Anderson** is an Associate Professor of Engineering and Technology Management at Portland State University. He earned an Electrical Engineering degree from the University of Minnesota, as well as M.S. and Ph.D. degrees in Industrial and Systems Engineering from the Georgia Institute of Technology. He has been the Program Chair or Co-Chair 13 times for PICMET since 1997. With over 35 refereed publications, his current research interests are in benchmarking, technology forecasting, data mining, and new product development.



**Dr. Scott Cunningham** is an Associate Professor of Policy Analysis and Systems Engineering at Portland State University. He earned degrees in engineering and in policy from the Georgia Institute of Technology and the University of Sussex (SPRU). He teaches topics of design, decision-making and data to M.Sc.



# TUTORIALS

students. He co-authored the book *Tech Mining* (John Wiley and Sons, 2004) with Alan Porter. He is the European Associate Editor for the journal *Technological Forecasting and Social Change*.

**Mr. Dong-Joon Lim** is a PhD student of Engineering and Technology Management at Portland State University's Maseeh College of Engineering and Computer Science. His current research interests include technology forecasting, efficiency measurement, trajectory mapping, and technological innovation.



## DAIKIN INDUSTRIES - NEXT GENERATION'S INNOVATION MANAGEMENT

DATE: THURSDAY, JULY 31

TIME: 10:30-12:00

LOCATION: SHIRASAGI-2

**SPEAKER: Mr. Katsumi Kawahara, Daikin Industries, Japan**

The outcome for an excellent company seeking continuous improvements of its merchandize is that at one point, what its product provides will eventually exceed the actual needs of customers, driving the market towards a search for new products, and losing its position as a leading excellent company. In this context, while Daikin Industries reached Global No.1 in the air conditioning field, there is no doubt that it shall pursue further energy-savings, noise reduction, miniaturization, and quality sophistication. However, when the basic functions of air conditioning exceed what customers and the market require, or when commoditization takes place such that there are barely differences compared with rival companies, the realization of creating "new customer value" will become more than ever necessary.

We, the Daikin Industries, believe in the potential of air. We believe that what air – *beyond the scope of air conditioning* – can provide to people's lives is still under explored, and that is our duty as the Global No. 1 to take the leading position to realize the new value of air and to change people's perspectives of air conditioning. With such expectations, the Daikin's new *Ba* (site) of co-creation – the Technology and Innovation Center (TIC) – is scheduled to open in November, 2015, with the aim

to achieve open innovation through the fusion of new technologies and the diversity of researchers from Daikin and as well as outside the company.

**Mr. Katsumi Kawahara** joined Daikin Industries in 1987 after completing his degree at the School of Engineering, Osaka University. He first worked at the Mechanic Technology Research Lab from 1987 to 2000 for the research of new materials, compressors, alternative refrigerant tribology, total enthalpy heat exchanger elements, and LCA. In 2000, he became Manager of the Mechanic R&D Strategy Division and was in charge of strategy planning for air conditioning R&D and the HR mapping for researchers' recruitment. In 2004 and 2005, Mr. Kawahara worked as Senior Manager and General Manager for the Air Conditioning Development Division for the preparation of the Daikin's Technology Manifesto, employees' awareness revolution, and the merchandize development planning coordination. In 2007, he became Chief Engineer of the Air Conditioning Manufacturing Division, and was responsible for the strategy planning on components and materials coat-down, rare-metal procurement, and the establishment of a new copper tube manufacturing site. Since 2011, Mr. Kawahara has been in charge of the Technology and Innovation Center (TIC) Preparation Office, and has been dedicating his work to strategy planning for the realization of the TIC, including the building construction, smart-grid operation working groups, and the construction of new management structures.



# PANELS

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## MEET THE EDITORS

DATE: MONDAY, JULY 28  
TIME: 14:00-15:30  
LOCATION: OOTORI-2 BALLROOM

**PANELISTS:** Timothy Anderson, Portland State University; Gloria Barczak, Northeastern University; Tugrul Daim, Portland State University; Robert Harmon, Portland State University; Fred Phillips, Stony Brook - State University of New York and SUNY Korea; Steven Walsh, University of New Mexico

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

## MANAGING TECHNOLOGY IN KNOWLEDGE-INTENSIVE INDUSTRIES

DATE: MONDAY, JULY 28  
TIME: 16:00-17:30  
LOCATION: HIBARI-1

**PANELISTS:** Simon P. Philbin, Imperial College London; Donald Kennedy, Willbros Canada

Technology and engineering management practitioners in knowledge-intensive industries, such as the high-tech and engineering sectors, face a number of challenges. These include the relentless pace of technological and organizational change, increasingly complex engineering systems as well as greater levels of global competition. Industrial companies are subject to a constant requirement to innovate and remain competitive, such as the need to maintain drug pipelines in the pharmaceutical sector, or the need for energy sector companies to reduce levels of carbon emissions. There are, however, many opportunities. Advances in science and technology are providing opportunities for new business models to be adopted, and the ability to capture, analyze and leverage large datasets and diverse forms of information is allowing some organizations to move ahead of competitors.

In the past, proven and fundamental approaches to technology and engineering management have prevailed each time; however, the inevitable question arises – how long will this continue? Do we need to consider new management frameworks to help industry cope with the

engineering complexities and the vast quantity of data and information that has been enabled through modern ICT (information and communications technology) applications? In this context, what are the areas that the technology management community needs to address, and how will they overcome the challenges. Therefore, this panel session will consider the issues at stake in knowledge-intensive industries and explore whether we need to further develop, modify, replace or even abandon our current approaches to managing technology and engineering systems.

The session will be convened by two presenters, one from the industrial sector (in Canada) and the other from academia (in the United Kingdom), thereby allowing a broad and international perspective to be brought to bear on the subject. The session will commence with two short presentations given by the conveners, which will provide context to the session, help identify some of the challenges and stimulate thinking around solutions. Attendees of the session will then be able to contribute their own perspectives through a short period of syndicate work and as part of the final discussion period.

**Dr. Simon Philbin** is Associate Director of Enterprise Projects at Imperial College London, where he leads corporate development projects across the university. He is also a Visiting Fellow of Imperial College Business School. Dr. Philbin joined Imperial in 2003 and prior to this he worked in scientific and managerial roles for QinetiQ and DERA (UK Ministry of Defense). Dr. Philbin holds a BSc (University of Birmingham) and PhD (Brunel University), both in chemistry, as well as an MBA with distinction from the Open University Business School. He is published widely



across several areas including project management, systems engineering, university-industry research collaboration and chemistry. Dr. Philbin is a recipient of the Merritt Williamson best paper award from the American Society for Engineering Management (ASEM) and the Rod Rose best paper award from the Society of Research Administrators (SRA) International.

**Dr. Donald Kennedy, PhD, P.Eng.**, attended his first PICMET in 2004. He has spent most of his time involved at the ground level of the execution of mega projects with budgets often exceeding \$10 billion USD. He has

# PANELS

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spent time as a lecturer at Canadian Universities. He currently works in Project Controls for an industrial construction company. He has written two books on the need for improved management of technical people.

## **PICMET '15 AND '16 PLANNING SESSION**

DATE: THURSDAY, JULY 31

TIME: 16:00-17:30

LOCATION: ZUIUN-1

This panel session will provide an opportunity to give feedback on PICMET '14 and to get involved in the planning for PICMET '15 and '16 conferences. PICMET '15 will be held August 2-6, 2015, at the Hilton Portland & Executive Tower in Portland, Oregon, USA.



# SESSIONS

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## MA-00 PLENARY - 1

DATE: MONDAY, 7/28/2014  
TIME: 08:30 - 10:00  
ROOM: OOTORI  
CHAIR(S): KIYOSHI NIWA; THE UNIVERSITY OF TOKYO, JAPAN

### MA-00.1 [K] Management and Technical Innovation of Railway as Social Infrastructure Can Make Higher Quality of Life

*Masaki Ogata; East Japan Railway Company, Japan*

The level of infrastructure is considered to be the index most correlated with a nation's competitiveness. In this context, transportation as infrastructure plays an important and indispensable role in society. In particular, the railway in the center of public transportation reduces significantly traffic jams by its characteristics of large capacities and high efficiency. It also has various characteristics such as environmental superiority and short trip time, greatly contributing to economic growth and regional development. JR East holding infrastructure of the railway system operates and maintains various categories of rail transport including Shinkansen, metropolitan, suburban, and regional trains together with manufacturing of rolling stock. We also manage life-style businesses such as station space utilization, shopping centers, hotels, and so on, and at the same time operate a micropayment business. Thus, we sustainably diversify in the multiple businesses described above, which has been and will be mostly accomplished by management and technical innovation. We believe that this sustainable innovation of transportation can raise people's quality of life. JR East is the overall customer service industry with the integrated technology. Today, we strongly promote the management & technical innovation and globalization. Towards the future, it is extremely important to adapt to the rapidly changing management environment such as shrinking market caused by low birth-rate and an aging society, strongly interrelated global economy, development of ICT, advancement of globalization, environmental issues like the greenhouse effect, and frequent occurrences of natural disasters. This adaptation will enhance our company to grow and raise the satisfaction of our customers as well as contribute to society. Through these activities, we strive to also contribute to Japan's competitive edge in the world.

### MA-00.2 [K] Promoting GEMBA (workplace) Innovation

*Tetsuji Ohashi; Komatsu Ltd., Japan*

Mr. Ohashi will start the presentation by introducing the KOMATSU Way, which has been passed on as the "DNA" of Komatsu's ways of manufacturing. He will then move on to DANTOTSU (unique and unrivaled) products, DANTOTSU service, and finally, DANTOTSU solutions, all of which are based on the KOMATSU Way. He will spotlight Komatsu Machine Tracking System (KOMTRAX) and Autonomous Haulage System (AHS) as the successful cases of DANTOTSU solutions. KOMTRAX enables the customers to remotely monitor, manage and analyze their machines' operating conditions, thereby helping them reduce machine lifecycle costs, such as maintenance, fuel and operator expenses. AHS, which Komatsu led the world in commercializing, frees truck drivers from a strenuous work environment at mines, therefore achieving an ultimate form of safety as well as reducing the running costs of trucks due to stable driving conditions of driverless trucks. He will introduce actual cases of service and solutions designed to create new customer values. He will finish the presentation by describing Komatsu's roadmap of product development for solutions and its efforts to make innovation as Komatsu looks into the advancement of technologies and changes of market needs.

### MB-01 Innovation Management-1

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Ootori 1**

**Chair(s) Andre J Buys; University of Pretoria**

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### MB-01.1 [R] Approach to Analyze the Organizational Characteristics for Being an Innovative Organization

*Norawat Chutivongse; Mahidol University, Thailand*

*Nathasit Gerd Sri; Mahidol University, Thailand*

Innovation has become an important weapon for an organization to sustain its competitiveness under today's business dynamic. This paper aims to propose the idea of how to develop a model to assess the organizational characteristics for being an innovative organization. With the development of the model, it would help the top management of any organization determine proper strategies to fill in the strategic gaps between the current and future requirements for becoming an innovative organization.

### MB-01.2 [R] Innovation Processes in Business Ecosystems: Creating a Common Understanding by Requirements

*Peter E Harland; Technische Universitaet Dresden, Germany*

*Sabine Wuest; Technische Universitaet Dresden, Germany*

*Ozgur Dedehayir; CeTIM, Netherlands*

In established supply chains, companies use specific requirement standards to coordinate product development activities. In recent years, companies like Apple and Google have focused on creating and controlling business ecosystems that integrate actors also from other industries in their innovation processes. These ecosystems are characterized by a different way of communicating requirements necessary to achieve successful collaboration in a joined innovation process. In this paper, we endeavor to identify those factors which emerge as important in how requirements are communicated in the ecosystem setting to provide stable and predictable operations. To this end, we explore four ecosystems displaying different product innovation traits and seek the variables that determine the manner in which requirements are communicated in business ecosystems. Our explorative work leads to central propositions, which we offer as the focus of future extensions of our work.

### MB-01.3 [R] Core Technological Competence and Knowledge Accumulation in the Functional Food Industry: An Empirical Study of Japanese Food Firms

*Paveena Lalithornasate; Tokyo Institute of Technology, Japan*

*Kumiko Miyazaki; Tokyo Institute of Technology, Japan*

Technological competence, an important factor for competitive advantage in several industries, was seldom studied in the food industry. While being called low-tech and largely dependent on markets and suppliers, the food industry has continuously adapted and innovated products responding to changing market and technological opportunities. The flourishing functional food industry in Japan (FOSHU), regardless of existing complex systematic regulation, is one of a proof that food firms have capabilities to perceive the market opportunity and technological changes, seek for knowledge and learn to efficiently integrate acquired knowledge in their core competences. The study on technological profiles and patent analysis allows understanding in firms' technological strategies such as positioning and dynamics of technological competences. The findings on six Japanese food firms that have FOSHU product activities have confirmed the role of core technological competence as a foundation of new creations under uncertainties, and imply the strategic importance of organizational flexibility in knowledge accumulation and learning process that facilitate firms in creating competitive advantage and responding to the new opportunities.

### MB-02 Technology Management Framework-1

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Ootori 2**

**Chair(s) Antonie M De Klerk; University of Pretoria**

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### MB-02.1 [R] Framework to Design the Interface Between Technology Development and Product Development

*Guenther Schuh; Fraunhofer Institute for Production Technology IPT, Germany*

*Katharina Apfel; Fraunhofer Institute for Production Technology IPT, Germany*



# SESSIONS

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In order to stay globally competitive, manufacturing enterprises face an increasing pressure to bring new products and applications to the markets, to enhance existing products technologically and to produce them at a lower price. New technological findings can enable enterprises to meet these challenges. In practice, technology developments with a long time horizon are given a low priority compared and due to everyday business. Therefore, more and more enterprises separate their technology development and product development units to increase innovation focused technology development. Due to this additional interface in the R&D organization, new problems appear, resulting in technology findings not being implemented in products, e.g., due to wrong time for transfer, insufficient technology readiness, or technologies that fail to meet product needs. The reasons for these problems often concern different aspects in the organization, e.g., culture, communication or strategy. In this paper of ongoing research, we introduce a framework to design the interface between technology development and product development.

## **MB-02.2 [A] The Collaborative Web: Building a Divergent Organizational Model for Research and Development, Based on 21st Century Notions of Employee Engagement**

*Laura McKinney; Oregon University System, United States*  
*Jef Bell; Galois, Inc., United States*

We describe the results of a 7-year management experiment in a small, high technology, research-services enterprise where the company moved from a traditional hierarchical management structure to a novel, researcher-centric, client-focused organization. We challenged traditional organizational assumptions: Management is sometimes denigrated by technical leadership. So what is the meaning of "manager?" Is that concept still useful? What structure might take its place? Technical staff members are often not trusted to understand business. What if we explicitly engaged engineers in business planning and decisions? The technical skills of managers often decay, reducing their effectiveness in the long run. What if we share and rotate leadership in engineering? The value of technical staff is directly correlated to how well they stay current, which sometimes is at odds with longevity of staffing. What if we paid people based on the value of future results? This paper will answer the questions of why we did this, from whom did we draw insights, what we learned, and finally, whether we were successful in improving the value to the client and the engagement of our research staff.

## **MB-02.3 [R] Proposal for a New Framework for a Medical Service System Using Smartphones**

*Toshinobu Ohnishi; Japan Advanced Institute of Science and Technology, Japan*  
*Michitaka Kosaka; Japan Advanced Institute of Science and Technology, Japan*

A service system in service dominant logic (SDL) is considered to be a configuration of operant resources including human beings that effectively increases value-in-context. It is important to integrate these operant resources in this configuration to develop products and services in value co-creation between firms and customers from the viewpoints of value-in-use or value-in-context. We propose a new framework for a medical service system using smartphones from the viewpoint of an effective configuration of operant resources for value co-creation. This framework consists of three subordinate service systems. The first is a subordinate service system where operant resources are integrated, the second is a subordinate service system to attain value-in-use and value-in-exchange, and the third is a subordinate service system to accomplish value-in-context. These subordinate service systems are connected with actors who play an important role in the value-in-context of operant resources. This framework was demonstrated to be effective in the management of firms providing products and services through analysis of a case study and it could be expanded to various service systems.

## **MB-02.4 [A] Research on Commercialization Management System Which Serve as the Infrastructure for Creating University Ventures**

*Yasuhisa Yamaguchi; DBJ Capital, Japan*

In order to utilize intellectual property created by researchers at universities and to create new industries, the role of university ventures plays extremely large. However, it has not succeeded in ventures creation in Japan. One of the reasons may be that the application created by researchers at a university does not meet the needs of the market. It is necessary that the mechanism providing solutions for solving the problems and systems for providing products and services are demanded by the market. In this research, the case of "Program for Creating Start-ups from Advanced Research and Technology (START program)" is shown, which has been implemented for university ventures creation in Japan. Additionally, the effectiveness of the stage-gate method that DBJ Capital has adopted to become the commercialization management system and other know-how will be examined.

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## **MB-03 Intellectual Property-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Ootori 3**

**Chair(s) Takao Fujiwara; Toyohashi University of Technology**

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## **MB-03.1 [R] Technology Portfolio, Patent Litigation Probability and Firm Performance**

*Michael Lee; National Chung Hsing University, Taiwan*  
*Hsing-Ning Su; National Chung Hsing University, Taiwan*

R105, This paper investigates if technology portfolio and patent litigation probability affect firms' short- and long-term performances, which in past literature have mostly been associated with economic indicators or financial models. The patent data used in this paper are downloaded from the USPTO patent database, and patent litigation probabilities are obtained from a previous study. To measure firm performance, the return on asset (ROA) and the market value are calculated as the short-term and long-term performances, respectively. The correlation coefficient is then employed to approach the ROA and the market value to evaluate if technology portfolio and patent litigation probability correlates with the short-term and long-term performances of firms. The result of this paper sheds light for firms to make strategic decisions based on their technology portfolio and to provide a novel way to identify firm performance.

## **MB-03.2 [A] Linkage between Science and Technology: A Case Study of Global Leading Smartphone Companies**

*Kai-Lin Chi; NARLabs, Taiwan*  
*Ming-Kwen Tsai; Tunghnan University, Taiwan*

In this study, the number and the strength of scientific linkage of smartphone related patents of global leading companies are analyzed. The results show that patents with litigation or transfer cite more journal papers. Therefore, the analysis of the strength of scientific linkage of smartphone related patents of global leading companies will help to evaluate the quality or value of the patents. The companies that have been listed in the worldwide smartphone vendor market share by IDC from 2012Q1 to 2013Q2 are included in this study. The results show that the top two smartphone companies, Samsung Electronics Co., Ltd. and Apple Inc. both have strong technology capacities. Samsung Electronics Co., Ltd own 9,534 smartphone related patents, which is ranked second in the 10 companies. The strength of Apple Inc.'s patents is high, though it has only 2,267 patents. The percentage of patents citing journal articles of Apple Inc. is the highest among the 10 companies. Both the patents of Samsung Electronics Co., Ltd and those of Apple Inc. have cited the journal articles published by the institutes in the country where these two companies are located.

## **MB-03.3 [R] Intellectual Capital Measures: Literature Review**

*Shu Yuan Huang; Feng Chia University, Taiwan*

In the era of the knowledge-based economy, enterprises are in a new game to win by intellectual capital, which is the key of corporate competitiveness. Hence, measurement of intellectual capital becomes an urgent task for organizations. Sveiby (2001) divided the measuring methods into four categories, namely DIC (direct intellectual capital methods), MCM (market capitalization methods), ROA (return on assets methods) and SC (scorecard

# SESSIONS

methods). This study adopted this classification method to review the total of 466 articles published in the Journal of Intellectual Capital from the initial issue in 2000 to 2013, and classifies the 45 articles concerning intellectual capital measures. The purpose is to gain an insight into the development and application of various measuring methods for the reference of future research and practical application.

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## **MB-04 Technology Management in Biotechnology-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Zuin 1**

**Chair(s) Mary Mathew; Indian Institute of Science**

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### **MB-04.1 [R] Acquisition of Drug Candidates in New Drug Development in Japan**

*Ryo Okuyama; Tokyo Institute of Technology, Japan*

*Hiroshi Osada; Tokyo Institute of Technology, Japan*

Open innovation (OI) is becoming a popular R&D management strategy in pharmaceuticals. In this study, we performed a comprehensive data collection on drug candidate acquisition, which has been the major OI mode during the drug development phase, in the Japanese pharmaceutical industry for the past 30 years. Our empirical analysis revealed that the acquisition of drug candidates has been widely conducted (accounting for a quarter of all newly developed compounds), and has contributed to more than half of launched products. Surprisingly, the acquisition of drug candidates has remained flat for the past 20 years; it has not increased in recent years despite the advocacy of OI. Acquisition at the preclinical stage was prevalent in the 1980s, and then late-stage acquisition started to increase and has dominated in recent years. There was no significant difference in therapeutic area distribution between in-house and outside-origin projects, suggesting that drug candidate acquisition was utilized mainly to reinforce internal R&D. Our findings can serve as a basis for discussion on the future direction of drug candidate acquisition in the Japanese pharmaceutical industry.

### **MB-04.2 [R] The Current Status and Value Creation of Unlisted Biotech Drug Discovery/Development Firms (Biotech DDFs) in Japan: A Holistic Approach**

*Mitsuya Sakurai; Kyoto University, Japan*

*Hawa I Munisi; Kyoto University, Japan*

*Hiroaki Kakiyama; Kyoto University, Japan*

*Shintaro Sengoku; Kyoto University, Japan*

Biotech Drug Discovery/Development Firms (Biotech DDFs), biotech firms that aim to discover and develop drugs, have recently started playing an important role in creating new drugs alongside traditional pharmaceutical companies. With the intention of proposing a policy that resolves issues concerning the cultivation of Biotech DDFs in Japan, we examined 44 unlisted Biotech DDFs through a comprehensive investigation using public domain information and commercial databases. We then analyzed the patents, and research and development pipelines, which are the key sources of Biotech DDF's enterprise value. The results of profiling and subsequent analysis indicated that most of the clinical compounds by Japanese unlisted Biotech DDFs are currently in a development stage where there is little possibility that they will be approved as pharmaceutical products. The results also showed that the patents of Japanese unlisted Biotech DDFs are heavily dependent on academia. We revealed that the industrial base for Japanese unlisted Biotech DDFs is still weak even though the government's innovation policies have made large financial supports for academia research to build up the biotech industry for one of the leading sectors. This result according to our holistic approach suggests that effective measures to strengthen Japanese Biotech DDFs need to be proposed.

### **MB-04.3 [R] Understanding Medical Device Patenting and Clinical Trials for Product Leadership**

*G Naga Rekha; Indian Institute of Science, India*

*Srigowtham Arunagiri; Indian Institute of Science, India*

*Mary Mathew; Indian Institute of Science, India*

Unmet clinical needs remain the primary driving force for innovations in medical devices. While appropriate mechanisms to protect these innovative outcomes are essential, the performance of clinical trials to ensure safety is also mandated before the invention is ready for public use. Literature explaining the relationship between patenting activities and clinical trials of medical devices is scarce. Linking patent ownership to clinical trials may imply product leadership and value chain control. In this paper, we use patent data from Indian Patent Office (IPO), PCT, and data from Clinical Trials Registry of India (CTRI) to identify whether patent assignees have any role in leading as primary sponsors of clinical trials. A total of 42 primary sponsors are identified from the CTRI database in India. Number of patents awarded to these primary sponsors in the particular medical device, total number of patents awarded to the primary sponsor in all technologies, and total number of patents in the specific medical device technology provide an indication of leadership and control in the value chain.

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## **MB-05 Technology Marketing-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Zuin 2**

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

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### **MB-05.1 [A] Marketing Testbeds for High Tech Innovations: The Case of Taurob Robotics**

*Matthias Biegl; TAUROB Corporation, Austria*

*Rainer Hasenauer; Vienna HiTECH and WU Wien, Austria*

*Lukas Silberbauer; TAUROB Corporation, Austria*

*Peter Filo; Economics University of Bratislava, Slovak Republic*

*Jozef Orgonas; Economics University of Bratislava, Slovak Republic*

*Barbora Paholkova; Economics University of Bratislava, Slovak Republic*

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

This paper describes how Taurob GmbH (LLC), a startup firm in robotics from Vienna, Austria, commercialized its flagship product platform, the Taurob Tracker, using the marketing testbed (MTB) approach. Taurob developed a highly versatile robotics platform, the Tracker, for use in highly hazardous environments. The design is very modularized; it can be customized to nearly any environment, but one design does not fit all environments. To make the Tracker profitable, Taurob has to characterize many potential market segments before their respective market windows open. The Hi-Tech Center, a multinational university-industry partnership in Vienna, Austria, performed a market analysis for the Taurob Tracker using the MTB approach. As a result of this analysis, the Taurob Tracker has entered or is planning to enter at least five markets - urban fire departments, railway fire departments, mining companies, petrochemical plants and nuclear power plants - in a timely manner. The Hi-Tech Center has applied the MTB approach to more than a dozen additional products in as many industries. Key lessons learned include, 1) cross-functionality is essential; 2) MTB is ideally suited to overcome semantic communication barriers between users/customers and suppliers/innovators; and 3) behind every bottleneck lies a new market opportunity.

### **MB-05.2 [R] Marketing Customized Products: A Discussion on the Preference of Color Combinations**

*Yang-Chih Lin; Chung-Yuan Christian University, Taiwan*

*Chin-Yi Chen; Chung-Yuan Christian University, Taiwan*

*Yu-Ying Chang; Chung-Yuan Christian University, Taiwan*

Nowadays, firms design personal products, that is, customized products which include changing the color and material to fulfilled consumers' diversified needs. The study focuses on exploring the relation between aesthetics lifestyle and color combination of the simple model of a cellular phone. The scale of aesthetics lifestyle is adopted in this study to investigate the consumers' preferences of color combinations. The research result shows that there are the correlations between monochrome, double-color, and tri-colored; and

# SESSIONS

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different types and matching colors of products won't affect the choice of colors. Besides, the color preferences of the blocks on product want to highlight the block of trademark, but other blocks have only slight differences.

## **MB-05.3 [A] Purchase Likelihood Prediction for Targeted Organic Food Marketing Campaigns in China**

*Beau Giannini; Tongji University, China*

*Song Chen; Tongji University, China*

*Pavel Paramonov; Multi-disciplinary Insights LLC, United States*

*Ying Yu Wu; Tongji University, China*

The demand for organic food products in China is growing in response to both increased spending power and food safety concerns. However, identifying likely buyers of organic products proves challenging due to their relatively small fraction in the overall population. Our study explores applications of machine learning algorithms for effective management of organic food marketing campaigns in China. Based on the data we collected through an online choice-experiment type questionnaire of Chinese consumers, a purchase likelihood estimation framework has been developed that utilizes customer profile traits such as age group, family status, education level, and geographic location. In addition, we apply clustering techniques to perform data-driven organic market segmentation and identify consumer profiles ready to pay more for high quality, certified organic products. The resulting market segments are compared to various types of organic consumers discussed in the literature. Our algorithms provide a useful framework for online retailers who are seeking lean strategies of market entry in China with their health food brands.

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## **MB-06 Knowledge Management-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Chidori**

**Chair(s) Robert Harmon; Portland State University**

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### **MB-06.1 [R] Realizing Knowledge Management in Value Creation Systems Using Principles of Fuzzy Control**

*Pascal Krenz; Helmut Schmidt University Hamburg, Germany*

*Sissy-Ve Basmer; Helmut Schmidt University Hamburg, Germany*

*Sonja Buxbaum-Conradi; Helmut Schmidt University Hamburg, Germany*

*Tobias Redlich; Helmut Schmidt University Hamburg, Germany*

*Jens Wulfsberg; Helmut Schmidt University Hamburg, Germany*

*Franz L Bruhns; Helmut Schmidt University Hamburg, Germany*

The increasing complexity of value creation processes and the surrounding economic environment (e.g., growing granularity of value chains, spatial distribution) gives rise to new challenges for the design and coordination of value creation systems. From a systems theory perspective, inter-organizational knowledge management has the potential to meet these challenges if it is carefully integrated in general management practices. Based on empirical findings from an industrial cluster in Germany, the authors identified three central conflicts of objectives that may occur during the implementation of knowledge management in complex value creation systems. Consequently, a context-sensitive compensation of the conflict-causing variables is necessary. Based on these premises, a systemic knowledge function has been developed that operates analogously to a fuzzy controller and is able to assess the system performance with regard to an intended system state and, finally, suggests actions for regulation.

### **MB-06.2 [R] Viral Geofencing: An Exploration of Emerging Big-Data Driven Direct Digital Marketing Services**

*Robert L Brown; Portland State University, United States*

*Robert R Harmon; Portland State University, United States*

This paper explores approaches for the effective integration of several focal areas of advanced analytics on currently achievable big data platforms to enable timely, and maximally

effective, geofence-triggered interventions (push marketing) that leverages viral or exponential returns. The viral or exponential growth behavior of modern social media-based interactions has garnered much attention in both public and private circles. The potential for harnessing and controlling these epidemic-like dynamics of spread or diffusion represent a significant and, as yet, underdeveloped marketing approach. This is especially true in the context of geo-fencing strategies and designs. Despite the potential for highly leveraged returns for location-based services (LBS), several barriers remain. Due to privacy concerns, legal issues, the immaturity of big analytics, and constraints presented by physical-level communications and geo-tracking enabling technology, LBS has remained under-developed and under-actualized. This reality is rapidly changing. This paper focuses on recent developments in big analytics, especially the integration of social networking dynamics, text mining, semantics, dynamic behavioral profiling, and real-time trigger-based geo-sensing capabilities that are enabling the next generation of high performance direct digital marketing services.

## **MB-06.3 [R] The Evolutionary Process from a Technology Concept to a Service Concept: A Cloud Computing Case Study**

*Rieko Kataoka; Japan Advanced Institute of Science and Technology, Japan*

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

*Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan*

In information technology (IT), new concept words frequently appear and affect the business environment. In several cases, the core technologies and architectures remain the same despite slight concept changes. For example, both grid computing and software as a service (SaaS) are considered to be the forerunner of cloud computing. In this paper, we describe the manner in which we applied a text mining approach to analyze all articles of the 2002-2012 editions of a famous IT magazine; attributing to this analysis, we propose a new evolutionary model describing how technological concepts are transformed into services. We focus our analysis on cloud computing, and this analysis reveals that the technical concept of "grid computing" and other related concepts appeared together in the first phase. In the second phase, such a group of words integrate to form a new concept, SaaS, which later expands into PaaS and IaaS. Finally SaaS develops into "cloud computing," and gains recognition in each industry as a completely specialized service concept (i.e., "x-cloud"). In addition, our analysis reveals that concept evolution has been affected by another evolution, namely from the organization-oriented world to the individual-oriented world by the advancement of social networking in our societies. This phenomenon provides further interpretation on concept evolution.

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## **MB-07 Strategic Management of Technology-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Shirasagi 1**

**Chair(s) Xiangdong Chen; Beihang University**

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### **MB-07.1 [R] Co-Evolution of Markets for Technology and Markets for Products in Mobile Telecommunication Standards: Examination of Essential Patents for GSM, WCDMA, and LTE Standards**

*Sangoon Yang; Hanyang University, Korea, South*

*Taehyun Jung; Hanyang University, Korea, South*

Patents conforming to technology standards ("essential patents") in a rapidly-changing and technology-intensive industry such as the mobile telecommunication industry have strategic values to the holder of the patent. Firms who play in such an industry, either manufacturers, parts suppliers, or non-practicing entities, thus fiercely compete against each other to develop standards-conformant technologies. In the mobile telecommunication industry, complex dynamics among firms (that stem from the different positions of each firm in the market for products and for technology) has formed interesting emerging patterns. In the paper, we examine the evolutionary pattern of the relationship between the position of a firm in product markets and its position in technology markets as the dominant design shifts from one to the next. In particular, we analyze essential patents conformant to different

# SESSIONS

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generations of mobile telecom standards (i.e., GSM, WCDMA, and LTE) from 2 different perspectives: 1) the product market position of the patent holder; and 2) the impacts of experience in product market and technology development on the position in the technology market for the subsequent standards. We discuss the emerging patterns of players in relation to their positions in both product markets and technologies.

## **MB-07.2 [R] Exploring High-technology Firms' Open Innovation Strategy and Performance from Knowledge-based View**

*Chun-Hsien Wang; National Chiayi University, Taiwan*

*Chih-Cheng Lo; National Changhua University of Education, Taiwan*

*Pei-Yu Chien; National Sun Yat-sen University, Taiwan*

Many studies have indicated that open innovation is critical to superior performance, yet findings have demonstrated the importance of different sources of abundant external knowledge to innovation efforts. In this study, we attempt to link the open innovation view and knowledge-based view to explain how a firm's external technology acquisition ability influences its innovation deployment, as well as its performance. That is, grounded in the open innovation view and knowledge-based view literatures, this study identifies key factors that allow for inbound open innovation and increase its efficacy and effects in a high competitive environment contingency. Based on a survey of high-technology firms, the results support the expectation that the ability to build well-developed collaboration channels with external connections in a competitive environment will increase the efficacy of inbound open innovation in achieving superior performance.

## **MB-07.3 [R] A Study on the Modes of Open Innovation Matched With Firms' Internal Capabilities**

*Yufen Chen; Zhejiang Gongshang University, China*

The open innovation paradigm coined by Henry Chesbrough offers a new way of thinking about and managing innovation. But it is still unknown how to manage open innovation efficiently. This paper analyzes key innovation resources owned by outside organizations. Based on the essential characteristics of open innovation, this paper establishes the modes of open innovation matched with firms' internal capabilities. The research manifests that openness does improve performance of innovation, and furthermore, there are interactions between internal capabilities and modes of openness. This leads to the suggestion that firms should select suitable modes matched with their internal capabilities. Specifically, it is suggested that different types of firms should adopt different matching strategies. For instance, for firms with intensive internal R&D activities and strong internal R&D capabilities, collaboration with science-based partners is preferable. But, for firms with good R&D capabilities and medium manufacturing capabilities, collaboration with horizontal connections will be an optimal option. Meanwhile, for firms with medium R&D capabilities, collaboration with technology related organizations and value chain partners will achieve better innovation performance. In sum, this paper states that it is important for firms to decide whether they can access complementary resources, which is beneficial for innovation from the openness.

## **MB-07.4 [A] Research on the Improvement of Independent Innovation Capability of Enterprises from the Path Dependence Perspective**

*Jing Hu; China Jiliang University, China*

*Yueyi Zhang; China Jiliang University, China*

*Xinghua Fang; Cina Jiliang University, China*

The enterprise competitiveness is one of the core issues in the development of the national and regional economy, and its center is the independent innovation of enterprises. At present, the enterprises in Zhejiang province are faced with an external environment which is extremely complex and turbulent. The traditional resource-based views and the core competence analysis are no longer applicable to the technology research which developed increasingly fast. The realistic technological innovation is the inevitable result of enterprise's technological research and development activities. At the same time, to a large extent, enterprises' technological innovation is a process of trial and error in a market where a

multitude of random factors, evident uncertainty and accumulation exist. Therefore, path dependence exists in the process of technological innovation. Through the analysis of the enterprise innovation process, the learning process and the technological knowledge accumulation, the behavior pattern of enterprises can be understood more accurately, the enterprise theory can be further improved, the research contents of economics can be enriched, and the guiding ideology for the research of innovation economics and technological economics can be obtained. In this paper, the path dependence of the technological innovation activities of the strategic emerging industries in Zhejiang province was quantitatively analyzed by using the theory of evolutionary economics, and the acting path was studied systematically.

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## **MB-08 Outsourcing-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Shirasagi 2**

**Chair(s) Amnon Gonen; Holon Institute of Technology - HIT**

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## **MB-08.1 [R] Regionalization of Engineering: A Structured Process Including Risk Considerations**

*Thomas Schaeffler; Siemens AG, Germany*

*Matthias Foehr; Siemens AG, Germany*

*Florian Steinmann; Friedrich-Alexander-University, Germany*

*Rudolf Kodes; Siemens AG, Germany*

*Andreas Muller-Martin; Siemens AG, Germany*

*Arndt Luder; Otto-von-Guericke University, Germany*

The companies active in international project businesses are faced with the optimization task of how the different phases in the technical value chain can most efficiently be shared between headquarters and local country organizations. Many regionalization cases the authors have examined have critical issues in domains such as internal setup, strategy, risk assessment, or know-how transfer. Therefore, in this paper, a process detailing how regionalization efforts in engineering can be effectively organized is explained, especially taking into account how typical risks inherent to regionalization can be identified. The process starts by defining regionalization goals in relation to the business strategy and identifying possible risks. After analyzing the preconditions, a regionalization concept is established by careful evaluation of different scenarios. Upon a decision for a certain scenario, detailed planning of regionalization is started, including e.g., preparation of change management and ramp-up of engineering manpower. Setting up the local organization includes training of employees, preparation of suitable environments and adaption of engineering processes. In this phase, the first regionalized projects can be performed. A carefully chosen lessons-learned process helps to augment the performance of the organization in its environment; a phase-out step may conclude the work in a regionalized environment. Practical information gained from expert interviews and taken from real regionalization cases in a multi-national company is presented in appropriate detail to illustrate the principles. They verify the approach and show the direction of further research.

## **MB-08.2 [A] How Can Foreign Multinationals Respond to the Complexity of Design Piracy in China?**

*Ganesh N Prabhu; Indian Institute of Management Bangalore, India*

Design piracy is potentially lethal for foreign multinationals making products in China, as high cost designs gets pirated with low manufacturing costs at acceptable quality for low priced sales in China and abroad. Two common options of dealing with piracy are protect and encourage, but neither effectively resolve this issue. We therefore suggest two distinct market options. The first option (labelled product enhancement) is to convert products through locally relevant redesign into significantly higher value products that address the small but high potential upper class Chinese who are less likely to seek pirated goods. The second option (labelled service enhancement) is to leverage local low cost services available in China to enhance their products by creating bespoke ethnic Chinese embellishments that appeal to upper-middle class Chinese customers and by creating stronger product-service combinations that lock in the customer. While these options do not prevent piracy, they lead



# SESSIONS

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to more China specific products that are less likely to be pirated into international markets. We illustrate how the European furniture firm IKEA can potentially adopt both of these modes in combination to create a distinct market space in China without compromising on their product designs or low cost business processes that are effective worldwide.

## **MB-08.3 [A] Innovative Public-Private and Philanthropy Partnership for Local Food Supply-Chain Infrastructure: Countryside Initiative of Cuyahoga Valley U.S. National Park**

*Ray R Gehani; University of Akron, United States*

In the post-modernist discourse of management of agro-food technology and urban infrastructure planning, unprecedented climate change and sustainability are setting the context for producing and supplying quality local food in highly densely populated urban and suburban regions. There is a seismic shift needed for innovative public and private partnerships governing green infrastructure for local food production. This empirical multi-disciplinary case study uses business model innovation theory and green suburban infrastructure framework to examine the Countryside Conservancy Initiative start-up by Cuyahoga Valley National Park (CVNP) for managing urban farming technology and local food production and supply chain. After considering some alternate theoretical frameworks, we use a case study methodology. It is noted that despite various centralized attempts by federal and state governments to stop the decline of agriculture within CVNP, most historic food producing farms in existence since the 1800s slipped into disrepair and disuse. The Countryside Initiative of CVNP was established in 1999 with an innovative 3P (public-private-philanthropic) partnership between public sector CVNP, private farms, and a not-for-profit Cuyahoga Valley Countryside Conservancy (CV-CC). This 3P partnership involved incentivizing 60-year long-term discounted leases for 13 agricultural farm lands, farm residences, and outbuildings to adopt and diffuse technological innovations for culturally intensive fruit and vegetable production, small intensive grazing operations, and small integrated crop-livestock production. Certified organic food production was encouraged, though not mandated. In this study, selection, growth and impact of family farm enterprises in the green suburban infrastructure in NEO region are investigated in the context of a business model innovation for family farmers. Strategic opportunities and challenges are proposed and discussed. Conclusions are left open for future discussion.

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## **MB-09 Enterprise Management-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Hibari 1**

**Chair(s) Takehisa Seino, Toshiba Corporation**

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## **MB-09.1 [R] How Public-Private Partnerships Co-Crete Value: The Case of Cultural and Creative Industry**

*Kuo-Hao Feng; Kun Shan University, Taiwan*

*Shih-Chieh Fang; National Cheng Kung University, Taiwan*

*Shih Chin Tai; National Cheng Kung University, Taiwan*

*Wen-Shan Lai; National Cheng Kung University, Taiwan*

Public-private partnerships (PPPs) have received considerable attention in the field of public management, business management, and strategy. However, researchers have mostly focused on public policies, public sector reform, and social problems, leaving how PPPs co-create value largely studied. Aiming at theorizing PPPs, this study reviews research on PPPs and value-based strategies, including value co-creation, and explores how PPPs co-create value. In our case study of Hwang Sun Enterprise in cultural and creative industries, we provide an understanding of how the focal firm initiated and governed a PPP with the public sector (Tainan City Government) and academic sector (Kun Shan University Incubation Center), how the firm shifted from the role of manufacturer to service provider, and how the firm combined its core technologies from auto-machinery with salt culture from Anping, and how they co-created value. Based on the introduced framework, we specify a theoretical framework for value co-creation of PPPs and indicate that heterogeneity and public goods characteristics of PPPs have impacts on value co-creation. Combining co-

specialized assets and dynamic capability of focal firm have moderating effects on how PPPs co-create value. Finally, theoretical contributions, implications, and limitations are discussed.

## **MB-09.2 [A] Proposal of 'Manufacturing Technology for Design (MFD)' as a New Concept of Manufacturing Technology Management for New Value Creation**

*Takehisa Seino; Toshiba Corporation, Japan*

*Tomoaki Kubo; Toshiba Corporation, Japan*

*Miki Mori; Toshiba Corporation, Japan*

One of the most important issues in technology management at manufacturing companies is to realize "process innovations" that will improve current activities and business processes in order to produce high-quality, low-cost products, systems, infrastructures and services with a short lead time by fully utilizing manufacturing technologies. Design for manufacturability (DFM) is one of the effective methodologies and concepts aiming at process innovations installing manufacturing knowledge and know-how into product design. To strengthen the competitiveness of manufacturing companies, "value innovations" that create new value for customers and markets are as important as "process innovations". However, DFM often prevents realization of value innovations because it restricts the flexibility of product design. The restriction of product design flexibility disturbs the possibilities of the creation of innovative products, systems, infrastructures, and services. To realize both process innovations and value innovations, a different approach is required. In this paper, "manufacturing technology for design (MFD)" is proposed as a new concept for increasing the flexibility of product design, and manufacturing technology management for MFD is discussed with references to actual applications.

## **MB-09.3 [A] Corporate Business Model Innovation: The Case of Travel Agent**

*Yu-Ting Chang; Yuan Ze University, Taiwan*

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

*Ya-Ti Lin; Yuan Ze University, Taiwan*

*Ching-Ying Yu; Yuan Ze University, Taiwan*

Improvements in electronic information technology and the deployment of the Internet have resulted in the success of e-commerce. Yet the business model of e-commerce must correspond to an ever-evolving Internet business environment. The question remains as to how organizations can establish and innovate their business models to keep up with new Internet technology such as Web 2.0. Few studies have focused on business model innovation. This study uses a qualitative research method to investigate the business model innovations of Lion Travel, the largest travel agency in Taiwan. In-depth interviews and data analyses help identify the major elements of Lion Travel's business model, including phase changes. The results indicate that Lion Travel has made continual efforts in three areas to innovate its business model for information technological revolution. Those three areas are informatization, Web 1.0, and Web 2.0. This paper concludes with future studies and relevant suggestions for business model innovation in the service industry.

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## **MB-10 E-Business-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Hibari 2**

**Chair(s) Janice Carrillo, University of Florida**

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## **MB-10.1 [R] Bargaining for Your Privacy in the Information Age: Systematic Factors Undermining the Equity of User-Company Online Information Transactions**

*Peter Glazer; Portland State University, United States*

*Jonathan R Straus; Portland State University, United States*

Consumer privacy and protection of personal information are among the forefront of emerging complex social issues in the internet age. This growing threat to consumers' safety and security is framed as a systemic problem of structural inequality, specifically one where

# SESSIONS

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consumers are situated in positions of inferior bargaining power compared to the online service providers they engage in personal information transactions with. We propose a host of vestigial societal factors interacting with the turbulently transitional information-based economy, including outdated legal and economic regulations as well as cognitive limitations and cultural preferences among public users, reinforce and exacerbate these inequitable consumer-company relationships. Potential implications on future policy, social changes and directions for future research are discussed.

## **MB-10.2 [R] The Agency Model for Digital Goods: Strategic Analysis of Dual Channels in Electronic Publishing Industry**

*Yinliang (Ricky) Tan; University of Florida, United States*

*Janice Carrillo; University of Florida, United States*

The advent of digital goods has made a significant impact on the current traditional (physical) goods markets for items such as movies, music, video games, and books. Firms that manage both a traditional and a digital goods distribution channels are facing many emerging operational challenges. One of the most pivotal challenges is the supply chain contract model for the distribution of digital goods alongside their traditional counterparts. Recently, the agency model utilized by the e-book publishing industry has been highlighted in the press as a result of the U.S. Department of Justice's lawsuit against Apple, Inc. The regulators claim that the agency model is hurting this industry as well as the consumer's welfare because e-book prices have increased after the introduction of the agency model. We investigate the strategic impact of the agency model by formulating a dual channel model in comparison with the prevalent wholesale model. Contrary to current press presaging the negative impact of the agency model, we find that the equilibrium price of digital goods is lower in the agency model than in the wholesale model. Furthermore, the agency model can mitigate the double marginalization effect of the supply chain and improve the consumers' surplus.

## **MB-10.3 [R] Factors Influencing Online Repurchase Intention: The Case of Clothing Customers in Thailand**

*Ya-Wen Yu; Asia University, Taiwan*

*Shao-Chun Chiu; Asia University, Taiwan*

*Supannikar Chumpoothepa; Asia University, Taiwan*

*James K Chen; Asia University, Taiwan*

The purpose of this study is to explore Thai online customers' repurchase intention towards clothing. This study integrated Delone and Mclean's e-commerce success model to predict customers' repurchase intention to purchase clothing on the Internet. The data was collected using the convenience sampling method with a survey of the customers in Thailand who had experienced purchasing clothing online. The findings indicate that repurchase intention is mostly influenced by both online shopping satisfaction and online shopping trust. The relationships between Internet shopping value and online shopping satisfaction and online shopping trust are found to be significant as well. Components of website quality have differing effects on utilitarian and hedonic value. System quality and service quickness influence the utilitarian value as well as the hedonic value. System accessibility and timely information positively influence utilitarian value, while information variety and service receptiveness have a positive effect hedonic value.

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## **MB-11 Technology Management in Government-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Toki**

**Chair(s) Sara S Grobbelaar; University of Pretoria**

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## **MB-11.1 [R] A Study of the Comprehensive Effects of a Top-Down Policy on UIRs: A Perspective of Principal-Agent Model**

*Peter J Sher; National Chi Nan University, Taiwan*

*Shihmin Lo; National Chi Nan University, Taiwan*

*Joseph L Che; Christ's College, Taiwan*

Seemingly inspired by the U.S. Bayh-Dole Act, many economics in distinctive contexts have been, if by prior agreement, promoting similar technology, and/or UIR-related legislation (university-industry relationships, UIRs), as a means of top-down policy aimed at commercializing results of academic research. Simultaneously, there are considerable studies on the effect of technology legislation and probably got some findings out of the blue. However, very rare exploration was made to raise comprehensive understanding of the top-down mechanism in UIRs rationale. Based on the principal-agent theory, this study attempts to develop a pattern to articulate why and how the effects of top-down policy on activities in UIRs vary with distinctive principal-agent relationship in stakeholders among UIRs. This paper compares main UIRs activities prior and post the introduction of Bayh-Dole-like act in Taiwan, one of major NIEs (new industrialized economies) in Asia, empirical evidences seemingly echo with the inferred model. These findings have profound implications for policy makers and researchers who are interested in exploring the strategies encouraging technology transfer of academic research.

## **MB-11.2 [R] Business Model Analysis for Social Challenges: Integration of MOT and PPP**

*Yu Namba; Toyo University, Japan*

*Koichi Tashiro; JDC Corporation, Japan*

*Norihiko Goto; Takenaka Corporation, Japan*

*Kozo Hara; Taisei Corporation, Japan*

*Hitoshi Abe; Oki Electric Industry Corporation, Japan*

Many governments are facing lack of resources and expecting some forms of public private partnership (PPP) in service provision and infrastructure development. Meanwhile, many public entities have put solving social challenges as a priority in their science and innovation policies. However, both public and private sectors lack knowledge of how the other partners develop policies/businesses, thus often causing failures or mismatches. Abe, Mitsuoka, Nakamura and Kojima introduced and applied MOT frameworks, business modeling and innovation architecture, to explore the possibility of using robot suits in elderly care at PIC-MET 2013. The article aimed to bridge the gap of understanding among public, private and other stakeholders. In this article, we emphasize the importance of matching regional characteristics and technologies in tackling social issues, thus aimed to incorporate regional assessment tools with MOT tools. Cases analyzed are development of a smart community in a tsunami-devastated area and regional medical care in rural Japan. These frameworks will help both public and private sectors to share thoughts/values, analyze their regional resources and develop PPP business models suitable for the region. Consequently, this article finds effectiveness of these tools as well as several issues in applying such analyses to actual policy developments.

## **MB-11.3 [R] Determinants of e-Government Readiness: A Literature Review**

*Nametsegang Boemo-Mokhawa; Portland State University, United States*

*Dundar F Kocaoglu; Portland State University, United States*

In all countries, services are being provided and delivered through the use of information and communication technologies (ICT). Over the past decade, the use of electronic services (e-services) has proved to be efficient and effective in the private sectors providing much needed financial viability and business growth. Governments around the world have since joined the bandwagon, and empirical research provides evidence that countries that have mature electronic government (e-government) systems enjoy improved efficiency and effectiveness in the public service provision and delivery. There are many measurement instruments that measure a country's readiness for use of ICT or e-government, and these measurements are commonly used for comparative purposes at regional, international and global levels. The instruments measure the capacity of a country to use ICT in the provision and delivery of services. This paper reviews these instruments and explores literature on existing methodologies on determining a country's readiness to adopt and use information and communication technologies in public services. The objective of these reviews is to identify critical determinants of a country's electronic readiness (e-readiness).

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## **MB-12 Productivity Management-1**

**Monday, 7/28/2014, 10:30 - 12:00**

**Room: Houmeiden**

**Chair(s) Jan-Harm C Pretorius; University of Johannesburg**

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### **MB-12.1 [A] Lean Agility Implementation and Process Optimisation Decisions**

*Andre Vermeulen; University of Johannesburg, South Africa*

*Jan-Harm C Pretorius; University of Johannesburg, South Africa*

*David Kruger; UNISA, South Africa*

Organizations face many challenges in their battle to survive in the current economic climate. A major challenge facing an organization is the need to change and change rapidly to remain competitive. This imperative to change can be categorized as a key to survival. A major change agent in the current economic climate is the optimization of resources and business processes. Consequently, optimization has become an essential part in the strategy for survival. An important prerequisite in achieving optimization is the elimination of waste and as a result adding value to business processes, products and services companywide. Recent research postulates that to be successful, organizations must implement strategies to boost process optimization objectives that achieve customer satisfaction and competitiveness. This paper explores and investigates the interrelationship between lean agility implementation and process optimization decisions. It particularly focuses on the impact of lean application in terms of speed, flexibility, reliability, quality and cost in an attempt to create value to survive and attain customer satisfaction.

### **MB-12.2 [R] Using DEA to Evaluate Operation Efficiency of Top 10 Global Solar Photovoltaic Companies**

*Shih-Chi Chang; National Changhua University of Education, Taiwan*

*Chun-Yi Liu; National Changhua University of Education, Taiwan*

*Lee-Yun Pan; Feng Chia University, Taiwan*

Experts indicate that fossil fuel depletion may happen in the next six decades. People start to think of the possibilities of developing alternative energy. Among different alternative energy, solar offers the most adaptable application and converts sunlight directly into electrical energy with the highest efficiency. Lots of enterprises then start to launch resources to develop solar photovoltaic (solar PV) technique and thus create fierce competition. Therefore, the importance of operation efficiency in the solar PV industry has been highlighted. In this research, we incorporate four years of financial records of the global top 10 solar PV companies and use DEA that includes technical efficiency, scale efficiency, and evaluation of returns to scale to evaluate each firm's operation efficiency. Results show that only 17.5% of the firms reach the ideal efficiency. Marketing and management expense should be reduced most. Solar PV companies may scale it down and then invest in the vital part of solar PV industry, R&D. Most of the problems of solar PV industry could be solved with technical improvement. This paper renders a global view of operation efficiency evaluation that results from the top global solar PV companies, and thus makes the results more applicable and are worth of referring.

### **MB-12.3 [R] Analysis and Classification of Karakuri Technologies for Reinforcement of Their Visibility, Improvement and Transferability: An Attempt for Enhancing Lean Management**

*Hiroshi Katayama; Waseda University, Japan*

*Kenta Sawa; Waseda University, Japan*

*Reakook Hwang; Samsung Economic Research Institute, Korea, South*

*Norio Ishiwatari; Sankyu Inc., Japan*

*Nobuyuki Hayashi; Sankyu Inc., Japan*

Karakuri technology, a member technology of lean management, is a unique method that aims to contribute to environmental and labor issues by utilizing natural physical phenomena and related useful elemental mechanisms. In recent years, their developed works and application tend to become black box-like due to maniac development as well as technol-

ogy advancement. Recognizing this situation, this paper proposes to utilize a template procedure for effective analysis and improvement of this technology for successful knowledge transfer among experts and beginners. Also, aiming to extract useful information on further development and improvement, it analyses the relations among various elements of this technology by statistical quantification model. An example application is also given for demonstrating the relevance of obtained information.

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## **MD-01 Innovation Management-2**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Ootori 1**

**Chair(s) Jieun Kim; Hanyang University**

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### **MD-01.1 [R] Relationship between Team Diversity and Innovation: The Moderating Effect of Team Leaders' Innovative Characteristics**

*Huei-Mei Liang; National Sun Yat-sen University, Taiwan*

*Rui-Hsin Kao; National Quemoy University, Taiwan*

*Chun-Chieh Yang; National Quemoy University, Taiwan*

*Pei-Yu Chien; National Sun Yat-sen University, Taiwan*

Innovation is an essential condition for enterprises to maintain their competitive advantage. Therefore, many enterprises attempt to find the factors which could achieve innovation. Prior studies have found that team diversity, which includes relation-oriented diversity, task-oriented diversity, and deep-level diversity, plays an important role in team innovation, but the results are inconsistent. Furthermore, we find that team leaders' innovative characteristic has a great impact on team innovation. However, few studies have investigated the moderating effect of team leaders' innovative characteristic in the relationship between team diversity and innovation. Therefore, we regard team leaders' innovative characteristic as the moderator to explore the relationship between team diversity and innovation. In this study, we draw on data from 24 teams in manufacturing and service industries. Finally, the empirical results find that relations-oriented diversity has a positive effect on team innovation, and deep-level diversity has a negative effect on team innovation. Moreover, this finding also shows that team leaders' innovative characteristic has a partly positive moderating effect in this study.

### **MD-01.2 [A] Design of a Methodology for Measuring Technology and Innovation Management on Research Units**

*David Betancur; University Pontificia Bolivariana, Colombia*

*Jhon Wilder W Zartha Sossa; University Pontificia Bolivariana, Colombia*

This initiative proposes a new tool to measure and diagnose technological and innovation capabilities of research groups, based on an existing tool actually being applied to companies. This new option includes important deep-in changes, adapting the language according to the idiosyncrasy of research personnel and institutions. Literature research showed a lack of methodologies that apply directly to research units. After re-design, the developed tool was applied to three research groups/units in a private Colombian university, with interesting findings about strategic thinking, productivity and the group's human and organizational integration.

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## **MD-02 PANEL: Meet the Editors**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Ootori 2**

**Panelist(s) Timothy R Anderson; Portland State University**

**Tugrul U Daim; Portland State University**

**Robert Harmon; Portland State University**

**Steven Walsh; University of New Mexico**

**Gloria Barczak; Northeastern University**

**Fred Phillips; Stony Brook - State University of New York and**

**SUNY Korea**

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Meet the editors of the Technology Management related journals. The editors will be dis-

# SESSIONS

cussing the philosophies, criteria, and submission processes of their journals and answer questions from prospective authors.

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## **MD-03 Intellectual Property-2**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Ootori 3**

**Chair(s) Daemyeong Cho; Hanyang University**

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### **MD-03.1 [R] The Longitudinal Impact of Academic Patenting on Publishing Behavior: Evidences from Taiwan (2001-2010)**

*Tung-Fei Tsai-Lin; National Tsing Hua University, Taiwan*

*Yuan-Chieh Chang; National Tsing Hua University, Taiwan*

*Bernhard R Katzy; CeTIM/University of BW Munich/University of Leiden, Germany*

The paper examines the longitudinal impact of academic patenting on faculty's publications in order to figure out the relationship between industry engagement and public knowledge production. There are few comprehensive and longitudinal studies that investigate the issue. The research framework is elaborated not only for patenting behavior in terms of involvement, productivity, and experience, but also publication characteristics in terms of quantity, quality, and orientations. Based on a panel dataset (2001-2010) from 377 faculties at National Tsing Hua University, the results indicate that academic inventors outperform non-inventors in quantity, quality, applied/basic journal publications, and find a reinforcing effect of academic patenting on publications.

### **MD-03.2 [R] Investigating Technological Innovation Competitiveness by the Use of Patent-Based Indicators: A Global Comparison**

*Jia-Yun Lin; National Chung Hsing University, Taiwan*

*Hsing-Ning Su; National Chung Hsing University, Taiwan*

There has been a rapid change in innovation technological development over the past several decades. Understanding technological development trends, keeping advanced technologies, and acquiring the most inimitable and appropriate technologies are pivotal elements for a country or an organization to maintain its technological innovation competitiveness, but it is rather difficult to evaluate such innovation competitiveness as there is no straightforward way of direct measurement. Therefore, this paper aims to apply selected patent indicators to measure technological innovation competitiveness for global comparison, in order to understand technology development trends, evaluate the technology diffusion trajectories, and understand national technological innovation advantages. The results obtained cannot only serve as evidence for decision making on national science-tech development, but they can also be used as a roadmap for strategic planning of organizational patent portfolios.

### **MD-03.3 [R] Mapping Technological Trajectories as Patent Citation Networks: Taking the Aero-Engine Industry as an Example**

*Yusen Xu; Dalian University of Technology, China*

*Xiaofang Hua; Dalian University of Technology, China*

Technological evolution is considered to be taking place along requirements and selective patterns change, shaped jointly by technological and scientific principles, and economic and other societal factors. Historical, descriptive analysis is often used to analyze trajectory. This paper uses patent bibliometric analysis and patent network analysis to monitor technological trajectories in the field of aero-engine. In this way we can easily recognize genuine paradigmatic changes compared to more regular changes in trajectory. Our aim is to identify when such changes took place in different generations of technological advances this industry has seen. Combined with the empirical research of the aero-engine industry, we not only explain the dynamic identification method of technological trajectory but also describe the process of technology changes in detail. These results first reveal different aspects of patenting activities in aero-engine field. Then, patent network analysis indicates the developmental tendency of worldwide aero-engine production based on different technology backgrounds. Furthermore, key technologies can be identified which provide the

opportunity to improve the efficacy in the path of main-stream technology for enterprises.

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## **MD-04 Software Process Management-1**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Zuim 1**

**Chair(s) David Raffo; Portland State University**

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### **MD-04.1 [A] An Analysis of Exploration and Exploitation of Technological Knowledge for Software and Service**

*Akira Ioku; Tokyo Institute of Technology, Japan*

This paper argues how firms explore and exploit technological knowledge for software and service through quantitative analysis. The present investigation deals with quantitative measurements of patent information in firms of the telecommunication industry and software industry in Japan. Based on patent information related to R&D alliance, technological diversity, or technological fusion in the firms, the status of exploration and acquisition of technological knowledge in the firms is described. The items that the author used to describe the activities were as follows: joint patent application, IPC (International Patent Classification) code allocated for each patent, co-occurrence of the IPC among several patents, and so on. By referring to the relationship among patent information, from the perspective of balancing exploration and exploitation in organizational learning, the author grasps the technological trend and the activity of competitions about the concerned industry, and the applicable strategic technology management is also discussed.

### **MD-04.2 [A] Issues and Formulas for Sustainable Profitability of an Embedded Software Business**

*Tomoki Kono; Omron software Co., Ltd, Japan*

*Atsushi Aoyama; Ritsumeikan University, Japan*

*Chugo Matsumoto; Omron software Co., Ltd, Japan*

*Eriko Takeo; Omron software Co., Ltd, Japan*

*Kohei Takahashi; Omron software Co., Ltd, Japan*

Making a continuous stable profit is one of the most important activities for the enterprises as profit-making organizations. Moreover, industries which mainly perform development without performing manufacturing or selling products, especially the embedded software enterprises, must make a steady profit from each development to make the continuous stable profit, and profit variation causes a threat to the stable business management. However, in the embedded software development business, which is in the midway stage of the development of industrialization, the profit variation is wide for some development items. The big issues in embedded software enterprises are how much can the width of the variations in profits distribution straiten and profit ratio increase. In this study, the purpose is to show the formulas of producing stable profit and high profit ratio by generating a hypothesis and its verification to the variation factors of profit ratio. Further, we specified some models during the validity confirmation of hypothesis by verifying various data of the past embedded software development.

### **MD-04.3 [A] Scrum and Embedded Software Development for the Automotive Industry**

*Ricardo Y Takahira; Magneti Marelli - Electronics Division, Brazil*

*Lilian R Laraia; USP - University of Sao Paulo, Brazil*

*Frederico A Dias; USP - University of Sao Paulo, Brazil*

*Abraham S Yu; USP - University of Sao Paulo, Brazil*

*Paulo T Nascimento; USP - University of Sao Paulo, Brazil*

*Alceu S Camargo Jr.; USP - University of Sao Paulo, Brazil*

Embedded software is becoming a key buying criterion for new vehicle customers. Workshops, conferences and presentations worldwide are showing that SCRUM methodology is increasing software development speed. So far SCRUM has seen little application in the automotive industry where V-model, a more rigid methodology, is dominant. Scientific journals have not been sensitive to the opportunity of speeding up the embedded software



# SESSIONS

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development by applying SCRUM methodology. The purpose of this study is to provide a first-hand investigation about the factors that may speed up the development and integrate SCRUM with the regular methodology in the automotive industry. The challenge is to find the best framework to combine SCRUM and the V-model for the systems engineering process. Both should be together applied, as a hybrid methodology, to keep the accepted levels of quality and safety powertrain requirements.

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## **MD-05 Project/Program Management-1**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Zuiun 2**

**Chair(s) Hans J Thamhain; Bentley University**

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### **MD-05.1 [R] Front End Project Planning for the Power Sector in Africa: A Conceptual System Dynamics Model**

*Noah O Ogano; University of Pretoria, South Africa*

*Leon Pretorius; University of Pretoria, South Africa*

Developing countries offer abundant opportunities for high return and high growth potential investments, such as in critical energy sector infrastructure projects. In Africa, major projects are presently in progress to upgrade and refurbish the infrastructure in the energy sector, and especially in the electricity energy sub sector. However, many of these projects run into delays, quality problems and cost overruns which, amongst other causes, are attributed to inadequate time and resources spent in the initial pre-planning and planning phases of these projects. This research focuses on electricity infrastructure projects in Africa using the system dynamics approach. From the literature, the paper explores and discusses theories, methods and models previously developed to better manage projects, including how these models are to be used to derive a model beneficial to energy sector projects in Africa. The results of the research will help in reducing uncertainty in projects in Africa and other developing countries, and they will be beneficial to energy sector players, including investors in the energy sector. This paper presents results of a literature review in this area as well as the initial systems thinking in model building. The research uses a system dynamics approach employing Vensim software in model building and analysis.

### **MD-05.2 [R] Development and Verification of a Conceptual Framework for Project Manager-To-Project (PM2P) Allocations in Multi-Project Environments**

*Lone Seboni; University of Leeds, United Kingdom*

*Apollo Tutesigensi; University of Leeds, United Kingdom*

This research is a follow-up from an empirical study that demonstrated that the current process of allocating project managers to projects (PM2P) in Botswana's multi-project environments is ineffective. The purpose of the current study is to develop a conceptual framework for the PM2P allocation process that can be used as a theoretical lens to study this process in more depth. A critical appraisal of the limited literature on the specific topic of project manager allocation models, including cognate fields of broader theories associated with this specific topic, was conducted and encapsulated into the construction of a generic conceptual framework in terms of all the relevant inputs, as part of verification from the source of evidence in the literature that supports each input. The second source of evidence for verifying the developed conceptual framework, which is out of scope for this study, will come from application of the model in practice to ascertain that the emerging data from its application does not result in significant structural modifications of the developed framework. Literature searching and management strategies such as cited reference searching were used during critical appraisal of literature. Really Simple Syndication (RSS) feeds and publication alerts for relevant articles were set up and reviewed, followed by content and thematic analysis of the secondary data that were used to construct the conceptual framework. The resulting conceptual framework, which incorporates broader theories supporting each input, is considered a contribution in terms of extending the understanding of existing but limited literature associated with this topic.

### **MD-05.3 [R] Challenges in Procurement of Engineering Services in Project Business**

*Florian Steinmann; FAU Erlangen-Nuremberg, Germany*

*Kai-Ingo Voigt; FAU Erlangen-Nuremberg, Germany*

*Thomas Schaeffler; Siemens AG, Germany*

*Jan Vollmar; Siemens AG, Germany*

In plant construction, business engineering has an outstanding influence on project success. Thereby, a plant is usually provided by a general contractor as a turnkey solution. However, to win these projects, the general contractor is depending on external engineering service providers. The reasons are, e.g., missing expertise in non-core-competence activities, lack of staff or too high costs of internal personnel. Thus, specialized companies are offering engineering services. But purchasing engineering services is a challenge because there are many stakeholders with different goals. This paper analyzes the main characteristics and challenges in purchasing engineering services. It is shown that, especially the description of the engineering, demand is a key element. The contract design and the service execution are based on the specification of the demand. But due to time pressure and established structures, the accuracy of specifications and with that the contract design is neglected more and more.

### **MD-05.4 [R] A Multi-Criteria Project Assessment Framework for R&D Organizations in the IT Sector**

*Nermin Sokmen; TUBITAK BILGEM, Turkey*

The project selection is one of the most important problems in information technology (IT) organizations. Project evaluation criteria with the assigned weights are used to evaluate, prioritize and select projects. Project evaluation criteria should be aligned with the specific objectives of the organization and accurately reflect the opinion of experts. The purpose of this paper is to present a multi-criteria project assessment framework for R&D organizations in the IT sector. The paper first generates a two-dimensional project selection framework which consists of project scoring and risk assessment hierarchies. The project scoring hierarchy consists of eight scoring criteria, namely, strategic criteria, financial criteria, marketing criteria, technological criteria, human resources criteria, organizational criteria, development process criteria, and environment criteria. The project uncertainties are calculated by threats caused by eight major factors, namely, technology factors, financial factors, marketing factors, human resources factors, organizational factors, development process factors, customer/user factors, and outsourcing factors. In this study, the judgments are elicited from 20 experts by using a pairwise comparison matrix and aggregated by taking the geometric mean of the individual judgments. The analytical hierarchical process (AHP) is applied to calculate the relative importance of each criterion and sub criterion.

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## **MD-06 TUTORIAL: The World of Business Games**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Chidori**

**Speaker(s) Amnon Gonen; Holon Institute of Technology - HIT**

**Eyal Brill; Holon Institute of Technology - HIT**

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Business games are usually an improved way to learn, in an exciting, novel and competitive way, the business world. The participants can turn a business plan into real-time decisions, examine their decisions, and learn from their own success or failures in a competitive environment. The tutorial will introduce the business game's theory and methodology, using a website business game simulation called "Decision Makers" to present the business decisions of firms. Decision Makers is an Internet-based business learning simulator that enables participants to practice their ability to make business, technology and management related decisions in simulated real-life situations. It enables the instructor to individually monitor the progress of each group, to control the level of the simulation's complexity, and to intervene at crucial points. The tutorial's objective is to introduce new approaches in business games.

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## **MD-07 Manufacturing Management-1**

# SESSIONS

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Shirasagi 1**

**Chair(s) Neslihan Alp, University of Tennessee at Chattanooga**

## **MD-07.1 [A] Application of Six Sigma in Small Company**

*Fernanda Amtrano; Federal University of Technology of Parana, Brazil*  
*Ligia de Oliveira Franzosi; Federal University of Technology of Parana, Brazil*  
*Carla Cristina Amodio Estorillo; Federal University of Technology of Parana, Brazil*  
*Kazuo Hatakeyama; Educational Society of Santa Catarina, Brazil*

Six Sigma has been used by large companies to improve the performance of their manufacturing processes. However, the interest and the application of this methodology in small and medium size companies is something emerging, despite being little widespread in the literature. This article shows the applicability of Six Sigma in a small Brazilian company, explaining the application strategy and its impacts. The work presents a review about Six Sigma and DMAIC (define, measure, analyze, improve, and control) method, which had been mostly successful so far in large companies and is suitable for this case, and shows the particularities of small business that could have some impact in this application. Then, details of the application of Six Sigma with DMAIC in a small company of surface treatment of metal parts are discussed. The article shows the feasibility, applicability, and impact of Six Sigma in this small company, which achieved the reduction of rework in approximately 20% on the zincifying process.

## **MD-07.2 [A] Creating 5S Climate at the Shopfloor**

*Murat Ayabakan; Aisin Otomotiv Parcalari San Tic AS, Turkey*  
*Ozgur Eken; Aisin Otomotiv Parcalari San Tic AS, Turkey*

Lean manufacturing involves a variety of principles and techniques, all of which have the same ultimate goal: to eliminate waste and non-value added activities at every production or service process in order to bring the most satisfaction to the customer. Lean manufacturing is a systematic approach in order to identify and eliminate waste (non-value-added activities). For companies to successfully implement lean, it is very much required that they maintain a proper 5S condition in the whole organization. The "5S" is the vital requirement to make all operations standard whereas it helps to point out the continuous improvement areas. This paper presents an approach for adapting 5S techniques in a production facility and gives a complete guide about a systematic method. Due to increased demand, high product variety, and a push production system, the plant has suffered from excessive waste, unorganized workstations, and an unhealthy work environment. This has translated into increased production cost, frequent delays, and low workers morale. Under such conditions, it has become difficult to implement effective continuous improvement studies. 5S is utilized for achieving project objectives. The work was a combination of both culture changes and physical changes on the shop floor. The project has drastically changed the plant and developed the infrastructure for a successful implementation of lean manufacturing studies.

## **MD-07.3 [A] Cooling and Heating Times of Apparatus in the Steel Industries: Effects on Production Planning, Control, and Maintenance Performance**

*Rubens A Reis; Federal Institute of Parana, Brazil*  
*Rui F Marcal; Pontifical Catholic University of Parana, Brazil*  
*Kazuo Hatakeyama; Federal University of Technology of Parana, Brazil*

This paper states and alerts over the overall and attribution of cooling and heating times of apparatus or furnaces as the indicators utilized for the assessment of the maintenance performance and production planning. It states that, where the variable temperature is present in any hot processing apparatus of the steel industries, the maintenance group should act integrated with production in order to adequate the planning practices sharing the responsibilities. The time of apparatus stoppage or operational unavailability for production does not follow the standard and attribution as an indicator for the "time taken to repair" or the "time without production", which depends on the cause of the needs to stop. In the case of maintenance process such times are recorded as the total time of intervention. Through

the survey it was possible to assert that the cooling and heating times are not considered separately. Ratios between the total time of stoppage with cooling time, repair maintenance time, and heating time ready for production were investigated. The conclusion of the study shows that integrated planning is an important factor for optimized planning and control for the efficacy of production output of the company.

## **MD-08 Competitiveness in Technology Management-1**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Shirasagi 2**

**Chair(s) Yufen Chen; Zhejiang Gongshang University**

## **MD-08.1 [A] Method to Detect Critical Characteristics of Light Construction Products from the Voice of Customer**

*Rodrigo E Aguirre Albas; Panel Rey, Mexico*  
*Silvia L Olivares-Olivares; Tecnologico de Monterrey, Mexico*  
*David Guemes-Castorena; Tecnologico de Monterrey, Mexico*

In the construction sector it is important to have continuous improvement and innovation of products due to the continuous change of market trends. To remain competitive, it is necessary to identify customer needs and translate them into technical product characteristics. This research aims to determine the critical characteristics of light construction products from the voice of the customer, based on a specific product from the family of joint compounds. To achieve the objective, a combination of interviews and observation techniques are used to obtain customer feedback; then, affinity diagrams are used for grouping and classification of comments; finally, these comments are organized and translated into critical characteristics of a product by using a matrix based on the QFD "House of Quality." The principles applied in this matrix are the difference between negative and positive comments, customers' priorities of the given comments, and comparison of product development against other manufacturers. Product monthly average shipments will be measured for the validation of the effectiveness of the method.

## **MD-08.2 [A] Review of Industrial Competitiveness and Growth of Solar Firms in India: Exploring role of Technology Management and Policy**

*K. S Momaya; Indian Institute of Technology, India*  
*Sanjeev Chachondia; New Silk Route advisors, India*

Emerging technologies can provide an opportunity to enhance industrial competitiveness (IC) for a new player focused on that sector. The players can be broadly classified as pure players focused on just one part of value chain and integrated players. The key objective of our study is to make sense of evolving dynamics as India tries to re-explore the potential of renewable energy to minimize climate change. More specifically, we examine the impact of policy intervention on attractiveness, capability and select performance of the Solar PV industry. We adapt an exploratory case-study approach to identify select polar cases among a sample of focal firms. External generic benchmarking on select performance factors such as cost and financial hints at rapid loss of IC with policy intervention (phenomenon has similarity to telecom). Efforts are made to understand the problem and its root causes to ascertain if technology management related causes are also there and at what level? Findings hint at significant root causes at the firm or group level. Country level policy-related causes are also important for competitiveness at the industry level. We evolve several implications and areas for further research.

## **MD-08.3 [R] Assessing Long-Term Country-Specific Sourcing Risk Using J-Curve Openness-Stability Analysis**

*Ray R Gehani; University of Akron, United States*

In managing many technologies, supply-chain sourcing accounts for a large share of the total cost of goods sold (COGS) that drives the competitive advantage of a multi-national enterprise (MNE). To gain significant COGS advantages in the short-term, many technology-intensive MNEs collaborate some parts of their value-adding activities with the developing and emerging economies that offer low wages and large labor pools. These low-cost countries, however, have some hidden long-term sourcing risks as well. Until recently,

# SESSIONS

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there has been nascent research and no comprehensive models available for assessing such long-term sourcing risks. Many prior studies on modeling supply-chain risk implicitly assume global convergence rather than exploring national specificity, though supply-chain managers are increasingly concerned with country-specific risks. This study, therefore, fills an important gap in research literature by applying Ian Bremmer's J-Curve Openness-Stability model to two illustrative applications: (A) sourcing from a low-cost country such as India, and others, and (B) sourcing of oil and gas from the Middle East. An additional contribution was made with an innovative way to qualitatively assess the long-term sourcing risk for BRIC (Brazil, Russia, India and China) countries and eight low-cost countries, relative to the U.S. In conclusion, research limitations are reviewed and some managerial and policy implications are proposed.

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## **MD-09 Technological Changes-1**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Hibari 1**

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

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### **MD-09.1 [R] Understanding the Dynamic Nature of Technological Change Using Trajectory Identification Based on Patent Citation Network in the Electric Vehicles Industry**

*Fei Yuan; Tokyo Institute of Technology, Japan*

*Kumiko Miyazaki; Tokyo Institute of Technology, Japan*

Since the 1990s, electric vehicles (EV) have experienced a significant rate of growth marked by a continuing period of significant technological change. It is argued that technological changes have been taking place along ordered and selective patterns in the potential paradigmatic shift of EV evolution. A patent based method is employed in this research to observe the technology evolution and to identify the dynamic changes of technological trajectories by applying network-based methodologies to patents and patent citation. Compared with the previous literature on technological trajectory research, which conducted a historical descriptive analysis alone or considered the technology development process as a whole without dividing different phases to identify the dynamic technological trajectory, this paper highlights the dynamic nature of technological evolution in the development process and improves the accuracy of analysis of the key technological trajectories. Together with the empirical study on the technology evolution of EV, this paper not only proposes a dynamic identification method of technological trajectory, but also describes the process of technology changes in detail. In addition, this approach helps to position the development path of an object technology and thus is utilized in designing the R&D strategy for the enterprises, countries and regions.

### **MD-09.2 [R] The Roles of Enjoyment and Shared Goals as an Integration Mechanism Between Transactive Memory System and Ambidextrous Innovation in Open Innovation Teams: An Exploratory Study on Cross-Field Student**

*Cheng Pa Lin; National Cheng Kung University, Taiwan*

The development of an effective and efficient mechanism to approach ambidextrous innovation plays an important role in interdisciplinary learning. The mechanism under consideration is comprised of enjoyment and shared goals. Enjoyment makes teammates feel comfortable with regard to learning, and shared goals help them focus in the same direction. With the support of a transactive memory system, we attempted to verify relationships involving whether or not these two powerful roles of integration mechanisms enhance learning attitudes and lead teammates to both improve existing knowledge and acquire new knowledge and, in turn, lead to the development of ambidexterity. Therefore, we adopted purposive sampling and received 36 responses from questionnaire surveys in the Promotional Program for Cross-Field Creative Scenario Value-Adding of the National Science Council in Taiwan. The results verified only that the role of enjoyment serves a function as a significant mediator between transactive memory systems and ambidextrous innovation.

### **MD-09.3 [A] Technological Dynamics: An Empirical Study in Mobile Telecommunications**

*Hsiao-Chen Mei; Precision Machinery R&D Center, Taiwan*

*Shihmin Lo; National Chi-Nan University, Taiwan*

*Peter J Sher; National Chi-Nan University, Taiwan*

The mobile communication market presents drastic technology changes from the first generation (1G), second generation (2G), third generation (3G) and next fourth generation (4G) in progress. This study investigates the impact of technological change on a firm's development of capabilities in the context of mobile telecommunications. We propose instability of technology scope—the diversity and ranking of patent classes of the industry over time—to measure technological changes. In a total of 21 firms and their 286,953 patents related in the field of mobile telecommunications, empirical results show that firms would tend to concentrate technological portfolio in addressing technological change.

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## **MD-10 Disruptive Technologies-1**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Hibari 2**

**Chair(s) Yi Ruan; National University of Singapore**

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### **MD-10.1 [R] The Influence of Regulation and Disruptive Potential on the Entrants' Motivation and Ability within the Context of a Network Industry**

*Stefan Huesig; University of Regensburg, Germany*

*Katalin Timar; TSG - Telekom Shop Vertriebsgesellschaft mbH, Germany*

*Claudia Doblinger; University of Regensburg, Germany*

This paper explores how regulation affects the motivation and ability of entrant firms to create successful new sub-markets that are shaped by a potential disruptive innovation. We focus on the telecommunication industry, particularly on the hotspot sub-market, to study these effects in the context of a network industry. In this setting, the impact of a potentially disruptive innovation might be different because of the institutional embeddedness of incumbent and entrant firms. We examine this phenomenon by analysing the entrants' strategies and success of market entry into the hotspot sub-market in 17 Western European countries. The results indicate that the sub-market success of entrants in regulated markets depends both on the regulation and the resistance of incumbents to regulation in a specific country. The findings from this paper further contribute to the general understanding of disruptive innovation, suggesting that regulation can be a more powerful force than the nature of the innovation itself on market outcomes. Finally, for Western Europe's telecommunication industry, our results show a predominately sustaining innovation character of WLAN used as public hotspots.

### **MD-10.2 [R] How to Analyze the Disruptive Potential of Business Model Innovation in Two-Sided Markets?: The Case of Peer To Peer Lending Marketplaces in Germany**

*Sabine Pur; University of Regensburg, Germany*

*Stefan Huesig; University of Regensburg, Germany*

*Hans-Georg Mann; Roland Berger Strategy Consultants, Germany*

*Christoph Schmidhammer; Deutsche Bundesbank University of Applied Science, Germany*

Since the financial crisis, established banks have to deal with different challenges. The lack of confidence of bank customers in established banking business models leads to increasing interest in alternative solutions and models in the financial industry. In the area of personal and small business loans and investment, peer to peer (p2p) lending offers an online-based transparent granting of credits between individuals without much need for traditional banking services. These p2p lending marketplaces provides private lenders and investors a more user-centric and interactive digitization of their lending and investing operations. Therefore, the questions arise whether p2p lending represents a disruptive threat for established banks and how the disruptive potential can be analyzed in this context. Since previous approaches did not pay enough attention to the business model aspect linked to

# SESSIONS

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disruption in services, we propose further improvement, especially in the case of two-sided markets which might display different levels of disruptive potential on each market side. We illustrate this enhanced theoretical approach by applying it to the case of p2p lending marketplaces in Germany. Finally, we provide a modified method and research implications together with managerial options for the future of the retail banking industry in the German context. Future research should analyze this approach in other contexts such as other p2p lending markets or similar industries.

## **MD-10.3 [R] Disruptive Innovation and the Two Views of Entrepreneurial Opportunity**

*Chang Chieh Hang; National University of Singapore, Singapore*  
*Elizabeth Garnsey; IFM/Cambridge University, Great Britain and Northern Ireland*  
*Yi Ruan; National University of Singapore, Singapore*

In view of the importance of disruptive innovations (DI) in both emerging and advanced economies, a better understanding of opportunities for disruptive innovations is called for. We provide case study exemplars that illustrate how entrepreneurs have undertaken disruptive innovations for customers of low-end and new markets. These are innovations that have the potential to be disruptive but perceiving and acting on opportunities to innovate in this way is problematic. By extending research on the generation of entrepreneurial opportunities into the arena of disruptive innovations, the paper aims to contribute to understanding of both DI and the nature of opportunity generation and to provide a basis for guidance to practitioners.

## **MD-10.4 [R] Creative Destruction in Clusters: From Theory to Practice, the Role of Technology Gatekeepers, Understanding Disruptive Innovation in Industrial Districts**

*Jose Albors-Garrigos; Univ. Pol. Valencia, Spain*  
*Jose Luis Hervás-Oliver; Univ. Pol. Valencia, Spain*

The industrial district (ID) literature assumes that technology gatekeepers (TGs) shape the district learning process and its evolution. However, the analysis of the TGs' resilience is absent. Instead, most of the evidence provided is set at a single point in time and considers only one stage of the cluster life cycle (CLC). This paper introduces into the discussion two important influences in order to analyze the dynamics of TGs and the ID evolution: the type of knowledge created (whether it is disruptive or not) in the cluster and the TG resilience across different stages of the CLC. This work responds to the gap that not much is known about the persistence of the TGs across different stages of the CLC. Using qualitative longitudinal case-study research, a world-class ID is analyzed over the last 20 years. The results show that there are new technological gatekeepers when it is a question of bringing in disruptive knowledge. Put differently, incumbent TGs are resilient but unable to create disruptive technologies in order to renew IDs, being more focused on the introduction of sustaining technologies. Results also shed light on the understanding of radical innovation in IDs, a fact almost neglected in the literature.

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## **MD-11 Technology Diffusion-1**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Toki**

**Chair(s) Etta Y. I. Chen; Yuan Ze University**

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## **MD-11.1 [R] Exploring the National Role and Position of International Technology Diffusion: A Technological Embeddedness Perspective**

*Hung-Chun Huang; Institute for Information Industry, Taiwan*  
*Tsung-Han Ke; Institute for Information Industry, Taiwan*  
*Hsin-Yu Shih; National Chi Nan University, Taiwan*  
*Tung-Lung Steven Chang; Long Island University, United States*

The international diffusion of technology is one of the most important topics in economics and technology policy research. Countries participating in a global network demonstrate interdependence and mutually influence one another. Characteristics in network structure

indicate the complexity of the overall network configuration. This study uses social network analysis to investigate the structural configuration of international technology diffusion. This research utilizes a collective behavioral analysis of social embeddedness to reveal a country's role and position as factors in international technology diffusion. Role and position analysis categorize network actors based on behavioral performance in regards to technology mobility source, transmitter, and receiver processes. This analysis provides insights into the global technological embeddedness of countries, and also proposes a technological development perspective for global network embeddedness. The study results not only identify the competitive position of countries in the global network, but can also provide policy makers with a new perspective in exogenous technological growth.

## **MD-11.2 [R] After-sales Service and Local Presence: Key Factors for Solar Energy Innovations Diffusion in Developing Countries**

*Kassahun Y Kebede; Ritsumeikan University, Japan*  
*Toshio Mitsufuji; Ritsumeikan University, Japan*  
*Eugene K Choi; Ritsumeikan University, Japan*

In this study, we have investigated the practice of an international network of companies and organizations which are engaged in the diffusion of solar home systems in Africa and Asia. This research looks into a network called StS Network for Rural Development in Ethiopia. To investigate the details of the network, the local business managers and governmental officers were interviewed. Our case study explored that the network (registered first as an NGO in Ethiopia through its Solar Energy Foundation) has managed to surpass other companies and even MNCs for its relatively unique approach aimed at the diffusion of rural solar home systems in Ethiopia. Furthermore, it is identified why the NGO has managed to diffuse a relatively larger volume of solar energy innovations than other competitors, which is mainly related to its effort of building trust among the local community through its after-sales service and local solar centers. This case study provides both policy makers and business managers with practical implications.

## **MD-11.3 [R] Mining Innovation Opportunities for Handheld Device Cases Using the Fuzzy Next Method**

*Chih-Hung Hsieh; Yuan-Ze University, Taiwan*  
*Yu-Han Chen; Yuan Ze University, Taiwan*  
*Yung-Chin Wu; Yuan-Ze University, Taiwan*

Many handheld devices, such as the smartphone and tablet, have become vital to many people's daily lives. Thus, identifying innovation opportunities for these handheld devices is important for academics and practitioners alike. In this study, we proposed a novel method - the Fuzzy NeXT method - for measuring the gaps between users' demands and technological availabilities, as well as possible ways to fill these gaps. To this end, we performed a literature review to identify criteria systems. Then, we evaluated current available products by assessing customer needs and core technologies. Finally we conducted a panel discussion to propose strategies to fill these gaps. The results showed that the Fuzzy NeXT method not only precisely measured the gaps between user demands and technological availabilities, but also stimulated participation and interaction between suppliers and customers. We postulated that this method may trigger additional co-innovation activities and can be useful for many applications, such as corporate foresight and service foresight.

## **MD-11.4 [R] Analyzing Technological Knowledge Diffusion Among Technological Fields Using Patent Data: The Example of Microfluidics**

*Zheng Qiao; Beijing University of Technology, China*  
*Lucheng Huang; Beijing University of Technology, China*  
*Feifei Wu; Beijing University of Technology, China*  
*Dan Wu; Beijing University of Technology, China*  
*Hui Zhang; Beijing University of Technology, China*

Study of technological knowledge diffusion can provide a basis for R&D planners to invest in new R&D projects with a proper direction. In this paper, we introduce a modified method to analyze the diffusion degree of technological knowledge among different technological



# SESSIONS

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fields using patent data at the technology patent class level. This method first generates a patent citation network related to a specific research area and then establishes a technological field diffusion matrix according to the concordance between the patent document and the corresponding patent class. After that indicators are set up to measure the diffusion degree of the technological field from two aspects of diffusion depth and breadth, and then we discern the diffusion types of typical fields. Finally, we conduct microfluidic technology as a case study to prove the feasibility of the method.

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## **MD-12 Technology Adoption-1**

**Monday, 7/28/2014, 14:00 - 15:30**

**Room: Houmeiden**

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

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### **MD-12.1 [R] What are the Core Drivers in Consumer Adoption of NFC-Based Mobile Payments?: A Proposed Research Framework**

*Thanh-Thao T Pham; Yuan Ze University, Taiwan*

*Jonathan C Ho; Yuan Ze University, Taiwan*

The rapid evolution of mobile technologies and the increasing diffusion of smartphones have given significant opportunities for innovative companies to create new payment solutions and offer value-added services to their customers. Near Field Communication (NFC) mobile payment has been emerging as a noticeable phenomenon that can enable consumers to turn their smartphones into digital wallets. Although there has been a lot of coverage on consumer acceptance of mobile payments, there are only few researches providing guidelines to interpret NFC-based mobile payments adoption. Taking into consideration the theoretical backgrounds of innovation diffusion and specific characteristics of NFC mobile payments, this study propose a research framework to provide a profound understanding of factors facilitating or impeding the adoption of NFC-based mobile payments among Taiwanese consumers. This study expects that intention to adopt NFC mobile payments is affected by product-related factors (perceived usefulness, perceived ease of use, compatibility, perceived security and privacy risk, trialability, perceived cost of use and additional value of NFC mobile payment), trust-based factors, personal-related factors (personal innovativeness in new technologies, absorptive capacity), and attractiveness of alternatives. This study will be able to advance literature on innovation adoption and facilitate technology marketers in NFC mobile payments. It provides a useful guideline to help researchers investigate issues related to NFC mobile payments. It also brings some managerial implications by assisting relevant parties in NFC mobile payments ecosystem such as mobile network operators, card issuers, payment processing institutions, bank decision makers and merchants when devising their business strategies and marketing campaigns to facilitate NFC mobile payments.

### **MD-12.2 [R] Factors Influencing the Use of Mobile Financial Services: The Extended Technology Acceptance Model**

*Feng-Shang Wu; National Chengchi University, Taiwan*

*Yung-Shen Yen; Providence University, Taiwan*

*Chien-Hsin Wu; National Chengchi University, Taiwan*

Mobile service innovation has become a critical issue in the financial sectors. Currently, many banks in Taiwan have developed various mobile services for their customers. However, mobile services in financial sectors are different from Internet services because of the mobility. First, mobile services enable mobile extensions of existing electronic services and new services that are valuable to users on the move. Second, most people have their own, personal mobile devices in the hands, but they may not have the computers with them anytime. Although consumers' technology acceptance has been examined in the context of e-commerce, mobile financial services have gained scant attention. Thus, this study aims to explore the factors influencing the use of mobile financial services (MFS). We conducted a qualitative research in depth, and investigated a renowned bank in Taiwan which developed various MFS for customers. The findings reveal that mobility and personal habit are two important antecedents influencing the use of MFS. Mobility positively affects perceived

ease-of-use and perceived usefulness, which in turn influence the use of MFS. Furthermore, personal habit positively affects the use of MFS.

### **MD-12.3 [R] Investigating the Innovation Resistance of Smart Phone Usage in Taiwan**

*Mavis Tsai; Shih Hsin University, Taiwan*

Taiwan is one of those countries with fairly high mobile phone and smart phone penetration. By 2009, Taiwan's mobile phone penetration was hovering near 110%. By June 2013, more than 45% of Taiwanese over the age of 13 owned smart phones. However, there are still some Taiwanese intentionally refusing to accept this new product of technology innovation, the smart phone, for different reasons. In this paper, the researcher launched in-depth interviews with traditional mobile users who refused to accept the smart phone when choosing their "new" mobile phone. The researcher also added some quantitative survey data to ascertain those factors which may relate to innovation resistance of smart phones. This study shows that besides the much higher price of a smart phone, there were still many factors which caused consumers to refuse the new technology. Those reasons include: a fear of the complexity of smart phone functions, a preference toward being free from the perceived bother or time consumption, a contentedness with their traditional mobile phone, as well as personal perceptions and poor impressions regarding smartphone users. In sum, researchers not only need to know why and how consumers accepted smart phones but also why and how they refused to adopt smart phones.

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## **ME-01 Innovation Management-3**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Ootori 1**

**Chair(s) Marcelo A Machado; Kwantlen Polytechnic University**

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### **ME-01.1 [R] Crowdsourcing in the Fuzzy Front End of Innovation**

*Maks W Gutierrez Rocha; Universidade de Sao Paulo (USP), Brazil*

*Abraham S Yu; Universidade de Sao Paulo (USP), Brazil*

*Paulo T Nascimento; Universidade de Sao Paulo (USP), Brazil*

This paper presents the different ways in which crowdsourcing could be adopted in the context of innovation. We then focus on its potential use in the fuzzy front end (FFE). An extant literature review allows us to identify the main success factors, issues, and challenges that should be considered if crowdsourcing is to be implemented into the FFE. We discuss what conditions could encourage or constrain its use as a strategic alternative in a more generalized way in the near future. Our study led us to many questions not yet explored in the research of crowdsourcing, considering its specific use in the FFE. This paper contributes to the incorporation of non-traditional means in the management of innovation because it proposes ways to integrate the theoretical and empirical findings about crowdsourcing with the management of the fuzzy front end. We also suggest some alternatives for further empirical research.

### **ME-01.2 [R] Moderating Effects of Customer Co-creation and New Product Performance in the Travel Industry**

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

*Ya-Ti Lin; Yuan Ze University, Taiwan*

Recently, it has been proposed that customers, in particular lead users of a product or service that co-create new products/services may enhance the success of those products/services. However, some research does not support this idea. Therefore, the present study re-examined this notion in the Taiwan travel industry. Well-known travel bloggers can be considered both lead users and co-creators of specified trip itineraries (here, specified trip itineraries) developed by travel agencies. A literature review, observations of the interactions among bloggers and their readers, and interviews of bloggers and managers of travel agencies are used to explore moderating factors of the effects of product co-creation on product performance; hierarchical regression analysis was used to determine the influence of these factors. The results indicate that the relationship between customer co-creation

# SESSIONS

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and the new travel products' performance is contingent upon the moderating effects of organizational culture and communication quality.

## **ME-01.3 [R] An Exploratory Research of Business Model: Case Study on Taiwan Technological Industries**

*Cheng-An Tsai; Shih Chien University, Taiwan*

*Li-Hung Cheng; Shih Chien University, Taiwan*

Taiwan is currently facing the challenge of industry upgrading, transformation of high-tech industry and services internationalization. Business model innovation is the key issue for Taiwan's industry. This paper reviews the literature over the past years and proposes an integrated conceptual framework which defines the business model as value proposition, value creation, value delivery, and value acquisition. We use the case study method to analyze a synthetic rubber company and identify two types of business models, namely the "Best Product" model and "Total Solution" model. "Best Product" model is to provide the best products with competitive features, whereas value creation and value delivery are separated and customers will not perceive the value of the transaction until they have access to the product. Thus, the value of products in the market is the major factor for a company's profits. The latter is to solve the specific problems of customers. While engaging in the problem solution, a company makes profits by co-creation, delivery and recognizes value with customers. Finally, this paper analyzes the relationship of these interactions to explore the different characteristics of the operation of the business model. Thus, enterprises can follow the procedures of continuous improvement and innovation of their business model, which can create hard-to-imitate competitive advantages.

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## **ME-02 Knowledge Management-2**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Ootori 2**

**Chair(s) Kiyoshi Niwa; The University of Tokyo**

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### **ME-02.1 [R] Openness and Trust in Value Co-Creation: Inter-organizational Knowledge Transfer and New Business Models**

*Tobias Redlich; Institute for Production Engineering, Germany*

*Sissy-Ve Basmer; Institute for Production Engineering, Germany*

*Sonja Buxbaum-Conradi; Institute for Production Engineering, Germany*

*Pascal Krenz; Institute for Production Engineering, Germany*

*Jens Wulfsberg; Institute for Production Engineering, Germany*

*Franz-L. Bruhns; Helmut-Schmidt-University, Germany*

The on-going paradigm shift from industrial production to value co-creation increases the importance of openness as a central competitive factor. From a systemic point of view, this means that external and internal interfaces within the value creation system need to be created in a way that knowledge can be exchanged more efficiently. However, openness in inter-organizational settings is often blocked by a lack of trust. Hence, concepts are needed to manage trust with regard to varying context-depending degrees of openness. The conceptual framework of this interpretive study is based on the theory of openness, which describes the dependency of the success of networks on the incidence of emergence. The developed concept of trust circles is based on empirical data selected from the aeronautical cluster Hamburg Aviation. It serves to identify circles of trust within the system and activate their potential to enable inter-organizational knowledge flows and new joint ventures.

### **ME-02.2 [R] Knowledge Value Chain Development: Cross-Field Open Team Knowledge Integration**

*Shu-Hui Chen; National Cheng Kung University, Taiwan*

*Cheng-Ta Lin; National Cheng Kung University, Taiwan*

To reflect the growing importance of networking beyond disciplinary and organizational boundaries toward an open R&D system with the commercialization aim, the Taiwan Engineering Section of the National Science Council in October 2009 began to support the "Promoting Program for Cross-Field Creative Scenario Value-adding." This promoting program

aims to facilitate the formation and cooperation of the interdisciplinary open teams toward developing one specific knowledge integration process for innovative R&D, method from "creative idea," "feasibility assessment," "prototyping," to commercialization bridging. We reflect upon the outcomes of primary and supportive activities performed in the knowledge value chain that has been proposed to explore based on the value-based commercialization framework. The subsequent empirical parts have been presented here based on the activities developed since 2009 and extensive case studies of nine open teams that undertook all knowledge value creation activities designed by the project office in the first year. In the last section, this study aims to discuss the issues of how to make these interdisciplinary open team participants work together as one innovation system as well as one specific interdisciplinary team in an integrated knowledge value chain. Implications and further research for such a peer mentoring process are provided.

## **ME-02.3 [R] A Study of the Structure of Public Attitudes toward Science and Technology in China**

*Lei Ren; China Research Inst. for Science Popularization, China*

*Chao Zhang; China Research Inst. for Science Popularization, China*

*Wei He; China Research Inst. for Science Popularization, China*

Based on the data of Chinese public understanding towards science survey in 2010, it has set some items to get general public attitudes toward science and technology. In order to study the features of different people's attitudes toward science and technology, we have developed a two-dimensional model of attitude toward science and technology fitted in China which was tested by the confirmatory factor analysis (CFA), one dimension was Promise of science factor and the other one was Reservation about science factor. Through this model we got the structure of attitudes toward science and technology of different people in China, which is helpful for science policy-making and other fields of social research.

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## **ME-03 Intellectual Property-3**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Ootori 3**

**Chair(s) Taehyun Jung; Hanyang University**

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### **ME-03.1 [A] The Impact of Pool & Standard on the Patent Litigation Landscape: A Case Study of the LED Industry**

*Yuhong Lan; National University of Singapore, Singapore*

*Hoi Yan Anna Fong; National University of Singapore, Singapore*

*Yu-Chao Cheng; IP Academy Singapore, Singapore*

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

It is conventionally believed that the formation of a patent alliance, patent pool and technology standard mitigates the problem of patent thickets, and therefore reduces patent disputes among industrial players. Our empirical analysis of the ongoing patent dispute landscape of the LED industry seems to suggest otherwise. The formation of patent pool (e.g., LED licensing program) and standard (e.g., LED consortium) did not appear to contain the prevalence of LED patent disputes. Instead, these patent aggregations gave rise to ambiguities as to the exact scope of the patent rights, and the formation of technology standards results in both technical and legal uncertainties - these emerging problems are forcing LED players to navigate an unfamiliar patent litigation minefield. While the LED incumbents could leverage on their well-formulated patent portfolios to turn these ambiguities and uncertainties to their advantage, downstream LED companies, such as many Asian manufacturers that have limited ability in patent deployment, are expected to face increasing challenges in the patent arena. An analytical framework on LED patent dispute management is therefore developed to assist LED players examine their respective positions in the dispute landscape and devise their individualized strategies as to R&D direction, product development, and dispute management.

## **ME-03.2 [R] A Survey of Intellectual Property Rights Literature from 1971 to 2012: The Main Path Analysis**

# SESSIONS

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Louis Y Lu; Yuan Ze University, Taiwan

John S Liu; National Taiwan Univ. of Science and Technology, Taiwan

Intellectual property rights (IPRs) protection is strategically crucial for multinational corporations which are heavily conducting technology innovation to keep their technological superiority, competitiveness, and return of innovation investment. Developed countries are concerned that unequal protection of IPRs may result in a significant loss through unauthorized imitation in other countries, while developing countries think that stronger IPRs would increase the costs of technology acquirement and raise the price of consumer products. The differences in IPR policies have led to significant disputes in international trade. Over the past four decades, many researchers have investigated various issues regarding the protection of intellectual property rights. This paper adopts a unique approach to review the development trajectories of IPR research over the past four decades. We use ISI web of science (WOS) as the data source to retrieve the related literature and their citation data, and then apply the main path analysis on the citation data to identify the key-route main paths of the citation-based network. A total of 3184 papers and their citation data were retrieved and analyzed. The key-route main path discloses three different focuses on the research of IPRs—the scope of the patents, the preferences of the North and the South, and patent reform.

## **ME-03.3 [A] Patent Survey to Japanese R&D-directed Firms**

Tomoko Saiki; Saiki Patent, Japan

The patent systems in the world have been standardized. The patent laws, including Japan's, have been revised in accordance with this standardization. We investigated how Japanese firms utilize the patent systems and how they have changed their behavior for patent protection between the last decade and the next decade by use of a questionnaire. The survey was conducted with 60 R&D-directed Japanese firms in the second half of 2011 (response rate was 35%). The firms as a sample were selected on the basis of the ranking of R&D expenditure and the number of patent applications. The results show, a) No big differences are found between activities for obtaining patents between the last decade and the next decade, b) The patentability of services inventions provide an incentive for patenting these inventions to the firms with higher R&D expenditures, c) It seems that the extra period of a patent protection affects R&D expenditures of firms with a lower number of patent applications, and d) As international activity for patent protection, the firms seem to put emphasis of their patent protection on those in China and India.

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## **ME-04 Technology Management in the Service Sector-1**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Zuiun 1**

**Chair(s) Kotaro Nakamura; Japan Advanced Institute of Science and Technology**

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## **ME-04.1 [A] Effects of Learning Infrastructures on Businesses in Service Industries**

Takashi Iwamoto; Keio University, Japan

As it is said that 2012 was the year of the MOOC (Massive Open Online Course) Revolution, learning infrastructures are rapidly changing in the world. In addition, mobile technologies are rapidly spreading to the world and utilizing Internet infrastructure, and mobile technologies are becoming more critical to educate human resources in various organizations. In this research, the effects of learning infrastructures on businesses in service industries were analyzed, and essences to build successful learning infrastructures were extracted. Learning infrastructure should be designed based on business strategy and a person who has capabilities of CLO (Chief Learning Officer) should take a lead. The CLO is the person who can understand not only learning but also corporate management and business. The learning methods should be blended by real (face-to-face) and online (PC-based and mobile-based) methods, and how to blend the methods becomes the know-how or competitiveness of the organizations.

## **ME-04.2 [R] Management and Leadership Approaches for Improving the Creativity of Knowledge Workers in Service Sectors**

Kazuhiko Itaya; Tokyo University of Agriculture and Technology, Japan

In developed countries in the post industrial age, the ratio of the working population in service sectors has been very high. Our great concern is to improve those knowledge workers' creative performance because it could be the source of having an advantage over our rivals. However, there has been a lack of discussion over the management of service sectors for knowledge workers engaged in creative work in those sectors. Management and leadership approaches for improving the creativity of knowledge workers are discussed from the view of comparing with those of R&D sectors.

## **ME-04.3 [R] Services Innovation Impact to Customer Satisfaction and Customer Value Enhancement in Airport**

James K Chen; Asia University, Taiwan

Ya-Wen Yu; Asia University, Taiwan

Javkhuu Batnasan; Asia University, Taiwan

Serving public transportation needs is a crucial issue in every country, especially for air transport, which is convenient, speedy, comfortable, and reliable. The purpose of this research is to create an evaluation model for services innovation impact to customer satisfaction and customer value enhancement in airports. The research objective is to examine which factors influence customer satisfaction, testing the relationship between customer satisfaction and customer value, and evaluate services innovation moderating efficiency impact to the enhancement of customer values. Data collected through online using two months collection 300 samples. The method of analyzed by reliability, validity test, exploratory factor analysis and structural equation modeling. The results show that customer value was influenced by customer satisfaction and service innovation. Among all three variables, security check has the highest influence on customer satisfaction. This study utilizes self-check-in kiosk, X-ray, social media communication, and micro-hotels as services innovation items in airport. The result indicated all four services innovation events revealed positive moderation effect. The security check was as the most important evaluation factor in airport service, which factor aroused the most satisfied customers, while airport accessibility ranked second.

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## **ME-05 Technology Assessment and Evaluation-2**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Zuiun 2**

**Chair(s) Daemyeong Cho; Hanyang University**

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## **ME-05.1 [R] A Preliminary Study on the Difference between the Citation Counts of Issued Patents and Their Corresponding Pre-Grant Publications**

Chung-Huei Kuan; Natl. Taiwan University of Science and Technology, Taiwan

Hsiang-Jui Cheng; Natl. Taiwan University of Science and Technology, Taiwan

This study addresses a basic question: do we miscount the patent citations? The citation count (i.e., the number of forward citations) of a patent is often considered an indication of the value or quality of the patent. However, patents, specifically utility patents, are usually published 18 months after their applications are filed and before they are issued subsequently. These so-called pre-grant publications and the corresponding patents disclose the same inventions, and are both citable as relevant prior art by the applicants or examiners of subsequent patent applications. Most patent analysts, however, consider only the citations of the patents and ignore those of their pre-grant publications. This omission may lead to an erroneous analytic result as a pre-grant publication has its own citations in parallel with its corresponding patent. This study assesses the impact of such an omission by using empirical data from the United States patent database. The result shows that citations of the pre-grant publications can be significantly more than those of the patents, and an analyst should not ignore the citations of the pre-grant publications when evaluating patents or conducting patent citation analysis.

# SESSIONS

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## **ME-05.2 [R] A Study on the Technological Innovation Performance of the Manufacturing Industry in Zhejiang Province of China**

Jing Hu; *China Jiliang University, China*  
Yong Zhang; *China Jiliang University, China*

Manufacturing is the main body of the industry and the major area of the technological innovation in Zhejiang province. In view of the mismatch of the development scale, speed and innovation ability of the manufacturing industry in Zhejiang province, the paper focused on studying the technological innovation performance of the manufacturing industry. Enhancing the technological innovation performance is the foundation of improving the technological innovation ability, and it is also the basic premise of the empirical analysis on this topic. Through taking the manufacturing industry of Zhejiang province as the research object, its industry differences, the effect and efficiency of the technological innovation are emphatically researched by using the parametric and nonparametric techniques. As a result, the changes and the influence factors of the manufacturing industry performance in Zhejiang province are systemically investigated in this paper.

## **ME-05.3 [R] Competition in Core-Periphery Technology?: Investigation of Overseas Companies on Their Integration of Mainstream Technologies and Surrounding Technologies in China**

Xiangdong Chen; *Beihang University, China*  
Min Huang; *Beihang University, China*  
Ying Hu; *Beihang University, China*  
Xi He; *Beihang University, China*

This paper aims to investigate the evolution of technology strategies of international companies operating in China in typical manufacturing sectors. Technology strategies are measured by a CP-system, in which two kinds of technologies, core technologies and periphery technologies, and three layers of technologies, mainstream technology (MT), scope technology (ST), and service based technology (SBT), are involved. Based on the patent data of 70 manufacturing MNEs selected from Fortune 500 companies, this research sheds light on typical questions over technical competitive performance, especially on nature in concentration and diversification, and relevant technical services in those sample F500 companies. Major findings in this paper are: sample F500 companies do possess more important technology backed competitive power than other non-F500 companies and local Chinese companies; all sample F500 companies widened their technical areas or technology scope; fields in IPC classification of IT and telecommunication technologies are the most competitive areas for sample F500 companies. On the other hand, other non-F500 sample companies, especially local Chinese companies, also increasingly develop their own technology strength in technical areas differentiated with those more competitive fields owned by sample F500 companies. Meanwhile, a strategic positioning of the five clustered sample company group is found on MT and ST in particular for concentrated and scoped technology trend. Through three measures over SBT by using information on subsidiaries, R&D centers in different regions, this paper further provides a more overall picture of the sample F500 companies on their technology backed MT-ST-SBT system operations in China.

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

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Chidori**

**Chair(s) Laura McKinney; Oregon University System**

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## **ME-06.1 [R] Real Options Analysis on Ecosystem for Agri-biotechnology Start-ups in Indonesia**

Anjani Putri; *Toyohashi University of Technology, Japan*  
Takao Fujiwara; *Toyohashi University of Technology, Japan*

Indonesia as a country that has great biological resources is considering the development of Biopark, a kind of science park that focuses on biotechnology. The government of Indonesia already made Biopark development plan in 2009, but to date it has not been realized. The possible problem is that the project seems to have a negative net present value (NPV). It

needs an appropriate way to assess the value of investment in Biopark, considering more than one source of uncertainty and potential growth in the future. The way to commercialize the result of research and development by Biopark, which is done by a start-up or established company, is also considered. Real option analysis, especially a growth option, can be a useful framework to value the investment in Biopark. Valuation of investment in Biopark by real option analysis is expected to encourage the stakeholders to start the project as soon as possible. This research has a role in valuing a potential unique project, Biopark, especially in the condition of Indonesia.

## **ME-06.2 [R] Towards a Dynamic Process for Business Model Innovation: A Review of the State-of-the-Art**

Elizabeth Gibson; *Portland State University, United States*  
Antoine Jetter; *Portland State University, United States*

Business models are not only necessary for entrepreneurs starting a company but also for established companies wishing to sustain a competitive advantage. Knowing when or how to change a model is difficult and implementation is risky. Business model innovation takes art and skill and implementation requires an iterative process. Despite the often experimental nature of creating a successful business model, there are few dynamic methods for business model generation. The most frequently referenced method - The Business Model Canvas (BMC) - maps business models into a framework but is static and leaves entrepreneurs and managers to struggle with ad-hoc trial and error experimentation. This paper lays the groundwork for improved approaches to business model innovation by outlining directions for future process and tool developments.

## **ME-06.3 [R] Best Practice of Innovation among the Indonesian Craft Industry Cluster: Lesson Learnt from Indonesia**

Lalu M Furkan; *Nagoya Institute of Technology, Japan*  
Nobutaka Odake; *Nagoya Institute of Technology, Japan*

This paper clarifies to what extent the Indonesian craft industry best practices have embraced innovation practices based on the UNESCO Award Excellence for Handicrafts 2010. Direct face-to-face interviews were conducted in the tourism corridor of the Master Plan of Acceleration and Expansion in the Indonesia Economic Development 2011-2025. Typical crafts such as metal, natural fiber, and wood were investigated in UD KamasanBali (Bali province), Mawar art shop (West Nusa Tenggara province), and Adeshya (Daerah Istimewa Yogyakarta province). The investigation revealed that the role of the government and universities is very crucial to the best practices. The transfer of knowledge from government, universities, international agencies, corporations and others small- to medium- sized tourism enterprises has a significant impact on the industry cluster development. Further, management of exhibitions is found to be the most effective and efficient method for promoting business achievements.

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## **ME-07 Emerging Technologies-2**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Shirasagi 1**

**Chair(s) Shintaro Sengoku; iCeMS/Kyoto University**

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## **ME-07.1 [R] Assessing the Knowledge-Building Dynamics of Countries in the Formation of Emerging Fields: A Bibliometric Approach on iPS Cells**

Alfonso Avila-Robinson; *iCeMS / Kyoto University, Japan*  
Shintaro Sengoku; *iCeMS/Kyoto University, Japan*

This paper seeks to demonstrate a method for assessing the dynamics of the knowledge-building of countries active in the formation of technological fields at early stages of development. The empirical case of induced pluripotent stem (iPS) cells, a newly discovered stem cell species, is chosen. Conceptually, we visualize knowledge-building efforts surrounding an emerging field as involving the formation of knowledge networks. According to the way countries participate in these knowledge networks, insights into their knowledge-building dynamics can be gained. Three types of dynamics are evaluated in this study: "knowledge



# SESSIONS

exploration," "knowledge nurturing," and "knowledge exploitation." For that purpose, an integrated and multi-dimensional bibliometric mapping approach encompassing both the intellectual bases and research fronts, and a conflated techno-scientific layer is used. Three types of networks were built: bibliographic coupling, co-citation clustering, and citing-cited networks; each network for each of the dynamics analyzed in this paper. By looking beyond the simplistic facade of general bibliometric indicators, the results of this paper are believed to provide a more complex picture of the dynamics involved in potentially rewarding emerging fields.

## **ME-07.2 [R] Detection and Introduction of Emerging Technologies for Green Buildings in Thailand**

*Tanunya Visessonchok; The University of Tokyo, Japan*

*Hajime Sasaki; The University of Tokyo, Japan*

*Ichiro Sakata; The University of Tokyo, Japan*

Energy efficiency in Thailand remains low despite the escalating energy consumption. Moreover, Thailand's energy security situation is risky and unsustainable due to its large proportion of energy imports and heavy dependency on natural gas for electricity generation. In this paper, a complete citation-based approach employing academic and patent data are utilized in order to detect the emerging technologies for green buildings in tropical countries like Thailand. Data from academic papers and patents are studied simultaneously, and solar cooling has been identified as a promising technology. Solar cooling possesses great potential since it closely fits the environment in Thailand where there is abundant sunlight all year round and air conditioning consumes roughly half of the total electrical usage.

## **ME-07.3 [R] How Businesses Fail in Managing Technology: A Review of the Literature**

*Jing Jiang; Biamp Systems, United States*

*Jacqueline McPherson; Portland State University, United States*

*Alexis Wittman; Portland State University, United States*

*Standley Limarta; Portland State University, United States*

*Tien-Hao Wang; Portland State University, United States*

*Julien Pessey; Portland State University, United States*

*Pongchalerm Tippayasawate; Portland State University, United States*

Improper technology management will cause business failure. Based on a literature review, this paper examines some of the main reasons why companies fail in managing technology. The paper identifies and explains seven principal reasons which may cause a tech company to fail: leadership, strategy, marketing, timing, finance, operations, and communications. Measures are suggested to prevent and predict these failures based on lessons learned as well as ideas and options for success. We analyze not only what happens in those failures but also the interdependencies of these failures. Business failure can always be traced to poor management of technology and improper innovation. Our work can help technology companies to avoid future failures or at least create some sort of awareness about common mistakes that are currently happening in businesses so that these can be dealt with on time.

## **ME-07.4 [R] Global WSN Developments: Fractal or Chaos?**

*Oludare Olorunniwo; Obafemi Awolowo University, Ile-Ife, Nigeria*

*Lawrence O Kehinde; Obafemi Awolowo University, Ile-Ife, Nigeria*

*Moses A Olorunniwo; Obafemi Awolowo University, Ile-Ife, Nigeria*

The ubiquitous developments of wireless sensor networks (WSNs) for data acquisition have migrated significantly over time from traditional data networks to real-time distributed network for sensor data fusion. However, the fractal geometry of sensor distributions and chaotic dynamics of WSNs have questioned the programmability techniques, computational capability, energy-efficiency and fault tolerance, positioning and location management of current frameworks in WSN applications. Thus, this study presents the status quo and visions of the next-generation WSN technologies, the self-similarity in efficient WSNs for topology control, and the observed pattern recognition in acquired data toward achieving

efficient data distribution.

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## **ME-08 Competitiveness in Technology Management-2**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Shirasagi 2**

**Chair(s) Yufen Chen; Zhejiang Gongshang University**

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### **ME-08.1 [R] Innovation Systems and Policy Instruments: The Application of S&T Indicators**

*Tay-Yeu Ho; National Tsing Hua University, Taiwan*

*Yung-Ching Tseng; National Tsing Hua University, Taiwan*

*Shih-Chang Hung; National Tsing Hua University, Taiwan*

To enhance country competitiveness, we can improve the function of the national innovation system and the exercise of policy instruments for S&T indexes. Despite the great importance to national development, scholars have paid little attention to this policy agenda, in particular the understanding of the linkages of national systems, policy instruments and S&T indexes. In this study using data from WEF and IMD, we draw on the questionnaire survey and Fuzzy Delphi methods to explore such linkages in Taiwan. We identify the missing linkages in Taiwan's national innovation systems, based upon which policy implications are drawn out.

### **ME-08.2 [R] An Exploratory Analysis on the Spatial Heterogeneity of the Brazilian Software Industry**

*Joao Paulo L Oliveira; Institute of Aeronautical Technology, Brazil*

*Jose Henrique S Damiani; Institute of Aeronautical Technology (ITA), Brazil*

This study explores and characterizes the spatial distribution of the Brazilian software industry making use of a framework based on the concept of industrial cluster, highlighting the importance of location for the strengthening of the innovation and industrial competitiveness. This paper is presented in three parts. The first section presents the theoretical framework and a general characterization of the software industry in Brazil. The second section discusses aspects related to the spatial distribution of the software industry. Finally, the last section summarizes the main conclusions of the paper, revealing a set of important strengths, weaknesses, opportunities and threats, and some strategies have been suggested to make the agglomeration better.

### **ME-08.3 [R] The Impact of Different Type of R&D Activities on Productivity Growth: An Empirical Analysis Based on Chinese Provincial Panel Data, 2000-2011**

*Yufen Chen; Zhejiang Gongshang University, China*

*Peng Sun; Zhejiang Gongshang University, China*

*Hengyu Sun; Zhejiang Gongshang University, China*

This paper estimates the total factor productivity (TFP) of each province and analyzes the impact of different types of R&D activities on TFP based on Chinese provincial panel data over the periods of 2000-2011. We divide R&D inputs into basic research, applied research and development according to the type of activities. The results show that the impact of basic research and applied research on TFP is less than development. This paper also finds that the impact is diverse in different regions. In the eastern region, the impact of basic research and applied research on TFP is greater than development; while in central and western regions, the development on TFP growth is more significant. Human capital and FDI have a positive effect on TFP, while the ownership structure has a negative effect.

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## **ME-09 PANEL: Managing Technology in Knowledge-Intensive Industries**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Hibari 1**

**Panelist(s) Simon P Philbin; Imperial College London**

**Donald Kennedy; WILLBROS Canada**

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# SESSIONS

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Technology and engineering management practitioners in knowledge-intensive industries, such as the high-tech and engineering sectors, face a number of challenges. These include the relentless pace of technological and organizational change, increasingly complex engineering systems, as well as greater levels of global competition. There are, however, many opportunities. Advances in science and technology are providing opportunities for new business models to be adopted and the ability to capture, analyze and leverage large datasets and diverse forms of information is allowing some organizations to move ahead of competitors. In the past, proven and fundamental approaches to technology and engineering management have prevailed each time; however, the inevitable question arises – how long will this continue? Do we need to consider new management frameworks to help industry cope with the engineering complexities and the vast quantity of data and information that has been enabled through modern ICT (information and communications technology) applications? Therefore, this international panel will consider the issues at stake in knowledge-intensive industries and explore whether we need to further develop, modify, replace or even abandon our current approaches to managing technology and engineering systems.

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## **ME-10 SPECIAL SESSION: Special Session in Japanese language - 1**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Hibari 2**

**Speaker(s) Shuui Kondou; Quad-Vision Research Institute and JAIST  
Yasuo Ikawa; Japan Advanced Institute of Science and  
Technology**

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"MOT Reform-Practice Community: Cases of Manufacturing Industries." Ishikawa MOT School has been operated for 10 years by Ishikawa IT Human Resource Development Center in collaboration with JAIST (Japan Advanced Institute of Science and Technology), with various supports from Ishikawa Prefecture and around 30 regional companies. Approximately 200 people completed the course. People who participated in the course have established the "MOT reform-practice community," which pursues a knowledge science approach to achieve human, organizational and entrepreneurial creation. From Monday through Wednesday, at the same session time each day, successful cases of such practices will be reported by the leading 12 companies/organizations, and application of "Quad Vision Thinking Methodology," which was developed by being inspired by the SECI model of Professor Nonaka, an author of "The Knowledge Creating Company," will be described in each presentation. In this session, PFU will present "From mind-innovation to process-innovation - A case of ScanSnap SV600 development"; EIZO will present "Toward Business Transformation for Professional Workers' Well-Being: A Case of Technology Based Servitization in Japanese Monitor Maker"; Komatsu Electronics will present "Ultra-pure water system development as a brand strategy"; and NIKKO will present "Establishing a brand as a pottery manufacturer based on more than 100-year history."

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## **ME-11 Technology Management in Transportation-1**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Toki**

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

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### **ME-11.1 [R] Verification of Risk Countermeasures Regarding Expressway Traffic Control System Based on Creative Risk Management Approach**

*Manabu Sawaguchi; Waseda University, Japan*

*Itaru Nakahara; Metropolitan Expressway Company Ltd., Japan*

The conventional risk management based on dealing with incidents that occurred in the past mainly focuses on preventing the similar incidents against the past incidents. In the meantime, it is true that there are a lot of comments saying "beyond the scope of the assumption" or "unknown accident we've never seen before" after the incidents occurred. Therefore, in this paper we propose a Risk Creative Approach (RCA) to prevent risks after creating the risk generating mechanism based on the way of realizing risks intentionally,

which comes from Sabotage Analysis (SA) benefitting from game theory's standpoint. We introduced RCA to the proposed plan (we already considered) regarding Backup System (BUS) of Expressway Traffic Control System (ETCS) at Metropolitan Expressway Company (MEX) and tried to analyze and verify it. In consequence, we reaped the viable risk countermeasures, including proposed measures against tsunamis. The countermeasures were proposed before the great eastern Japan earthquake on 11th of March 2011. And we conducted a review of the previous plan by applying proposed risk countermeasures. What this case example makes clear is that we confirmed the effectiveness of the RCA (proposed method).

### **ME-11.2 [R] Evaluation of Electric Vehicle Power Technologies**

*Jonathan C Ho; Yuan Ze University, Taiwan*

*Yu-Hua S Huang; Yuan Ze University, Taiwan*

The evolution in power technologies from combustion engine to hybrid or pure electricity requires automakers to mobilize organizational capability as well as to change operational patterns. Conventional combustion engine, hybrid, plug-in hybrid, and pure electric vehicles of various engineering designs are among the competing technological alternatives for the future. Given the situation, firms with heavy R&D investments in renewable vehicle energy face the dilemma to choose among these competing technologies. This research develops a technology evaluation model which incorporates technological factors and market criteria to facilitate decision making on allocating resources to various renewable power technologies for passenger vehicles. Using the analytic hierarchy process (AHP), the technology evaluation model was quantified by experts in lithium-ion batteries, fuel cell, hybrid technologies as well as by consumer survey. Expert quantification ranks the technological alternatives in order of technological performances, while consumer survey prioritizes user needs for the technological performances. The research should be able to help automakers and technological developers of electrical power effectively mobilize resources and deploy strategies for the future.

### **ME-11.3 [R] Differences of Technology Absorptive Capacity: Evidence from China's Automotive Industry**

*Donghui Meng; Tsinghua University, China*

*Xianjun Li; Tsinghua University, China*

*Ke Xu; Tsinghua University, China*

Technology absorptive capacity (TAC) is critical for innovation and competitiveness of enterprises in latecomer countries. The current literature lacks deep study on the differences in corporate TAC. Taking the automotive industry as an example, this study selected 13 self-brand passenger car manufacturers in China and researched the existence and dimensions of differences in corporate TAC through principal component analysis, complemented with analysis of major reasons causing the differences. The results proved to be significant, with emerging enterprises' TAC generally stronger than traditional ones. Specifically, emerging enterprises have much stronger realized technology absorptive capacity (RTAC), while traditional enterprises are slightly advantageous in potential technology absorptive capacity (PTAC). The fundamental reason for traditional automobile companies' weakness in TAC, in spite of their abundant prior knowledge, is low intensity of effort and lack of input in assimilation and transformation, which is a validation of Kim's absorptive capacity model.

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## **ME-12 Decision Making-1**

**Monday, 7/28/2014, 16:00 - 17:30**

**Room: Houmeiden**

**Chair(s) Nasir Sheikh; State University of New York, Korea**

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### **ME-12.1 [R] Improving Scenario Discovery by Bagging Random Boxes**

*Jan H Kwakkel; Delft University of Technology, Netherlands*

*Scott Cunningham; Delft University of Technology, Netherlands*

*Erik Pruyt; Delft University of Technology, Netherlands*

# SESSIONS

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Scenario discovery is a novel participatory model-based approach to scenario development in the presence of deep uncertainty. Scenario discovery relies on the use of statistical machine-learning algorithms. The most frequently used algorithm is the Patient Rule Induction Method. This algorithm identifies regions in the uncertain model input space that are highly predictive of producing model outcomes that are of interest. To identify these regions, PRIM in essence uses a hill climbing optimization procedure. This suggests that PRIM can suffer from the usual defects of hill climbing optimization algorithms, including local optima, plateaus, and ridges and alleys. In case of PRIM, these problems are even more pronounced when dealing with heterogeneously typed data. Drawing inspiration from machine learning research on random forests, we present an improved version of PRIM. This improved version is based on the idea of performing multiple PRIM analyses based on randomly selected features and combining these results using a bagging technique. The efficacy of the approach is demonstrated through a case study of scenario discovery for the transition of the European energy system towards more sustainable functioning, focusing on identifying scenarios where the transition fails.

## **ME-12.2 [R] Model Ontology for Economic Models**

*Frederick Betz; SUNY Korea and Portland State University, United States*  
*Fred Phillips; Stony Brook - State University of New York and SUNY Korea*

In an earlier paper, we introduced the distinction between a “model-structure” (consisting of the system components and lines connecting components) and a “model-ontology” (consisting of the measurement methodology in the model and the translation of information to another model). Here we apply this distinction to the methodological challenge of measurement and integration of economic models. The economics literature had divided into two schools over the nature of models—of commodity markets and of financial markets. The Neo-Classical Synthesis school emphasized a model of commodity markets. The Keynes-Minsky school emphasized a model of financial markets. In the first school, commodity markets are modeled in “price-equilibrium” models; and in the second school, financial markets are modeled in “price-disequilibrium models.” We investigate the ontological issues of transmitting data from one kind of economic model to the other.

## **ME-12.3 [R] Assessment on Carbon Capture Technology: A Literature Review**

*Jiali Ju; Portland State University, United States*  
*Dundar F Kocaoglu; Portland State University, United States*

The dominance of coal resources in many countries and the advantage of coal to generate power in terms of cost and abundance of energy supply make coal a critical source of energy. As a result, considering the climate change challenges and the carbon dioxide emission problems from coal-fired power plants make the development of carbon capture and storage technology crucial to reconcile the conflict between carbon dioxide emission mitigation and the need for sufficient energy supply to satisfy the demand. The research objective of this study is to overview the assessment methods of carbon capture technologies and to propose a holistic evaluation model for them.

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## **ME-13 Quality Management-1**

**Monday, 7/28/2014, 18:00-17:30**

**Room: C'est la Vie**

**Chair(s) Antonie de Klerk; University of Pretoria**

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## **ME-13.1 [A] Lean Implementation in the Gauteng Public Health Sector**

*David J Kruger; University of South Africa, South Africa*

The preponderance of the South African populace has no access to adequate health care. Consequently, the Government concluded a requirement subsist for a National Health Insurance (NHI) scheme analogous to the National Health Service (NHS) in the United Kingdom. The study was undertaken in Gauteng provincial hospitals in Johannesburg, South Africa. The attainment of the objective is conditional on execution of value-added services. Hence,

it is critical to augment quality and efficiency of effort whilst containing costs. A unique and capable methodology ascertained in health care establishments is Lean, an improvement attitude and an array of philosophies initiated by the Toyota Motor Company. The research exposed Lean as appropriate in multifaceted knowledge work environments comparable to assembly-line manufacturing. Executed decorously, Lean transmutes the manner organizations behave and initiates a voracious pursuit for improvement. The paper delineates Lean philosophies as deliberate, signifying the vital vibrancy of Lean. The fundamentals isolated were postures on continuous improvement, value creation, and unity of purpose, reverence for employees, visual tracking, and malleable procedure. The rationale of the paper is the discussion and exposition for creating a procedure for evaluating and improving Gauteng provincial hospitals. The mechanisms encompass a structure or exemplar for gauging, assessing, analyzing and improving the hospitals.

## **ME-13.2 [R] Effectiveness of the Risk Based Inspection Process in the Sasol Business in South Africa**

*Toby J Antony; Sasol Infrachem, South Africa*  
*Antonie M De Klerk; University of Pretoria, South Africa*

In an era where companies need to be cost-effective in their operations without compromising safety or performance, a significant amount of effort is being directed towards the process of risk based inspection (RBI). RBI addresses technical risks by means of establishing appropriate inspection strategies for equipment and is currently being utilized by Sasol petro-chemical businesses in South Africa. Although several organizations, especially petro-chemical, are incorporating RBI into their business strategies, little is known on the challenges involved in the successful implementation of RBI within an organization. This paper researches the effectiveness of the RBI process currently followed in Sasol (Sasolburg) with emphasis on the adoption of the approach by personnel as well as business and personnel factors such as competency and training. The extent of management support and how it influences the company's RBI process are also investigated. The research was undertaken by means of a questionnaire completed by different role players who participate actively in the RBI process, influencing the outcomes or who are directly affected by the results of the process. The results obtained suggest that the expertise and preparation of the process personnel involved with the RBI process is lacking and that there is a definite shortage of RBI facilitators and training in the organization.

## **ME-13.3 [R] Exploring the Underlying Mechanism of PDCA Cycle to Improve Teaching Quality: A Motivation Theory Perspective**

*Yawen Li; Tsinghua University, China*  
*Xiaoming Li; South China Agricultural University, China*  
*Jizhen Li; Tsinghua University, China*

Considering the importance of teaching quality in the field of education, the purpose of this paper is to explore and discuss the underlying mechanism of plan-do-check-action (PDCA) cycle in the education context through the motivation theory. Firstly, the PDCA cycle is applied to design integral implementation steps in the management for colleague students' study to improve the teaching quality. Moreover, the goal setting theory in motivation theory is used to discuss the underlying mechanism of PDCA cycle to improve teaching quality. To understand this, the goal commitment and task complexity are served as moderators of the relationship between the students' plans and performance. Additionally, we demonstrate that the self-efficacy plays as a mediator between the teacher's action and the students' performance. Hypotheses are given and further tested with a sample of third year colleague students in a Chinese University.

## **TA-00 PLENARY - 2**

**DATE: TUESDAY, 7/29/2014**

# SESSIONS

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TIME: 08:30 - 10:00  
ROOM: OOTORI  
CHAIR(S): DILEK CETINDAMAR; SABANCI  
UNIVERSITY, TURKEY

## TA-00.1 [K] The Hitachi Group's Social Innovation

*Shinjiro Iwata; Hitachi, Ltd., Japan*

Based on the belief that innovation will bring about a world where economic growth can be compatible with efforts to solve the environmental, energy, and population problems faced by society, the Hitachi Group is putting all of its energy towards the Social Innovation Business. The Hitachi Group utilizes various service innovations based on "human," "IT" and "social infrastructures" to help give people comfortable lifestyles and to make a sustainable, prosperous society a reality. In this speech, Mr. Iwata will introduce the Hitachi Group's efforts to contribute globally to business and social innovations to realize this prosperous society.

## TA-00.2 [K] Total-System Innovation Management: An Overview with Applications to Creative Idea Generation

*Oliver Yu; San Jose State University, United States*

This presentation will introduce the concept of Total-System Innovation Management, which emphasizes both a total-system perspective of the innovation management process and a disciplined systematic approach to the development of the individual key elements of the process. The key elements of the innovation process include creative idea generation, seeking and providing initial support, team formation and organization development, product or service development and marketing, external competition and cooperation, and ethical considerations. The presentation will also discuss the applications of the total-system approach to the key element of creative idea generation for the systematic development of a set of effective techniques for the ideation process.

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## TB-01 Innovation Management-4

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Ootori 1**

**Chair(s) Masanori Namba; Ritsumeikan Asia Pacific University**

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### TB-01.1 [R] Service Innovation Structure Analysis for Recognizing Opportunities and Difficulties of M2M Businesses

*Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan*

*Hirokazu Ishimatsu; Japan University of Economics, Japan*

*Yoshiyuki Kageyama; Toshiba Corporation, Japan*

*Yuji Kakutani; Hitachi, Ltd., Japan*

*Kazunori Mizushima; Hitachi, Ltd., Japan*

*Hiroshi Naruse; NEC Corporation, Japan*

*Shigeaki Sakurai; Toshiba Solutions Corporation, Japan*

*Susumu Yoneda; Softbank Mobile Corporation, Japan*

With the popularization of high-speed and high-capacity communication networks, machine-to-machine (M2M) communication has received significant attention. However, even though the related technologies have been actively investigated, creating new businesses based on M2M communication is not easy. This paper proposes a service innovation structure that visualizes the opportunities and difficulties of M2M businesses. In our proposal, opportunities are classified as two types of value creation (optimization value and identification value) using the sharing-connecting-analyzing-identifying (SCAI) model. In addition, difficulties are discussed using a fishbone chart. The SCAI model pays particular attention to the identification value, which tends to be ignored in other models. Opportunities and difficulties are structured as a map according to backcasting from a desired future. Using this backcasting map, we can discuss M2M businesses more clearly and strategically by

recognizing the opportunities and the difficulties with stakeholders.

### TB-01.2 [R] The Impact of Appropriation Strategy on Open Innovation

*Ming-Jen Yu; National Cheng-Chi University, Taiwan*

*Mu-Yen Hsu; National Cheng-Chi University, Taiwan*

*Hao-Jun Chuang; National Cheng-Chi University, Taiwan*

The purpose of this study is to investigate the relationships between firms' appropriation strategy and open innovation. We identify four distinct groups of appropriation strategy in the electronics sector by Latent Class Analysis of data from the third Taiwan Innovation Survey and Taiwan Economic Journal databank. These four groups of appropriation strategy are proactive group, first-mover group, intellectual property rights (IPRs) group and non-proactive group. We found that firms in the proactive group are more open and more likely to cooperate in innovation with competitors than other firms, but less probable to cooperate in innovation with suppliers. Firms belonging to the first-mover group are more probable to engage in innovation-related cooperation with suppliers and government research organizations, but less likely to cooperate with clients or customers. Finally, we conclude this study with our findings and implications for further research.

### TB-01.3 [R] Relational Embeddedness, Absorptive Capacity and Supply Chain Flexibility: Evidence from China

*Bei Wu; Zhejiang Gongshang University, China*

*Jieli Du; Zhejiang Gongshang University, China*

*Juan Juan Tian; Zhejiang Gongshang University, China*

*Xiaoyan Wang; Zhejiang University, China*

*LiYing Wang; Zhejiang University of Technology, China*

Competition is no longer company to company, but supply chain to supply chain, and flexibility is viewed as a key dimension of supply chain performance in global competition recently. Companies must manage the entire supply chain and work together with supply chain node enterprises, have access to resources, knowledge, and information from the network, and improve supply chain flexibility. Relational embeddedness is often considered as a crucial driver for the improvement of supply chain flexibility. However, quantitative studies demonstrating these links are scant, and an increasing amount of evidence suggests that there is a need to develop a complete model of relational embeddedness on supply chain flexibility by examining the potential mediating effect of absorptive capacity. To meet this need, we define relational embeddedness and absorptive capacity, develop a valid and reliable instrument to measure these, build a framework that relates relational embeddedness, absorptive capacity and supply chain flexibility, and then test structural relationships within this framework using SPSS. Based on 136 responses from companies in the Yangtze River Delta, statistically significant and partially positive relationships were found among relational embeddedness, absorptive capacity and supply chain flexibility. Managerial implications of the empirical findings of this study are also discussed.

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## TB-02 New Product Development-1

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Ootori 2**

**Chair(s) Gyunghyun Choi; Hanyang University**

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### TB-02.1 [R] Knowledge Integration in a Product Development Organization for New Businesses: A Case Study of a Precision Device Manufacturer

*Nobuhiro Horie; Japan Advanced Institute of Science and Technology, Japan*

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

This study discusses knowledge integration in product development organizations for new businesses. The goal is to contribute to the establishment of a methodology that helps accomplish the purpose of entry into new business. This study analyzes establishment of new product development organizations and their entry into new businesses. There are many differences between existing businesses and new businesses: characteristics of product, characteristics of market and so on. Knowledge required for existing businesses and



# SESSIONS

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knowledge required for new businesses is different. Thus, it is very important to integrate knowledge required for existing businesses and knowledge required for new businesses. This study indicates that persistence of existing knowledge of a product development organization may be an adverse factor for knowledge integration since it prevents searching for new knowledge necessary for new businesses and absorbing searched knowledge. It is suggested for product development organization to have unlearning process of knowledge not required for new businesses.

## **TB-02.2 [R] Strategic Management of New Product Development Projects**

*Supachart lamratanakul; Kasetsart University, Thailand*

Strategic management of projects is an evolving concept in research literature of project management. In this study, we investigated the implementation of strategic management, particularly in new product development projects, to determine its existence and its forms. We found that such projects typically use the following four strategies: product superiority, product time-to-market, customer intimacy, and product cost advantage. Besides providing a guideline to a project team in effectively performing project activities, these strategies are used as a mechanism to deploy business strategy to the operational level of project management. We also found that, in many cases, to attain better business results, project teams use a combination of these strategies with different priority levels.

## **TB-02.3 [A] Investigation of Different Perspectives between Developers and Customers: Robotic Vacuum Cleaners**

*Byung Sung Yoon; Portland State University, United States*

*Antonie J Jetter; Portland State University, United States*

The literature on high-technology marketing frequently observes that the perspectives of managers in cutting-edge product development are often at odds with the perspectives of consumers, leading to products that do not fit into consumer values, force behavioral changes upon them, are difficult to use, or do not meet needs at all. A possible case-in-point is robotic vacuum cleaners (RVC) for home use. In 2001, their market introduction was accompanied by optimistic forecasts, but the pace of market penetration has been slow and over 10 years after their initial launch, RVCs still only account for 4.1% of the vacuum cleaner market in 2012 in the United States. This paper investigates if there is a mismatch between product developers' perspectives and actual customer needs that can provide a possible explanation about why RVCs are facing difficulties in expanding market share in the home cleaning device market. To do so, it uses fuzzy cognitive mapping (FCM) to capture and quantitatively model the perceptions of RVC developers and RVC customers. The developer model shows the causal links between product features and presumed product attractiveness; the customer model shows causal links between product features and perceived product desirability. The models are used to investigate how developers and customers value alternative product improvements and to what extent their perspectives are aligned. Results show that there are distinct gaps between both perspectives, causing product developers to favor product improvements with little pay-off for perceived product desirability.

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## **TB-03 Intellectual Property-4**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Ootori 3**

**Chair(s) Charles Weber, Portland State University**

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## **TB-03.1 [R] Understanding Patent Portfolio and Development Strategy of 3D Printing Technology**

*Yen-Tzu Chu; National Chung Hsing University, Taiwan*

*Hsing-Ning Su; National Chung Hsing University, Taiwan*

This study aims to analyze the patent portfolio of the three-dimensional printing industry and future trends, as well as to explore how patent strategy could be developed. A total of 1089 patents that belong to 3D printing technologies are retrieved from the United States Patent and Trademark Office (USPTO) patent database for analysis. There are two objects in

this research: first, from the patent perspective to distinguish how emerging three-dimensional printing is; second, using a knowledge flow tool to demonstrate how diversified the 3D printing industry can be. Moreover, by analyzing the 1089 of 3D printing patents, some important implications, i.e., technology life cycle, patent citations, patented characteristics information and knowledge flow, can be uncovered to understand the overall 3D printing technology trends in terms of country, industry and organization levels.

## **TB-03.2 [R] Analyzing Patent Characteristics and Business Strategies of Non-Practicing Entities**

*Syuan-Yi Jiang; National Chung Hsing University, Taiwan*

*Hsing-Ning Su; National Chung Hsing University, Taiwan*

The operation of non-practicing entities (NPEs) has been denounced. The influences of NPEs are more and more significant for the economy, society and technology. The objective of this paper is to characterize patents owned by selected famous NPE corporations. A total of 12 NPEs with 4,947 utility patents are analyzed in this paper from four aspects: country, industry, corporate, and valuation assertion. Moreover, in the valuation assertion section, 11 patent characteristics are used as indicators for evaluating NPE patents. This paper also compares the degree of patent value among NPE patents, litigated patents and ITC patents in the most significant 6 patent characteristics. One important finding is that NPE patents are verified as more valuable patents than litigated patents and ITC patents. However, No. of patent citation received (also called No. of forward citation; CI) does not show positive relation as other patent indicators do. In summary, this paper offers three major contributions: using 4,947 NPE patents from 1976 to 2012 as sample patents; measuring NPE patents value by 11 patent characteristics; and showing that NPE patents are more valuable than litigated patents and ITC patents.

## **TB-03.3 [R] Comparative Study of Technological Trend Between DAIKIN and Panasonic in the Field of Air Conditioner**

*Nhivuong Pham; Tokyo Institute of Technology, Japan*

*Yoshitoshi Tanaka; Tokyo Institute of Technology, Japan*

This research focuses on patent applications filled in Japan, in the business field of air conditioner for home use. In spite of the saturated Japanese market, only two companies, DAIKIN INDUSTRIES, LTD, and Panasonic Corporation, have been increasing domestic market share of air conditioners in recent years. In this study, we visualized technical purposes as a system diagram. We made a comparative evaluation on the difference of technical strength of these two companies. Moreover, we evaluated the correlations between the number of patent applications of each company and the score of consumer needs collected by a questionnaire survey. We surveyed how each company applies for patent applications for consumer needs by monitoring and propose a new concept for evaluation of patent portfolios, and we believe that the patent portfolio should have a proper matching with the consumer needs portfolio.

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## **TB-04 Technology Management in the Service Sector-2**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Zuiun 1**

**Chair(s) Paulo T Nascimento; University of Sao Paulo**

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## **TB-04.1 [A] ERP Adoption in the Hotel Industry: How Software Implementation Becomes Development**

*Regina Helena P Vianna; University of Sao Paulo, Brazil*

*Fernando Fonseca; Univesity of Sao Paulo, Brazil*

*Adriana M Mello; University of Sao Paulo, Brazil*

*Paulo T Nascimento; University of Sao Paulo, Brazil*

Integrating operational and managerial activities, enterprise resource planning (ERP) systems are strategic tools to get a better market position, reduce costs and raise process efficiency and service quality. This case study aims to explore further the barriers that arise during the implementation of these systems, particularly in the hospitality industry. We

# SESSIONS

found that the main reason for adopting ERP is the need for better-centralized control in a naturally decentralized network of hotel units. We also explore the difficulties in integrating different software packages and adapting the operational routines to them. As the case shows, the company bought an ERP, but it lacked essential functionality and required further and difficult integration with other software. Commercial ERPs do not yet fully meet the operational requirements of the decentralized network hospitality company. The intended implementation actually becomes a system integration development.

## **TB-04.2 [R] The Effect of Mobile Information Services on Commuter Trains**

*Takayuki Matsumoto; Tokyo Institute of Technology / JR East, Japan*

*Kazuyoshi Hidaka; Tokyo Institute of Technology, Japan*

In this study we verified what kind of mobile information services passengers need on board through empirical research on commercial commuting trains. We provided rail information services as well as marketing tools such as news, shop information, advertisements and coupons for smartphones. A content server and Wi-Fi access points were newly installed on trains with the server connecting to an existing onboard train information management system. Line-related and location-based information can be provided to smartphones on board by using the server that obtains various data from the train management system or from on-ground networks. Content server access logs were then obtained and analyzed, and several questionnaire surveys were conducted in order to evaluate these information services during the test period. This study revealed that almost 90 percent of passengers who answered questionnaires would use these mobile information services if the services were actually introduced, and that satisfaction in railway information content was higher than that of marketing contents. These contents can be divided into the following types according to different point of view, location-based contents and non-location-based contents. We also found that the satisfaction in location-based information content affected overall intent to use these mobile information services.

## **TB-04.3 [R] Semi-Globalization of Service Value Co-creation in Context-dependent Business: 'O-motenashi' Culture-style Service in the Traditional Japanese Inns of Kaga-ya**

*Kotaro Nakamura; eCraft Inc. & JAIST, Japan*

*Hisashi Masuda; Japan Advanced Institute of Science and Technology, Japan*

Cross-border deployment of business operations provides an opportunity not only for enlarging the market but also for getting new value-creation knowledge. Rather than pursue a uniform across-the-board strategy, semi-globalization focusing on both similarities and local differences is becoming an important theme for local "hidden champion companies" to operate a sustainable service-oriented business. The service-oriented business in such semi-globalization requires realization and refinement of the service process through engineering and management of the facilities / ICT infrastructures and human resource / staff organization, according to transition of service value and degree of context dependency based on the changes of market trend or customer's sense of values. The purpose of our research is to establish a comprehensive understanding of the innovation insights through the semi-globalization of service-oriented business of the yet not sufficiently studied context-dependent service industries. The semi-globalization of service business is demonstrated on the case study of the traditional Japanese inns of Kaga-ya, which have strongly high-context service business model based on the "o-motenashi," a typical Japanese high-context treatment culture. From the differences of value co-creation process between Kaga-ya Taipei and the flagship inn in Japan through on-site surveys at both locations, including interviews with the executives, we were able to recognize and get comprehensive understanding of the transition of multi-context service values. The insights from the present research lead to a methodology aiming at advancing context-dependent service-oriented industries.

## **TB-04.4 [R] A Study of the Usable Concept of Transportation Information Services for the High Value Added Railway Transportation Infrastructure**

*Shotaro Kohtsuki; Ritsumeikan University, Japan*

*Toshiyukil Izumi; West Japan Railway Company, Japan*

In urban areas, the railway systems and these transportation services are indispensable for the social infrastructure to ensure the safe, punctual and comfortable transportation for a large number of passengers. In order to perceive a whole railway service, we need to evaluate hospitality of staffs and crews, and provide the information during train delays such as the train schedule and the conditions of equipment of vehicles and stations. In these studies, the train information in Japanese transportation service is focused on, and an appropriate effect of transport information on the passenger's behavior is analyzed, and an appropriate concept of information service is presented for the railway transportation system. The properties of railway service are reviewed by the SSM-IA analysis, and the train information services which can elevate the railway service values are pointed out. Next, the usability of information items such as passenger's congestion state and the train position inside lane are suggested by the analysis of the user's preferences survey. In addition, the relations between the customer's satisfaction and information services are viewed from the effect on passenger's behavior in the transportation infrastructure. Finally, an expected information service model is suggested in order to improve the passenger's transportation value.

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## **TB-05 Technology Transfer-1**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Zuiun 2**

**Chair(s) William T Flannery; University of Texas at San Antonio**

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## **TB-05.1 [R] Technological Transfer in Public Research Centers: The Peruvian Case**

*Jose C Alvarez; Universidad Nacional de Ingenieria, Peru*

*Kazuo Hatakeyama; UNISOCIESC, Brazil*

The public research centers were created to research activities and knowledge generation. Some studies around the world have been developed about this problematic and the opportunities for technology transfer from these institutes. In the Peruvian case, until now, the national institutes of research have structured and applied its programs and models of technology transfer in an incipient form. Some of difficulties perceived are: the lack of studies on technology management, ignorance about other local experiences on technology transfer, the lack of comparison with technology transfer models. In this context, this paper aims to identify and analyze the technology transfer experiences since the public research institutes in Peru. The methodology consisted in the literature review over the technology transfer topic, followed by a diagnostic of the technology transfer at the Peruvian public research institutes, its discussion and analysis. Major results from the study showed a disordered sector, with lack of mechanisms for technological transfer, and scarcity of codification the few experiences. However, the potential knowledge is substantial.

## **TB-05.2 [R] Comprehensive Technology Exploitation Using System Dynamics**

*Guenther Schuh; Fraunhofer Institute for Production Technology IPT, Germany*

*Markus Engel; Fraunhofer Institute for Production Technology IPT, Germany*

*Toni Drescher; Fraunhofer Institute for Production Technology IPT, Germany*

*Katharina Apfel; Fraunhofer Institute for Production Technology IPT, Germany*

Extensive exploitation of technology is strategically planned so far only in very few research institutions and companies. Thereby, a great technological as well as economic potential remain untapped. A major reason for the neglect of the exploitation potential is that a situational assessment of exploitation opportunities throughout the entire technology life cycle has not yet been systematically explored. Although individual aspects of the problem were treated, a comprehensive model considering all relevant variables, such as the technology to be exploited, the specific objectives of the research and development project, and the relevant factors of the environment of the exploitation situation, has not yet been developed. In addition, the change of these factors should be taken into account throughout the technology life cycle. In order to achieve this goal, all relevant variables for the exploitation decision have to be described in sub-models and later combined in a multi-attribute decision model.

# SESSIONS

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Based on a first framework previously presented by the authors, the intended contribution of the present paper is to develop a deeper understanding of the interdependencies between the key influential factors of the exploitation situation as well as the considered sub-models. Thereby, the expected developments of the sub-models for the used system dynamics model can be modeled.

## **TB-05.3 [R] Factors Analysis and Countermeasure Research of Influencing Technology Transfer Across the Industry**

*Feifei Wu; Beijing University of Technology, China*

*Zi Yang; Beijing University of Technology, China*

*Lucheng Huang; Beijing University of Technology, China*

*Zheng Qiao; Beijing University of Technology, China*

Technology transfer across the industry is considered as one of the important issues in technology transfer research. By means of literature retrieval combined with expert investigation, firstly, we find out factors influencing technology transfer across the industry. Secondly, each factor is determined according to the fuzzy analytic hierarchy process (FAHP). Thirdly, we make an analysis of the mutual influence between key growth factors based on the method of DEMATEL. In order to put forward pertinence solutions for improving technology transfer across the industry, the Attention & Recognition Matrix model is used to express how key growing factors come into play in the current situation. Finally, a countermeasure study is made. The conclusion of the study lays a solid foundation for encouraging technology transfer across the industry and applications of technological achievements among several industries.

## **TB-05.4 [R] Modeling Technological Value Net through Network Contagion: The Case of LED Industry**

*Hsin-Yu Shih; National Chi Nan University, Taiwan*

*Yen-Seng Hao; National Chi Nan University, Taiwan*

Co-opetition provides a framework from which to identify firms' strategic position and alternatives in any given situation. The value net model is a strategic view of the key relationships that drive any company's ability to compete or cooperate with other players in a business condition. The idea of the value net model can be used in the technological system where the company can identify its technological competitors and complements. This study aims to construct a quantitative method for modeling the technological value net with the help of social network analysis. Patent citations are quantified by social network contagion in order to ascertain what kinds of contagion patterns take place in a technological system. The study employs the LED industry as a research samples about 17 LED manufacturers are identified. The 17 manufacturers' patents that are issued in USPTO from 2006 to 2012. The study finds that the technological competitors of players are different in supplier views and customer views. On the other hand, the technological complements of players are different from supplier views and customer views. These findings can help the company to identify technological competitors and complements in the technological system.

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## **TB-06 Entrepreneurship / Intrapreneurship-2**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Chidori**

**Chair(s) Leon Pretorius; University of Pretoria**

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## **TB-06.1 [R] A Technology Management Model for Entrepreneurial Business Ventures**

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

*Leon Pretorius; University of Pretoria, South Africa*

Managing technology effectively and competitively in a fast-moving globalized world has become an increasingly challenging endeavor. Design, Information and Action (DIA) as defined by the authors have been found to be key aspects which significantly influence the degree of innovation, competitiveness and business leadership achievable. A technology management model was developed on the basis of these three key aspects, which are

further cascaded in five levels of business-space derived-dimensions in a systems hierarchy to enable non-traditional managers (entrepreneurs) to run their organizations. The understanding and judicious application of inter-relationships of these dimensions have been found to be critical to improved effectiveness in technology leadership and competitiveness. The paper elucidates the details of the management model and describes the initial research conducted, especially on the DIA entrepreneurial space as well as on the applicability of the model, in a global scenario indicating possible mapping dimensions to selected companies in diverse technologies in three countries. The integrated outcome of the study is a management model that consists of critical management literacies which are essential for every entrepreneurial business venture. The importance of the unique combination of the factors Design, Information and Action with regard to entrepreneurship and the cascaded dimensions is shown in preliminary bibliometric data or literature searches that may eventually be useful in representative case studies which make use of the nine critical management literacies.

## **TB-06.2 [R] Virtual Biotechnology Start-Up Model as Exclusive Network Innovation under Uncertainty**

*Takao Fujiwara; Toyohashi University of Technology, Japan*

The virtual biotechnology start-up model has recently been created from venture capital's reluctance for investment. For example, Quantice Pharmaceuticals was founded by a VC firm as a matchmaker; Versant Ventures, an established biopharmaceutical company as a would-be licensee; Celgene, and idea generating researchers of Stanford University, in San Francisco and La Jolla in November 2011. As a research question, is it possible to regard this type the same as open-source innovation like Arch2POCM, which seeks speed-up by preventing the overlap of the pre-competitive R&D cost? VBS is defined as a portfolio of real options in a process for commercializing life-science ideas until the milestone of proof-of-concept by partnerships among university, pharmaceutical company, and VC. The option-games method is defined as an integrated methodology between real options and game theory, regarding the difference of real options with financial options as the limited exclusiveness. The objective of this paper is to examine, firstly, a theory on investment timing under uncertainty and competition; secondly, the deterioration models of growth options at monopoly and perfect competition as both competitive extremes; and thirdly, the implication of VBS model as social innovation at oligopolistic structure and sensitivity analysis. It is still necessary to analyze the incentive of non-profit R&D by public private partnership.

## **TB-06.3 [R] A Comparison of Four Measurement Systems and Evaluation Indicators in Entrepreneurship: Evidence from Five Innovation-driven Economies in Asia**

*Yi-Wen Chen; Tamkang University, Taiwan*

*Chien Chiang Lin; Shih Hsin University, Taiwan*

*Chien-Liang Kuo; Chinese Culture University, Taiwan*

*Yu-I Lee; Far East University, Taiwan*

The nascent field of entrepreneurship is growing rapidly and attracting increased attention from many sectors, which developed 10 evaluation indicators continuously. In spite of the lack of a comprehensive comparison, rankings from those measurement indices were extensively used for investigating, evaluating, and adjusting entrepreneurial policies in different countries. Based on the criteria of academic value and social influence, four index systems were selected for further investigation and thorough comparison. Subsequently, we selected five innovation-driven economies in Asia and, using various indicators, examined whether their entrepreneurial performances differed significantly. A comparison with the business environment and entrepreneurship rankings showed that Singapore has an entrepreneurship-friendly infrastructure but a negative entrepreneurial atmosphere. A similar situation exists in Hong Kong. By contrast, Japan has few entrepreneurial activities and the least favorable overall entrepreneurial environment in Asia. However, people in Taiwan and South Korea have strong entrepreneurial passion and are willing to actively participate while entrepreneurial environments are improving. In conclusion, Taiwan and South Korea are the more appropriate Asian countries for entrepreneurship in the future.

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The comparisons in this paper showed that four indices possess a certain level of explanatory power and limitations. Cross-referencing these indices can significantly enhance the current understanding of relevant data.

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## **TB-07 Cultural Issues in Technology Management-1**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Shirasagi 1**

**Chair(s) Kiyoshi Niwa; The University of Tokyo**

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### **TB-07.1 [R] Culture as an Engine for Start-up Networks in a Cultural and Creative Product-based Small Service**

*Pei-Chia Chiang; National Cheng Kung University, Taiwan*

*Chia-Han Yang; National Cheng Kung University, Taiwan*

This research aims to explore the role of culture as a driver for starting up a cultural and creative product-based small service, particularly in discussing the embroidery shoe business in Taiwan. The antecedent studies have heavily explored the driver of innovation in different product-based business. However, the exploration about using culture as a driver for innovation and start-up network building remains undeveloped, and there is still little examination on the development pattern of culture and creative start-up and what role the culture really plays at an early stage. As a result, this study conducts a qualitative approach using participant observational studies and self-immersion approach through a single case study of the embroidery shoe business. The findings reveal that the role of culture in the start-up process will follow three phases including "culture as content," "culture to be preserved," and "culture to be regenerated." Meanwhile, instead of business partners in a network, there are also cultural partners in the start-up networks of cultural and creative business, thereby creating a cultural network for cultural events, workshop, exhibition, educational activity, and sales channel. Finally, the results also show that the role of incubator in the start-up network should more emphasize the service at demand side for cultural preservation and regeneration, instead of the conventional incubation service at supply side.

### **TB-07.2 [R] The Impact of Culture on Group Model-Building Process**

*Rina Sadia; Shenkar College of Engineering and Design, Israel*

System thinking refers to the interrelationship between the parts of the organization that intend to design, produce and distribute products or services. System thinking is actually a conceptual language that encourages professionals into using "feedback loop" thinking rather than mere linear thinking. To solve a problem, systems thinking requires the building of a model by a diverse group with a varied input. The group modeling process, which is an important process of system dynamics intervention in organizations, is mainly developed by researchers from similar backgrounds and cultures. A research conducted in Israel, a country with a mixture of cultures and social backgrounds, evokes a different experience and approach to the more known group model building techniques. Since the participants in the group were from diverse backgrounds in terms of their culture, economic situation and their work position, they could easily be led by their social condition in their thinking and opinions. Therefore, knowledge elicitation through the group model building process during the group sessions and on the other hand, knowledge elicitation through personal conversation brought up contradictory information and called for constantly improving the elicitation process.

### **TB-07.3 [A] The Value Creation and Governance of Ecology System in Creative Park Cased Taiwan**

*Bi-Ling Yeh; National Cheng-Chi University, Taiwan*

*Seh-Wa Wu; National Cheng-Chi University, Taiwan*

Value creation is a central concept and important issue in the creative and culture industry. It refers both to the content and process of the recombination of resources including tangible and intangible assets. The main question is how the value can be captured. We consider that there is an ecology system which emerges from the development of a creative park. The purpose of this paper is to explore the concept of value creation from an

integrated perspective. We identify four key factors which matter to the development of the creative industry: territorial capital, innovation milieu, value-network, and innovation space. We use the case Huashan 1914 Creative Park to illustrate the emergence process of value ecology and compare it with other creative park cases to discuss the interaction of the four factors which leads to the difference of the governance model.

### **TB-07.4 [R] Evaluating the Relation between Cultural Capital and Creative Industry Development by Grey Relation Analysis: Comparable Study of Creative Cities in Taiwan and Mainland China**

*Chia-Han Yang; National Cheng Kung University, Taiwan*

This research aims to provide an analysis derived by the grey relation approach regarding how the cultural capital in a city affects regional creative industry development, particularly in a comparable study of different cultural cities in Taiwan and China. Under this circumstance, this research adopts the statistical data investigated by Asia Pacific Cultural and Creative Industry Association (CCIA) in 2011 and 2013, using the grey relation approach to evaluate the most critical cultural capital in a city for developing cultural and creative industry. Three dimensions of cultural capital, including cultural support, cultural context, and cultural creation, are used as selected criteria in this method. The output of creative industry development such as industry network, market development, and cultural commercialization, are adopted as a benchmark base in this grey relation analysis. To compare the difference across the strait, the survey in five of Taiwan's municipalities and four of China's municipalities are analyzed in different groups, respectively. The research finding shows the essential cultural capital for developing creative industry in Taiwan's city was cultural context in 2011, and shifted to cultural support in 2013. Contrarily, the critical cultural capital for creative industry development in China's city was cultural support in 2011, and shifted to cultural creation in 2013.

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## **TB-08 Sustainability-1**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Shirasagi 2**

**Chair(s) Sara S Grobbelaar; University of Pretoria**

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### **TB-08.1 [R] Fostering Impact Investment in Developing Countries**

*Dilek Cetindamar; Sabanci University, Turkey*

*Hayri Kozanoglu; Kemerburgaz University, Turkey*

The paper presents the development of impact investment as an industry and then specifically focuses on the ways of fostering such a financial instrument in developing countries. Similar to the venture capital firms supporting innovation in high technology firms, impact investment firms are spurring social innovation in a vast variety of countries. Such a financial instrument might have high potential in developing countries that are faced with many social and environmental problems besides economic ones. Based on the experiences in advanced countries, we compare the conditions of advanced and developing countries in terms of building and running an impact investment industry. As impact investment is a unique financial institution, we will highlight how developing countries can learn from the experience of advanced countries and develop their own impact investment industry in order to foster their social innovation capability.

### **TB-08.2 [A] An Analysis of Japanese Social Innovation: Comparison Study on U.S. and Japanese Social Innovation**

*Yaeko Mitsumori; Tsukuba University, Japan*

The concept of innovation has been evolving. In the past, innovation was translated into Gijutsu-kakushin (technological reform), and the scope was limited to technology. However, today the scope of innovation has been expanding and it also includes "service innovation" as well as "social innovation." Social innovation is still a very new concept in Japan. After 3.11 (Great East Japan Earthquake), it is said that Japanese people changed their mind and turned to social values rather than monetary values. Especially, young people re-set their mind and started new businesses targeting creation of social benefits or social values. They



# SESSIONS

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are a part of social innovation. However, such cases are still limited in Japan. The author this year won some research fund and conducted her study on the U.S. social innovation activities as well as, on a limited basis, on Japanese social innovation activities. This study compared social innovation activities in these two countries: the U.S. and Japan. The study may give some implications for Japanese policy makers to work out some policies and measures to promote social innovation in Japan.

## **TB-08.3 [R] Environmental Sustainability And Reverse Logistics: An Analysis Of The Recycling Networks Of Cooking Oil Waste In Sao Paulo, Brazil**

*Rosicler B de Oliveira; Instituto Triangulo de Desenv. Sustentavel, Brazil*

*Mauro S Ruiz; Nove de Julho University - Uninove, Brazil*

*Marcelo L Gabriel Dias da Silva; Universidade Nove de Julho - Uninove, Brazil*

*Aldo Struffaldi; Ecoleo, Brazil*

*Evandro Bocatto; MacEwan University, Canada*

The recycling of used cooking oil is gaining increasing attention as society begins to realize the environmental, economic and social benefits of this activity. The reuse of cooking oil has not only prevented its inappropriate disposal but has also yielded economic and social benefits via the valuation of cooking oil waste as a raw material and the possibility of generating employment and income. This study aims to analyze how cooking oil recycling networks are formed to identify ongoing initiatives of collection and reuse, as well as to understand the processes of both formation and expansion of these networks. At present, a number of Civil Society Organizations of Public Interest (CSOPs) and nongovernmental organizations (NGOs) are spreading this idea and forming networks among suppliers of used oil (final consumers), collection points, processors (companies that collect, filter and sell the product) and companies that use the recycled oil as a raw material. This study examined two of these organizations (Ecoleo, an NGO, and Triangle Institute, TI, a CSOP) to obtain a preliminary overview of a number of existing initiatives for the collection and recycling of cooking oil in Brazil and the networks that are being formed around these initiatives, including their dynamics and expansion perspectives.

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## **TB-09 Technology Acquisition-1**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Hibari 1**

**Chair(s) Tomoko Saiki; Saiki Patent**

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## **TB-09.1 [R] Evaluating the Innovation Performance of Technology Mergers and Acquisitions in the Equipment Manufacturing Industry**

*Yue Wang; Beijing Institute of Technology, China*

*Yue Wang; Beijing Institute of Technology, China*

*Lining Shang; Beijing Institute of Technology, China*

*Ying Guo; Beijing Institute of Technology, China*

*Alan L Porter; Georgia Institute of Technology, United States*

Technology M&A has been an important way for companies acquiring knowledge resources to achieve rapid development externally, especially that aiming to obtain key technology capabilities. A big challenge that faces corporate managers and government policy makers is how to evaluate the innovation performance of post acquisition effectively. In this study, based on innovation process, we devise a method to evaluate the performance of the Tech M&A from the perspective of the technological innovation process, including R&D, patent and product sales. We present results in the numerical control machine tool industry in China.

## **TB-09.2 [R] Sources of Knowledge for Innovation in Automotive Component Manufacturing in South Africa, China and India**

*Khanyile Gwija; University of Pretoria, South Africa*

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

This paper investigates to which extent the scope and degree of novelty of innovation by automotive component manufacturers in developing countries are associated with the

scope of sources of knowledge used. The literature indicates a positive association between these parameters in the developed country context. However, it is not evident that in the developing country environment the same associations exist. Potential causes include market composition and institutional conditions. The data was obtained from a questionnaire survey amongst automotive component manufacturers in South Africa, China and India. Some 500 responses were analyzed by association testing. For firms in South Africa no association was found between the diversity of sources of knowledge and diversity of impact of innovation. In the case of the firms in China the association was found for local and domestic sources of knowledge. In the case of firms in India, an association was found for local sources of knowledge. While in the case of South Africa the lack of association between the diversity of sources of knowledge related to local, domestic and international sources and innovation degree of novelty appear anomalous, it has to be understood within an institutional context that favors dependency on multinational parent companies rather than indigenous technological innovation based on accessing a broad range of sources of knowledge.

## **TB-09.3 [R] The Study on Patent Acquisition from Complementarity and Supplemantarity: Evidence from Smartphones of Apple and Samsung**

*Ping-Chun Chang; Yunlin University of Science and Technology, Taiwan*

*Yu-Hsin Chang; Yunlin University of Science and Technology, Taiwan*

*Fang-Pei Su; Shu-Te University, Taiwan*

*Shu Jung Chen; Yunlin University of Science and Technology, Taiwan*

*Kuei Kuei Lai; Yunlin University of Science and Technology, Taiwan*

This study tries to figure out the strategy of patent acquisition against infringe litigation between rival companies of smartphones under dynamic competition. Patent citation network analysis is used to realize the difference of patent deployment and portfolios after patent acquisition between the leader Apple and the follower Samsung from the view of supplementary and complementary. Four patent indexes provide the movement of technology position and role in the network and the change in technology supplementary/complementary. The result shows that even though the leader and follower used to cooperate in relationship of OEM with technology supplementary, they intend to "de-opponent" technically because of patent litigation after becoming rivals in the same market. The leader will acquire supplementary patent to enhance his original patent portfolios and the follower will go the other way to strengthen his patent portfolios by acquiring a complementary patent.

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## **TB-10 Technology Roadmapping-1**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Hibari 2**

**Chair(s) Tugrul U Daim; Portland State University**

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## **TB-10.1 [R] Industrial Technology Roadmap as a Decision Making Tool to Support Public R&D Planning**

*Yonghee Cho; Portland State University, United States*

*Seong-Pil Yoon; Seoul National University of Science & Technology, Korea, South*

*Karp-Soo Kim; KAIST, Korea, South*

*Boyoung Chang; KIAT, Korea, South*

There are a variety of methodologies to forecast the future of technology, the economy, and society. Technology roadmap (TRM) is one of the easily implementable methods of technology forecasting. It is a strategic management tool to support R&D planning and new product development at various levels such as a firm and government. This study aims to address a strategic decision making tool in public R&D programs to affect firms' strategic behavior under this umbrella. The main purpose of this paper is to address evolutionary aspects of the industrial technology roadmap and provide a more advanced framework of public R&D planning. In South Korea, technology roadmapping has been initiated by the government since 2000 and nowadays is popularized in small- and medium-sized companies as well. Despite its popularity, there are only a few studies that provide practical guidelines and a systematic process to develop TRM applicable to R&D planning in any

# SESSIONS

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organizations. The framework of the industrial technology roadmap developed by the Korea Institute for the Advancement of Technology—which was established by bringing together six major government agencies such as Korea Industrial Technology Foundation, Korea Technology Transfer Center, Korea Institute of Industrial Technology Evaluation and Planning, Institute for Information Technology Advancement, Korea Material and Components Industrial Agency, Korea National Cleaner Production Center, Korea Institute of Design Promotion—can be applied to the R&D planning process of diverse government R&D programs in other countries. The proposed framework can be applied and modified to the R&D planning process in any organization. The study deals with a variety of industries having different characteristics, and it proposes a similar technology roadmap. Consequently, this paper attempts to articulate establishing firms' R&D and business strategy, accompanied by government R&D programs, and setting priorities among R&D projects.

## **TB-10.2 [R] Architecting Strategy: Visual Form and Function of Roadmaps**

*Robert Phaal; University of Cambridge, United Kingdom*

*Satoshi Yoshida; Advanced Institute of Industrial Technology, Japan*

Roadmapping is an established management method that supports strategy at innovation, business and sector levels. Roadmaps help to align investments in technology, infrastructure, capabilities and other resources with commercial, organizational and societal goals. The structured visual representation of strategy provided by roadmaps supports dialogue and communication across organizational boundaries. Roadmapping was originally developed for application in large technology-intensive industries such as electronics, aerospace and defense. The underlying principles of the approach are based on systems concepts commonly used to design complex engineered products. However, relatively little research has been undertaken to explore and develop the underlying conceptual basis of the approach, despite growing interest in the academic community, due to the emphasis on its practical origins and application. This paper provides a new perspective on the structure and function of roadmaps, based on well-founded design principles from the discipline of architecture. The conceptual basis of the technique is described, and illustrated with an industrial example, which is then related to perspectives from the field of architecture, strengthening the theoretical foundations of this established method. Based on this cross-disciplinary exploratory study, recommendations for future research are provided.

## **TB-10.3 [R] Developing an Integrated Technology Roadmapping Process to Meet Regional Technology Planning Needs: The e-Bike Pilot Study**

*Kelly R Cowan; Portland State University, United States*

*Tugrul U Daim; Portland State University, United States*

*Steven T Walsh; University of New Mexico, United States*

Smart grid is a promising class of new technologies offering many potential benefits for electric utility systems, including possibilities for smart appliances which can communicate with power systems and help to better match supply and demand. Additional services include the ability to better integrate growing supplies of renewable energy and perform a variety of value-added services on the grid. However, a number of challenges exist in order to achieving these benefits. Many utility systems have substantial regulatory structures that make business processes and technology innovation substantially different than in other industries. Due to complex histories regarding regulatory and deregulatory efforts, and due to what some economists consider natural monopoly characteristics in the industry, such regulatory structures are unlikely to change in the immediate future. Therefore, innovation within these industries, including the development of smart grid, will require an understanding of such regulatory and policy frameworks, development of appropriate business models, and adaptation of technologies to fit these emerging requirements. Technology Roadmapping may be a useful method of planning this type of future development within the smart grid sector, but such technology roadmaps would require a high level of integrated thinking regarding technology, business, and regulatory and policy considerations. This research provides an initial examination of the process for creating such a type of integrated technology roadmapping and assessment process. This research proposes to build upon previous research in the Pacific Northwest and create a more robust technology planning process

that will allow key variables to be tested and different pathways to be explored.

## **TB-10.4 [A] Integrating Data Mining into Technology Roadmapping**

*Tugrul U Daim; Portland State University, United States*

*Kevin van Blommestein; Portland State University, United States*

*Nazrul Islam; Aberystwyth University, United States*

*Sercan Ozcan; Aberystwyth University, United States*

*James Hillegas; Bonneville Power Administration, United States*

*Judith Estep; Bonneville Power Administration, United States*

This paper demonstrates the use of bibliometrics, patent analysis and social network analysis in identifying technical experts and leading organizations for technology roadmapping projects, thus addressing the challenge of identifying the right experts for varying roadmapping workshops as well as the technologies existing or under development.

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## **TB-11 Technology Diffusion-2**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Toki**

**Chair(s) Mei H Ho; National Taiwan University of Science & Technology**

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## **TB-11.1 [R] Investigation of the Diversity of Engineering Disciplines**

*Florian Steinmann; FAU Erlangen-Nuremberg, Germany*

*Kai-Ingo Voigt; FAU Erlangen-Nuremberg, Germany*

*Thomas Schaeffler; Siemens AG, Germany*

*Ulrich Loewen; Siemens AG, Germany*

The word engineering is used in various contexts and for a broad range of disciplines. But there is no common understanding for engineering disciplines. It is not clear which disciplines exist, the scope of disciplines is not defined, and there are no common naming conventions for engineering disciplines. This paper shall promote the common understanding of engineering by an investigation on the diversity of engineering disciplines. It is analyzed which engineering disciplines appear in publications and which disciplines are referenced by professional engineering associations and companies or by universities and educational associations. This work shows that the range of engineering disciplines is evolving. Based on our research we created a list of more than 200 engineering disciplines and examined the used names for the different disciplines. A final frequency analysis examines the frequency of occurrence of certain terms. Based on this analysis, the disciplines were ranked. It is shown that disciplines are evolving, that there are some major disciplines, and that newer disciplines are on the advance.

## **TB-11.2 [R] Technological Knowledge Diffusion in Customers' Community: Case of Tire Technology**

*Toufiq Ahmad; JAIST, Bangladesh*

*Belal H.M.; JAIST, Bangladesh*

*Kunio Shirahada; JAIST, Japan*

Diffusion of technological knowledge among customers is a big issue due to technology's complexity. This opens up a communication gap between providers and customers who do not have technological knowledge. This gap often leads customers to choose lesser quality goods and services. Therefore, the gap needs to be reduced by diffusion knowledge and finding ways to interact with customers to share that knowledge. The aim of this paper is to identify the key factors of technological knowledge diffusion in the customer community. We selected the tire industry as a sample. This is because, in the tire industry, companies often face a communication gap with consumers who do not understand tire technology. Tire technology knowledge and medical knowledge are similar from the viewpoint of safety, hazards, and sensitivity in terms of technology. We have analyzed drug knowledge diffusion in the customer community in our previous work as diffusion research. In this paper, we proposed three hypothetical perspectives to diffuse tire technology knowledge on the basis of the findings of drug knowledge diffusion. In addition, we will identify how manufacturers and dealers share tire technology knowledge with customers through direct contact, which

# SESSIONS

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will help customers with their buying decision. Focusing on the customer community as a unit analysis is a new perspective for understanding the mechanism of technology knowledge diffusion in the global tire business.

## **TB-11.3 [R] Analyzing the Brokerage Roles of Stakeholders in a Technological Network: A Study of GMO Plant Technologies**

*Mei H Ho; National Taiwan University of Science & Technology, Taiwan*

*Han Ying Cheo; National Taiwan University of Science & Technology, Taiwan*

Knowledge flows help to explain how technologies evolve from certain applications to other new directions. Flows in some technology show how stakeholders utilize the success of new inventions to improve human life, whereas some knowledge diffusion expresses that the dominance of technological development is embedded in a few stakeholders. We take genetic modified organism (GMO) technologies used in plants as the research context and discuss the development of biotechnology sectors in the past few decades. We also explore how industrial actors, governmental units, and universities have influenced the path of technological development. This study collects 4,117 patents, owned by 492 institutions, in USPTO (United States Patent and Trademark Office). We utilize patent citations to build the networks among technologies and among stakeholders. A main path analysis, i.e., the technological network, specifies the core developments in GMO technologies during this research time period. Through brokerage analysis of different stakeholders, some national governments show their importance by being a liaison among different stakeholders. United States industrial actors play a dominating role in the field, while European research agencies play a consultant role to facilitate knowledge flows among different nations.

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## **TB-12 Enterprise Management-2 Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: Houmeiden**

**Chair(s) Stephen Hundley; Purdue School of Engineering and Technology**

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## **TB-12.1 [R] Exploring the Sustainability Life Cycle of Enterprise Computers in Higher Education**

*Martin J Wagner; Purdue School of Engr. and Technology Indianapolis, United States*

*Charles Feldhaus; Indiana University, United States*

*Pat Fox; Purdue School of Engineering and Technology, United States*

*Feng Li; Purdue School of Engineering and Technology, United States*

*Kim Milford; Indiana University, United States*

*Julie Little-Wiles; Purdue School of Engineering and Technology, United States*

*Stephen Hundley; Purdue School of Engineering and Technology, United States*

Enterprise computing services play a critical role in universities enabling faculty, students, and staff to complete meaningful work and further goals of the institution. These services require physical server computers with processors, disk space, and memory. Physical servers take up data center space and consume power; they are designed for performance with little detail paid to ecological design. In an effort to reduce hardware and maintenance costs, a trend to virtualize these servers exists, which would also free up physical space and save energy. This exploratory case study explored the current sustainable computing trends at a large university in the Midwest as well as whether practices of virtualizing enterprise server computers were economically, socially, and ecologically sustainable. Finally, this study investigated how these practices were planned, monitored, and evaluated. Findings indicate that virtualizing enterprise servers in the Intelligent Infrastructure is economically, socially, and environmentally sustainable. Recommendations for university leadership were developed as a result of data gathering and analysis from participant interviews, correspondence, observations and artifacts. Maximizing utility and outreach were the two dominant related themes present in the data sources.

## **TB-12.2 [R] Influence of Organizational Elements on Manufacturing Firms' Service-enhancement: An Empirical Study Based on Chinese ICT Industry**

*Aifang Guo; Zhejiang Sci-Tech University, China*

*Guangpu Chen; Zhejiang Sci-Tech University, China*

*Ze Zuo; Zhejiang Sci-Tech University, China*

Despite the growing awareness of the importance of servitization of manufacturing, relatively little study has been performed on how organizational elements may or may not enhance the value creation of manufacturing, and even less in the developing countries. The present study aims to bridge this gap by examining the impact of a set of organizational elements on service enhancement in a sample of the ICT industry in China. The results of a multivariate analysis indicate that the degree of service enhancement (measured by product, customer and financial performance) can be well explained by five organizational elements (service technological capability, strategic orientation (including market and innovation orientation), organization design, and resources endowment). Therefore, it is necessary for organizations to consider organizational elements in implementing servitization in manufacturing firms.

## **TB-12.3 [R] Evaluation Tool for Technological Project Selection in the Early Stage of Innovation: Experiences from the Development of the Application in a Technology Transfer Office**

*David Guemes-Castorena; Tecnologico de Monterrey, Mexico*

*Gonzalo I Uscanga Castillo; Tecnologico de Monterrey, Mexico*

A technology transfer office needs to assess its technological project portfolio and is faced with the dilemma of selecting the most promising ones. Moreover, at the earliest stages of technology exist higher technical and market uncertainties as well as unsatisfactory evaluation tools to support the decision. Within this context, we already developed an evaluation tool that aims to assess the portfolio and supports the decision. However, there are some important questions related to the usability and the relevance and other benefits of the evaluation tool. This paper focuses on the experiences, the feedback from applicants/evaluators, and the lessons learned due to the application of the evaluation tool to a technology transfer office project portfolio in order identify the relevance of the evaluation tool as well as to improve the performance and its impact. This study comprises the problems associated with applying the tool, interpreting the results obtained, and foresees the future for the evaluation tool.

## **TB-12.4 [A] Disaggregation of Infrastructure and Service: Learning from Indian Telecom Sector**

*Sanjeev Chachondia; IIT Bombay, India*

*Kirankumar Momaya; IIT Bombay, India*

The telecom market in India has seen tremendous growth post-industrial liberalization in India that saw the unveiling of a new telecom policy in 1994. Today India boasts of 900 million telecom subscribers and very competitive tariffs at less than US\$ 0.01 (INR 0.5) per minute. The key objective of our study is to understand the growth of the Indian telecom sector during three phases (Phase I from 1994 to 2000, Phase II from 2001 to 2007 and Phase III from 2008 to 2013), exploring technology strategies and competitiveness performance with specific focus on the relationship between infrastructure and service integration. We begin by understanding the impact of policy intervention on the growth and in creating competition. We then adapt an exploratory case-study approach to look at the leading telecom firms' response to these policy changes. Some leading Indian companies adopted a very unique business model outsourcing large part of their network and IT infrastructure, and this paper attempts to evaluate its impact on performance factors such as technological capabilities, network quality and financials. We also explore the impact of this decision on their competitiveness, particularly in the international context and ability to succeed during a volatile time and rapidly changing market dynamics.

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## **TB-13 Technology Adoption-2**

**Tuesday, 7/29/2014, 10:30 - 12:00**

**Room: C'est la Vie**

**Chair(s) Nihan Yildirim; Istanbul Technical University**

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## **TB-13.1 [R] Pricing Model for Delivery of Cloud Computing Data**

# SESSIONS

## Infrastructure Services

Joe E Amadi-Echendu; *University of Pretoria, South Africa*  
Ayodele P Boglo; *Cartelcom Nigeria Company, Nigeria*  
Adeola Adebare; *Aphsiba Business Solutions, Nigeria*

Cloud computing provides a means for developing economies to improve their global competitiveness. This is because it is a combination of infrastructure, technology innovation and technology readiness. Private organizations, in the developing economy of context, believe there is a sizeable market to be served. The key challenge is to do this effectively at a price that is not only affordable but also economically viable. This is because it is believed that providing cloud services in the developing economy would cost more than it would in developed economies. This paper takes a risk-neutral approach, based on cost-plus pricing strategy to develop a model to help cloud providers build a case in this regard. The resulting model was then applied to a number of services and revealed that, indeed, providing cloud services in a developing economy would not be competitive without a public-private partnership in the areas of power and broadband internet.

## TB-13.2 [R] Exploring Viral Phenomenon as an Innovative Trajectory

Archana Boppolige Anand; *Indian Institute of Science, India*  
Mary Mathew; *Indian Institute of Science, India*

The viral phenomenon has garnered a great deal of attention in recent years. Although evidence of viral success exists, the underlying factors leading to the phenomenon and its measurement still remain a grey area which needs to be explored. The viral phenomenon for a product or information and its distinction based on growth curve trajectory has not been rigorously explored in the previous works. This paper aims to understand the viral phenomenon that makes products or information go viral. The viral phenomenon trajectories that distinguish the viral from a non-viral phenomenon are demonstrated. The curve fitting methodology for viral phenomenon is adopted which has not been looked into in the previous works. TED talks are analyzed to understand the diffusion pattern, essentially one or more spike, within a time period. Insights drawn indicate the characteristic viral growth trajectories and its implication on innovation.

## TB-13.3 [A] How to Implement and Diffuse ICT Based Education in Areas with Limited Resources in Developing Countries: Lessons from Rural Kenya

Yoshihiro Tabira; *Ritsumeikan University, Japan*  
Francis Otieno; *Ritsumeikan University, Japan*

ICT (information & communication technology) has been touted as having the potential to solve a number of educational issues faced in rural parts of developing countries; however, little research has been done to assess the impact of ICT-based education on teacher-student relationship and interaction. An action research approach is used to explore the impact of introducing ICT as a new learning tool. The findings are used as a guide to determine the appropriate type of ICT tools to be deployed for areas with different resources. A case study done in rural areas reveals the new relationship where students co-construct the way lessons are designed and taught, further the research finds that in areas of limited financial resources the DVD based content is the most appropriate method of executing a lecture style lesson. By designing appropriate methods, this paper also clarifies the barriers to diffusion of ICT in education.

## TB-13.4 [R] Improving Learning Motivation in a Learning Style Integrated Mobile Cooperative Learning Environment

Yu-Ching Chen; *Chinese Culture University, Taiwan*  
Yih-Jiun Lee; *Chinese Culture University, Taiwan*

Motivation is an essential factor to promote academic performance and learning satisfaction. Moreover, the development of mobile cooperative learning has become important in the mobile learning environment. Taking different learning styles into consideration when designing instructional materials will meet individual needs and improve the learning outcome. However, limited research has been done on investigating motivation in mobile

cooperative learning considering individual differences, so this study developed a mobile cooperative learning environment that integrates different learning styles (LSIMCLS) and tries to compare students' motivation between the groups with and without integrating learning styles. In this study, the MSLQ developed by Pintrich, et al., was modified to evaluate learning motivation. The results showed that the participants in the LSIMCLS group performed better than the non-LSIMCLS group. Moreover, the participants in the LSIMCLS group were more motivated in value, expectancy, and affective components. The results will be valuable when instructors want to develop a mobile cooperative learning environment integrating individual learning differences.

## TD-01 Innovation Management-5

Tuesday, 7/29/2014, 14:00 - 15:30

Room: Ootori 1

Chair(s) Dietmar H Winzker; *University of Pretoria*

## TD-01.1 [R] Product Innovation Factor Analyses in Korean Manufacturing Enterprises

Gyunghyun Choi; *Hanyang University, Korea, South*  
Minje Kim; *Hanyang University, Korea, South*  
Jooyoung Kim; *Hanyang University, Korea, South*

Korea's economy has been rapidly developed through the manufacturing industry since the 1960s. The current business environment is very complex and its uncertainty is also growing rapidly. Many manufacturing firms in Korea are trying to deploy an innovative product, but they are facing difficulties with product innovation because of various complexities such as the environment, organization, and customer. In this context, the purpose of this paper is to identify the product innovation factors in Korea's manufacturing industry and to analyze a driving power and dependence power among them. And then, it finally shows findings and implications for a management point of product innovation variables reflecting industrial characteristics of three major manufacturing industries in Korea: chemicals, electronics/optical products, and motor vehicles. This research uses interpretive structural modeling (ISM) and cross-impact matrix multiplication applied to classification (MICMAC) methodologies, which is derived from product innovation data of the Korea Innovation Survey (KIS).

## TD-01.2 [A] Networks in Shipbuilding Cluster in Western Part of Japan

Daisuke Yamakawa; *Nagoya Institute of Technology, Japan*  
Nobutaka Odake; *Nagoya Institute of Technology, Japan*  
Kana Hayase; *Nagoya Institute of Technology, Japan*

Lately, we are interested in networks of industrial clusters. Though these studies point out the importance of cluster networks, the network itself has not been analyzed. The Japanese shipbuilding industry is concentrated in western Japan, specifically in the Seto-Uchi and northern Kyushu areas, and makes the value chain in this cluster. It consists of two industries, ship manufacturing and marine equipment. The research objective is to derive solutions for some issues regarding future prospects of the Japanese shipbuilding industry cluster by targeting an analysis of the present situation in western Japan, including the Seto-Uchi and northern Kyushu areas, based on a cluster or a network analysis. Our analysis perspectives are the following three points: (1) transaction status among the cluster, (2) the network structure, and (3) the network function. Our study shows that the multilateralization of Japanese ship industry has changed its cluster structure. The ship manufacturing industry developed out of the Meiji era Navy yard and was successfully taken over by the private sector. The marine equipment manufacturing industry, on the other hand, was widely spread out across Japan. In other words, we understand that it becomes apparent that this cluster constitutes a specialization network in western Japan and it has a different structure in each industry.

## TD-01.3 [R] Exploratory Innovation, Exploitative Innovation and Firm Performance: Moderating Effect of Organizational Structure and Slack Resources



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Xuefeng Liu; Xiamen University, China  
Yuying Xie; Shepherd University, United States

As suggested by prior research, there are two types of innovation: exploratory innovation and exploitative innovation. What is the relationship between the two approaches of innovation and firm performance? We argue that the effect of each approach of innovation on firm performance is contingent upon organizational structure, measured by centralization and formalization, and slack resources, consisting of absorbed slack resources and unabsorbed slack resources. Using data from 155 Chinese manufacturing firms, we show that centralization has a positive moderating effect on the relationship between exploitative innovation and firm performance; formalization has a negative moderating effect on the relationship between exploratory innovation and firm performance; and unabsorbed slack resources have a negative moderating effect on the relationship between exploitative innovation and firm performance.

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## **TD-02 New Product Development-2**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Ootori 2**

**Chair(s) Gloria Barczak; Northeastern University**

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### **TD-02.1 [R] Design Principles for an Integrated Product and Process Development Approach for Rotationally Symmetric Products**

Guenther Schuh; WZL RWTH Aachen University, Germany  
Till Potente; WZL RWTH Aachen University, Germany  
Christina Thomas; WZL RWTH Aachen University, Germany  
Stephan Schmitz; WZL RWTH Aachen University, Germany  
Jonas Mayer; WZL RWTH Aachen University, Germany

Highly customized products lead to irreproducible complexity in product development and manufacturing. Additionally, order processing becomes very complex. Today's product design and IT tools reduce this complexity insufficiently. Potentials in administration and manufacturing are not fully in line. Most of the relevant approaches for designing products focus on the product without considering interactions with manufacturing. Approaches within concurrent engineering predominantly support optimization of single components rather than modular product platforms. The presented approach develops constituent features by setting product and manufacturing-process standards for modular product platforms. These constituent features describe product characteristics that have a critical impact on product and manufacturing complexity. These features don't affect customer demands and therefore can be standardized. The key factor to derive constituent features is to quantify the variance sensitivity of product features. Variance sensitivity is a measure of the costs required to produce product variance. Hence, highly diverse variance-sensitive features lead to additional expenses in manufacturing processes. The aim of this paper is to develop an approach to statistically quantify the variance sensitivity in order to set constituent features for rotational symmetric products. Knowledge of the influence between product features and manufacturing process enables companies to offer customized products with cost-effective manufacturing processes. This technological and production-related flexibility is essential for the growing needs of global markets.

### **TD-02.2 [R] New Product Development Effectiveness: A Pathway to Sustainable Competitive Advantage**

Marcelo A Machado; Kwantlen Polytechnic University, Canada  
Evelina Ericsson; KTH - Royal Institute of Technology, Sweden  
George Verghese; Kwantlen Polytechnic University, Canada

New product development (NPD) is a major source of competitive advantage to companies. Decades of quality research lead to substantial developments. Time-to-market was substantially reduced. The elimination of non-value-adding activities and a controlled, almost error-free flow from idea to launch resulted in substantial reduction of NPD expenditures yet improvements in project quality. Considering how increasingly challenging it is to launch successful products in the market, the question becomes is that enough? This study aims

at discussing the idea that a greater emphasis on creativity may lead to a more effective NPD process. A more effective NPD process will in turn generate development of outstanding products and consequently increase revenues, profitability, brand value, stock performance and ultimately sustainable competitive advantages. In terms of organization, firstly this study will contain a literature review about pertinent NPD. Secondly, a conceptual model of NPD enabling both creativity and efficiency, and consequently NPD effectiveness, will be proposed. Finally, conclusions, limitations, and opportunities for future research will be discussed.

### **TD-02.3 [R] The Influence of Product and Service Ratio on Stakeholder Interaction in Software System Development**

Man Hang Yip; University of Cambridge, United Kingdom  
Tomi Juhola; University of Turku, Finland

Software systems have a growing importance in how services are delivered in the present-day. New methods and technologies are constantly introduced for realizing novel services in a wide range of industries. For example, software has been integral to the delivery of financial services. In this study, stakeholder engagement in the development of software systems is examined. Two software development projects are selected for their varying degrees of product and service content. Both teams use an adapted stakeholder identification framework developed for the healthcare industry to identify stakeholders for the new software systems. This paper presents the preliminary conclusion that the adapted stakeholder identification framework is suitable for new financial services software system development. The differences in stakeholders for the development of new software systems of dissimilar product-service mix are discussed in the paper, highlighting four key observations in the perspectives of product quality, relationship management, product support by customer, and service delivery process.

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## **TD-03 Intellectual Property-5**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Ootori 3**

**Chair(s) Tomoko Saiki; Saiki Patent**

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### **TD-03.1 [R] Forecasting Dental Implant Technologies Using Patent Analysis**

Sandy W.C. Chang; National Tsing Hua University, Taiwan  
Charles V Trappey; National Chiao Tung University, Taiwan  
Amy J.C. Trappey; National Tsing Hua University, Taiwan  
Squall ChunYi Wu; National Tsing Hua University, Taiwan

Technology development extends the frontier of knowledge and offers new economic opportunities. Global populations are experiencing increased longevity which in turn increases the need for new medicines, devices, and medical services. For example, the percentage of people with missing teeth is almost 10% with the largest number (over 5.5 billion) in Asia and Africa (Tsai et al., 2010). There is a significant market for newer, less expensive, and easier to place dental implants. This research studies dental implants to document the development and trends using time series and cluster analysis of patent data. The methodology uses a three step search strategy to define the target patent groups. The database is built using the United States Patent and Trademark Office (USPTO) online files and search engine. The first step defines the target patent groups using related dental implant key phrases. The second step analyzes the main assignees and builds a patent map of the patent metadata. The patent map analysis includes the trends of applications over time, the analysis of assignee activities, the countries of assignees, the forward citations, the analysis of inventors, and the analysis of techniques. The final step determines the quality of the target patent groups. In order to understand the content of the patents, this research ranks the quality levels within a matrix of technology functions. The proposed methodology analyzes the distribution of dental implants and the patent strategy of main assignees. Extracting high quality patents and building clusters of emerging technologies provide an opportunity for companies to explore opportunities for designing next generation dental implant technologies.

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## **TD-03.2 [R] How Can We Specify the Second Use Drugs from Patent Information?: R&D on the Second Use Drugs May Lead to Further Development of Pharmaceutical Industries**

*Nobuko Tsutani; Tokyo Institute of Technology, Japan*  
*Yoshitoshi Tanaka; Tokyo Institute of Technology, Japan*

Needless to say, it is not easy to develop new drugs because of the huge amount of investment in R&D. For the pharmaceutical companies, which have difficulty to enter into new drugs development, it will be one of the opportunities to make R&D to find the second use of commercialized drugs. The second use drugs are known as the drugs which its new effects have been found out after the original drugs and the new effect shall be different from the original effects. The result of R&D of the second use drugs can be patented as use claims depending on its inventive step. However, it is not easy to specify which patent claim is the second use drug, and there are no well-established methods to identify them. So, in this research we will propose the way to identify them with patent information by using the variation of IPCs, the description of patent claims, and the joint applicants. Then, for the collected second use drugs' patent information based on the proposed method, we made analysis of the situation of R&D strategy targeting the second use drugs, as an example, Takeda Pharmaceutical Company Limited. We believe the proposed method and the results of empirical study will contribute to further growth of pharmaceutical companies by defining R&D strategy which is well balanced developments between new drugs and the second use drugs.

## **TD-03.3 [A] Can We Specify the Technical Field of Know-How by Making Patent Portfolio Analysis?**

*Manabu Sugimoto; Tokyo Institute of Technology, Japan*  
*Yoshitoshi Tanaka; Tokyo Institute of Technology, Japan*

It is important for companies to make decisions about whether new technology is applied as a patent application or should be hidden as know-how to keep technical competitiveness. Companies are given exclusive rights by patent granting. On the other hand, know-how is protected under the trade-secrets law. Companies are required to make strict secrecy management of know-how to have protection. However, it is not easy to keep it as secrecy, and in the real business situation there are many disputes, according to information leakage by the mobilization of human resources. Originally, know-how was controlled as a secret in companies, and it is invisible for outsiders. However, if we specify a technical field in which know-how is hidden in patent specification without disclosure, it is useful for leading companies to keep its secrecy and upgrade the strategies of managing know-how. On the other hand, it helps following companies to make decisions about which technical field they should concentrate on in the development effort of such a secrecy area. This research is a challenge to specify a technical field in which know-how is hidden in patent specification, by making analysis on patent specification, in the field of aramid textile as one of the example of this research field. We believe that this research outcome contributes to management of technology in chemical companies in aramid textile field, and it also gives the possibility to use the same methodology to find out know-how area from patent specification of the other industry field in the future.

## **TD-03.4 [R] India's First Compulsory License: Its Impact on the Indian Pharmaceutical Market as Well as the World Market**

*Yaeko Mitsumori; Tsukuba University, Japan*

India's pharmaceutical industry is the fourth largest in the world, by volume. However, between 1970 and 2005, the country did not have product patent. Without any product patent, the Indian pharmaceutical industry developed at a very rapid pace. However, due to the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), India was required to introduce product patent protection in its patent law. Despite objections to the introduction of product patent, the Indian government revised its patent law in 2005. Specifically, the Patents (Amendment) Act, 2005 includes some sections aimed at supporting a compulsory licensing regime. In 2012, the Indian government issued the country's first compulsory license against a foreign company's patented

drug. This article examines the impact of India's very first compulsory license on both the Indian pharmaceutical market and the world pharmaceutical market. It also analyzes and offers solutions for both developing countries and foreign companies who wish to avoid the compulsory licensing regime.

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## **TD-04 Collaborations for Technology Management-1**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Zuiun 1**

**Chair(s) Awie C Leonard; University of Pretoria**

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## **TD-04.1 [R] Talent Mobility Model at the National Level: A Case Study of Industrial Technology Assistance Program in Thailand**

*Songphon Munkongsujarit; National Science and Technology Development Agency, Thailand*

Science and technology capability is one of the critical factors in developing the nation's competitiveness and driving the economic growth as well as the well-being of the people. The mobility of talent between academia and industry contributes significantly to the stock of human resources in science and technology, thus talent mobility at the national level plays an important role in the country's strategy, especially in the developing country. Since Thailand has a limited number of human resources in science and technology, the establishment of appropriate talent mobility policy and measures is necessary. This paper explores one possible model of talent mobility at the national level by using case study analysis of the Industrial Technology Assistance Program (ITAP), which facilitates the linkage between academia and industry via the intermediary process that provides university professors and/or researchers to help solve technical problems for small and medium enterprises in Thailand. The paper discusses multiple cases of talent mobility in Thailand from different sectors to show the appropriateness of the ITAP model as one of the possible talent mobility schemes for Thailand.

## **TD-04.2 [R] A Rational Framework on the Causes and Cures of Collaborative Projects Failure**

*Zhijian Cui; IE Business School, Spain*  
*Christoph Loch; Cambridge University, United Kingdom*

This paper takes a rational perspective to study the causes and cures of collaborative projects failure in the organizations. It shows that project cooperation failure may result from two causes: project members' private information (with respect to their preferences and/or outside options) as well as their incentives to misrepresent—explicitly and implicitly—that information; and failure to build trust. Different from the prior studies, which often attribute project failure to poor skills of project management (e.g., miscommunication, trust building, etc.), this study shows that in collaborative projects, it is the structural conflicts among project stakeholders that handicap the communication and trust building. In addition, this paper also examines two mechanisms of self-enforcement and their effects on cooperation. First, when the costs of implicit communication are strongly asymmetric, one party may have the incentive to signal her private information in a way that goes beyond "cheap talk." Second, if the project payoff is fixed for one party but potentially higher for the other party, the risk of cooperation failure actually increases because the latter party then bargains more aggressively.

## **TD-04.3 [A] Collaboration Partners, Slack Resources and Firm's Innovation Performance**

*Yinjuan Yang; Zhejiang University, China*  
*Jin Chen; Qinghua University, China*

Firms rely more and more on external collaboration partners to reduce the R&D cost as well as shorten the product life cycle. Open innovation has become a new paradigm for firms to become competitive in a highly dynamic business environment. A firm's collaboration partner extends from customers, suppliers to universities, research institutes, and even competitors, and the resource based view holds that different partners can provide

# SESSIONS

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complementary resources and add more fuel to a firm's innovation, while the transaction cost theory holds that the coordination, communication traveling and the exchange of information among the involved collaboration partners will increase the innovation cost. Based on various theory foundations, this research highlights how the collaboration partners influence a firm's innovation performance, and how a firm's resource redundancy influences the interaction result of firms and various partners. This study underlines the importance of a collaboration partner in the process of a firm's innovation and highlights the role of slack resources in the interaction between an external collaboration partner and a firm's innovation performance.

## **TD-04.4 [R] Strategic Intent of University-Industry Transfer Collaboration**

*Beryl Z Kuo; Taipei College of Maritime Technology, Taiwan*

*Hsin-Yu Shih; National Chi Nan University, Taiwan*

*Peter J Sher; National Chi Nan University, Taiwan*

This paper examines the rationales of the firms that collaborate with the universities. Using information from a mail survey, this study examines the optimal collaboration mode for conveying the firms' strategic intents to interact with the universities. We test hypotheses from the knowledge-based view of the firm using information from a survey of 91 usable questionnaires out of 645 Taiwanese firms. Our empirical results suggest that the firms tend to collaborate with the universities when they aim at "passive" intents, but it is less likely for firms to license in university technologies based on "proactive" intents. The firms may collaborate with the universities by taking account of "efficiency-seeking, resource-seeking or internalization-seeking" intent. However, the firms tend not to license in university technologies when they aim at resource-seeking or internalization-seeking intents.

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## **TD-05 Technology Forecasting-1**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Zuiun 2**

**Chair(s) Fred Phillips; Stony Brook - State University of New York and SUNY Korea**

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## **TD-05.1 [R] Technological Frontiers and Embeddings: A Visualization Approach**

*Scott W Cunningham; Delft University of Technology, Netherlands*

*Jan Kwakkel; Delft University of Technology, Netherlands*

The paper concerns the measurement and forecasting of technological change, a topic relevant to many high-tech organizations and their customers. We revisit recent and classic data sets from technology forecasting data envelopment analysis (TFDEA) research and technometrics in light of a new visualization technique known as t-Distributed Stochastic Neighbor Embedding (t-SNE). The technique is a non-linear visualization technique for preserving local structure in high-dimensional spaces of data. The technique may be classified as a form of topological data analysis. Specifically, each point in the space represents a potential technological design or implementation, and each line segment in the space represents a local measure of technological improvement or degradation. We hypothesize six distinct kinds of performance development in technology within this space including the frontier, the fold, the salient, the soliton, and the lock-in. Then we examine the spaces to determine which kinds of development are the best explanations for observed development. The technique is not extrapolative, and therefore cannot supplant existing technometric methods. Nonetheless, the approach offers a useful diagnostic to existing technometric methods, and may help advance theories of technological development.

## **TD-05.2 [R] Improving Forecast Accuracy by a Segmented Rate of Change in Technology Forecasting Using Data Envelopment Analysis (TFDEA)**

*Dong-Joon Lim; Portland State University, United States*

*Timothy R Anderson; Portland State University, United States*

Technology forecasting using data envelopment analysis (TFDEA) captures technological advancement from the evolution of the state-of-the-art (SOA) frontier. Within this process,

TFDEA combines rates of changes (RoC) from past technologies that have been superseded by superior technologies. However, it was occasionally observed in previous applications that forecasting based on a single aggregated RoC did not consider the unique growth patterns of each technology segment, which resulted in a conservative or aggressive forecasting. This study proposes a procedure to improve the forecasting accuracy by identifying local rates of change for each frontier segment that may represent different product families. This approach is applied to six previously published applications using a rolling origin hold-out sample tests to validate its performance compared to the traditional TFDEA approach. The results indicate that the segmented rate of change approach determines different rates of change for product niches that result in more accurate forecasts.

## **TD-05.3 [R] Structural Equation Modelling Based Data Fusion for Technology Forecasting: A National Research and Education Network Example**

*Leon Staphorst; University of Pretoria, South Africa*

*Leon Pretorius; University of Pretoria, South Africa*

*Marthinus W Pretorius; University of Pretoria, South Africa*

This paper presents an example model instantiation of Staphorst, Pretorius and Pretorius' framework for Structural Equation Modelling (SEM) based Data Fusion (DF) for Technology Forecasting (TF) in the National Research and Education Network (NREN) technology domain. The paper's example NREN model instantiation is constructed through deductive reasoning from knowledge gained during action research in the South African National Research Network (SANReN), as well as secondary data from TERENA's NREN compendiums for global NREN infrastructure and services trends. A variety of technology related measurements are employed in the example NREN model instantiation as indicators for technology related model constructs, such as the level of core network traffic in an NREN. Indicators for context related model constructs include, amongst others, the range of institutions an NREN is mandated to connect. For confirmatory purposes the secondary data published by TERENA in its yearly NREN compendium series is then used in the Partial Least Squares (PLS) regression analysis to determine the indicator loadings and path coefficients of the example NREN model instantiation. A reliability and validity analysis of the example NREN model instantiation is also considered.

## **TD-05.4 [A] A Hybrid Roadmapping Method for Technology Forecasting and Assessment: A Case Study in an Information and Communication Technology Company**

*Meina Cheng; The Hong Kong Polytechnic University, Hong Kong*

*Benny Chi Fai Cheung; The Hong Kong Polytechnic University, Hong Kong*

*Sui Hei Fung; Hong Kong RFID Limited, Hong Kong*

*Kwok King Tsang; The Hong Kong Polytechnic University, Hong Kong*

Technology roadmapping is an indispensable method for aligning closely between strategic objectives and technology management, especially technology-intensive enterprises. It is interesting to note that most companies are pursuing technology roadmapping approaches, which is very compelling, but the normal perspective for most companies is from inside to out, which they start by looking at their own organization. To address the limitations found in the existing methods, this paper aims to develop a hybrid roadmapping method (HRMM) by incorporating two inside-out and outside-in perspectives for technology forecasting and assessment, which provides companies with fresh insights for strategic innovation and technology planning. The HRMM is composed of four main steps, which include preliminary discussion, inside-out roadmapping, outside-out roadmapping and follow-up discussion, respectively. It has been developed to provide a roadmap for strategic and innovation planning in inside-out and outside-in perspectives. The capability of the HRMM is realized through a case study conducted in the information and communication technology (ICT) industry, and encouraging results have been obtained.

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## **TD-06 Management of People and Organizations-1**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Chidori**

# SESSIONS

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**Chair(s) Donald A Kennedy; Willbros Group, Inc.**

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**TD-06.1 [A] Learned Techniques for Managing Engineers on Remote Major Projects**

*Donald A Kennedy; Willbros Group, Inc., Canada*

As world populations increase, the demand for non-renewable resources forces organizations to pursue mega projects in sparsely or non-populated regions. Worldwide trends towards urbanization make it increasingly difficult to attract and hold skilled workers in these less attractive locations. As well, the skill sets required to design and build the large projects may not be required within the organization once the facilities are operating. The operating organizations turn to a variety of outsourcing techniques to provide the labor to design and construct their mega projects. The differing priorities of the organizations involved can create further problems on all sides. Over a 15-year period, formal and informal interviews were held with a variety of players working on 10 remote projects with budgets in the \$1 to \$20 billion range. Although the interviews included skilled craft doing the physical construction, this paper focuses on the design phase and in particular the challenges with the management of the engineering effort. Techniques that mitigated reappearing problems were found in some of the projects and are offered here. These learnings should assist others considering a venture into such an endeavor, particularly if they do not have the bench strength within their current organization.

**TD-06.2 [A] Consideration Related to Engineering Human Development in Thailand Focusing on After AEC**

*Shinichiro Nomoto; JMA Consultants Inc., Japan*

Due to the sudden labor cost jump and population ageing in Japan, promoting new manufacturing factories in developing countries is accelerating more and more. Recently, product rollout is started by marketing which focused on developing country market and R&D strengthening. Beginning with top-rank corporations, developing country business strengthening is advancing. Until now, there are some types of industries such as food, electrical machinery, and machine that have been promoted in ASEAN, but it is said that promoting and localization for other types of industries such as medicine manufacturing, transportation/service, and construction will be accelerated from now on. In ASEAN, AEC (ASEAN Economic Community) will be launched in 2015. It is said that many kinds of infrastructures will be provided, and the transferring of human resources, technology, products, investment, etc., will go forward due to AEC. Required human resource must be changed more due to business expansion in entire ASEAN, especially Indochina peninsula by Thailand local enterprises and localization of management level of Japanese/foreign enterprises. This presentation considered about movement of engineering human resource development in Japanese and local companies which our company Thailand is dealing with, skill set which will be required from now on, and education/training method, etc., to acquire these.

**TD-06.3 [R] Technological Change and Its Impact on Skilled Jobs: The Case of Mexico**

*Humberto Merritt; National Polytechnic Institute (IPN), Mexico*

Technological change has always had a strong influence on the economy. In the case of the Information and Communications Technologies (ICT), their incessant penetration has transformed traditional working places, such as the office. Although many white collar activities have survived given the enduring reliance on qualified staff with abundant skills and experience, they now seem at risk due the progressive automation of clerical work. These trends are not exclusive of industrialized nations, though. Then, we pose the following question: to what extent is technological change affecting skilled jobs in developing nations too, and more specifically in Mexico? In attempting to answer this question, we examine the impact of ICTs on six skilled jobs in Mexico City: data entry keyers, photographers, computer systems analysts, messengers, stenographers and lathe operators. We found that traditional occupations have indeed disappeared, whereas specialized manufacturing jobs, such as lathe operators, seem to be still required by the market, although in a lesser

extent. We conclude that jobs are no longer defined by traditional skills but by multitasks abilities, especially in ICTs.

**TD-06.4 [R] The Study of the Key Factors of Successfully Importing Foreign Workers by Utilizing Two-Stage Relationship Marketing Model**

*Yann-Ling Wu; Feng Chia University, Taiwan  
Wen-Hsiang Lai; Feng Chia University, Taiwan  
Ying-Chyi Chou; Tunghai University, Taiwan*

In recent years, the Taiwanese government has been importing foreign workers to supplement the shortage of domestic labor force as a temporary expedient. Its main purpose is to help solve domestic businesses' labor problems. By importing foreign workers, the employer is able to obtain an immediate labor force. At the same time, the agency also generates economic gains. Upon arriving in Taiwan, language, religion culture and environment are all unfamiliar. For this reason, the workers have to adjust to these differences and work to achieve their financial goals at the same time. Some experience difficulties in both work and everyday life. Apart from issues of a personal nature, these difficulties may be related to several other issues particular to the foreign worker system. It could be government policies or control measures. It could also be the way the employer utilizes the worker or runs the business. This study is based on relationship marketing models. To discuss the key factors of successfully importing foreign workers, this study will be conducted by using questionnaires to verify the model and analyze the data.

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**TD-07 Technology Marketing-2**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Shirasagi 1**

**Chair(s) Rainer Hasenauer; Vienna HiTECH and WU Wien**

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**TD-07.1 [R] Mobile Connection: An Examination of Antecedents to Engage Consumer in Social Network App**

*Etta Y. I. Chen; Yuan Ze University, Taiwan  
Yu-Wen Lin; Yuan Ze University, Taiwan*

With the popularity of mobile handset devices, such as smart phones or tablet computers, it is very convenient for consumers to access wireless service on the go and for service providers to offer very instant and location-based services (LBS) via mobile applications. Marketers prefer to adopt social network applications (SNAs) as a new customized marketing tool to connect with their consumers nowadays. As a result, consumers face a variety of choices in SNAs. How to engage consumers in one SNA should be important for the service providers and sponsoring brands of SNAs. This study explores the motivation of consumer engagement in mobile SNAs by adopting the conceptual framework of content, process and social gratifications in Uses and Gratifications Theory. A questionnaire survey was designed for sampling the response of app users who reported using any social network app on mobile devices. 543 valid questionnaires were reserved for further SEM analyses. Research findings provided the evidence that entertainment was the key content gratification that motivated more consumer engagement in SNAs. Process gratification of LBS and instant service were found to be critical to consumer engagement in SNAs. Lastly, socialization gratification of self-expression and social influence also enhanced consumer engagement in SNAs.

**TD-07.2 [A] Consumer-Oriented Service Innovation in Music Industry**

*Etta Y. I. Chen; Yuan Ze University, Taiwan  
Chi-Jen Li; Yuan Ze University, Taiwan*

Music can be traditional but delivered to consumers in an innovative way to arouse their interests not only to listen but also to experience, for every touch points to the consumers. Technology plays an important role to catalyze the creative experiential marketing for the music industry. This case introduces a music company in Taiwan which targets at the segment of non-main stream music trying to elaborate new digital technology to bring their music closer to consumers by adopting consumer-oriented service innovation. For



# SESSIONS

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example, a creative marketing campaign for a new music album extended the benefits of mobile applications to have consumer play puzzle games for fun and meanwhile experience music of natural sounds. Another experiential marketing campaign for a new album of relaxing music uses the individual physiological tests, such as blood pressure or body temperature, as information to customize the prescription of personal relaxing music. As a result, no matters in virtual or real channel, these consumer-oriented service innovations provide a new look for music products to attract potential consumers.

## **TD-07.3 [R] Blogger Effect: User Behavior during the Theme Park Selection Process**

*Chia-Ko Lee; Feng Chia University, Taiwan*

*Yi-Chih Lee; Chien Hsin University of Science and Technology, Taiwan*

*Wei-Li Wu; Ching Yun University, Taiwan*

*Yang-Chu Lin; Soochow University, Taiwan*

Taiwan depends heavily on its tourist trade. The purpose of this study is to use the online platform of blogs to investigate whether emotional contagion, blog attraction and customer perceived value would affect the consumer's intent. The number of valid questionnaire samples is 312, and PLS is used to conduct linear structural equation model analysis. Research results show that blog attraction and customer perceived value have positive effects on purchase intention. Therefore, blog is an important channel to attract a consumer's attention.

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## **TD-08 The Innovation Database Platform for evidenced based science, technology and innovation policy by NISTEP, MEXT**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Shirasagi 2**

**Chair(s) Kazuyuki Motohashi; University of Tokyo**

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### **TD-08.1 [A] Japanese Government Project on Innovation Database Platform**

*Hirofumi Tomizawa; NISTEP, Japan*

*Natsuo Onodera; NISTEP, Japan*

*Yasuo Nakayama; NISTEP, Japan*

*Kenta Nakamura; Kobe University, Japan*

The Japanese government has been implementing a research program aimed at rationalizing the process of science and technology innovation policy-making. Part of this is a project to build an innovation database platform, which has been underway since 2011. The primary goal of this project is making available systematic data for promoting empirical quantitative research on science, technology and innovation policy. This paper describes the goal of this project and what the resultant data infrastructure could bring. Insights gained through past activities are reported as well. What is valued in the public and higher education sectors is creating databases for bibliometrics, a powerful methodology for the quantitative analysis of output from scientific research. The project aims to eliminate the division between each level of data (macro, mezzo and micro) arising from differences in the ways to create data, and to establish linkage between them, which we call a "vertical linkage" for its ability to connect upper and lower levels of data. The project also emphasizes "horizontal linkage," or links between bibliometric and non-bibliometric data such as data on R&D and research funding. In the business sector, which is the other key area, the project focuses on establishing mutual connections among different data sets, primarily including patent and corporate data, as well as data on innovation activities, intellectual property right (IPR) activities, and investments in R&D and intangible assets. The biggest hurdle to overcome in forming such mutual links between various data held by different companies lies in the organizing of patent data, a task that would call for a process known as "data cleansing," as in the case of bibliometric data. Almost three years have passed since the start of these efforts to develop databases. The databases are already available and have been used by policy researchers. The next challenge is how to exploit the outcome of such research for policy-making.

## **TD-08.2 [A] From Observation, Detection to Design of Innovative Research and Technology**

*Yuya Kajikawa; Tokyo Institute of Technology, Japan*

Citation network analysis is a powerful approach to illustrate a science map and therefore has been utilized for R&D planning and science and technology policy. However, observation of research trends based on publications and a science map lags behind the cutting-edge research front. Currently, much effort is devoted to developing a methodology to detect an emerging research front. In this paper, we develop it further and propose an approach to design innovative research and technology and to assess industrial opportunities in addition to traditional observation and detection methods. Citation network was used to illustrate science map and to detect emerging research fronts. Then, text analysis was used to measure relatedness between papers and patents and also papers in different research domains to design innovative research and technology. Results of case studies in energy technologies are shown to demonstrate the effectiveness of the proposed approach. Our results show that the proposed approach to integrate citation network analysis and text analysis can find plausible and promising research targets and evaluate industrial opportunity.

## **TD-08.3 [A] R&D and Patent Data for Empirical Analysis for Evidence Based Science, Technology and Innovation Policy**

*Kazuyuki Motohashi; University of Tokyo, Japan*

In this paper, the contribution of empirical economic analysis to evidence based science, technology and innovation policy planning is discussed based on two case studies, (1) financial support to a firm's R&D by subsidies or tax measures and (2) innovation system reform policy such as university and industry collaboration promotion. It is important to make a good balance of "theoretical rigidity," "practicality by addressing important issues" and "quality of dataset" for empirical policy analysis. In addition, the results from empirical analysis should be interpreted with substantial reservations in terms of the limitations of economic theory and datasets.

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## **TD-09 Commercialization of Technology-1**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Hibari 1**

**Chair(s) Robert Harmon; Portland State University**

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### **TD-09.1 [A] A Failure of Infrastructure and Service Integration: The Case of US 6 093 403**

*W. Austin Spivey; University of Texas at San Antonio, United States*

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

Worldwide, the occurrence of type 2 diabetes is outpacing population growth, and it will rank among mankind's main disablers and killers during the next few decades. The current dominant design for treating this scourge consists of four parts aimed at managing the disease: education and diagnosis; blood sugar monitoring; diet; and exercise. But what if a cure were possible, even without pharmaceutical intervention; better, what if diabetes could be prevented? In 2000, USPTO 6,093,403 offered this promise: an herbal formulation that lowered blood glucose and insulin levels; clinical trials showing undisputable evidence that both blood glucose and insulin levels fell into a desired range. This herbal concoction consisted of nothing more than plant extracts. Yet, the science-based entrepreneurs failed in their attempts to commercialize the promise. Why? The answer is a classic case of the failure in infrastructure integration and service in the broader sense of missed connections across the entire value chain, not merely information technology.

## **TD-09.2 [R] The Process of Value Creation, Delivery and Perception: The Theory of Value Perspective in Art Glass**

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

*Shih-Chieh Fang; National Cheng Kung University, Taiwan*

*Hung-Hsiang Kao; National Cheng Chi University, Taiwan*

# SESSIONS

Cultural creativity is part of our lives. Over the recent years, the cultural-creative industry has drawn a great deal of attention from the public and has been widely researched by scholars. However, the process by which the value of cultural products is created, delivered, and perceived remains largely not well understood. Using art glass as an example, this paper aims to construct a value co-creation model for cultural products through interpretive methods of qualitative research. The major findings of this study are: 1) The value co-creation model of cultural products can be understood from the perspectives of the creator, the product, the place/channel, and the consumer; 2) the model of value co-creation is a process of dynamic organizing; and 3) the value co-created by cultural products involves both economic and social values, and can be realized through dialogue/communication, purposely designed context, and awareness building. With these findings, this paper not only provides new insights to the theory of value, but also practical implications for the cultural-creative industry.

## **TD-09.3 [R] Effects of Organisation's Dynamic Capabilities on the Duration of Patent Commercialisation: the Case of Taiwan Biotechnological Industry**

*Shih-Chieh Fang; National Cheng Kung University, Taiwan*

*Ming-Yeu Wang; National Chia Yi University, Taiwan*

*Feng-Shang Wu; National Chengchi University, Taiwan*

*Wei-Ying Chen; National Cheng Chi University, Taiwan*

In recent years, the commercialization of technology has attracted considerable attention. The technology development process, from invention to commercialization, contains numerous uncertainties and factors that influence the duration of patent commercialization, such as appropriability, lead time, science linkage, and number of patent citations. However, most studies have neglected the relationship between organizational capabilities and the duration of commercialization. This study used dynamic capabilities to construct a research framework for the factors that influence the commercialization of biotechnological patents based on the primary theoretic basis of organizational capabilities. Following a literature review, this study proposed a hypotheses regarding the influence that four major capabilities of an organization's dynamic capabilities have on the commercialization of biotechnological patents. Data were collected using questionnaires distributed to companies in the biotechnology industry. Regarding the 119 questionnaires distributed, 28 of the collected questionnaires were valid. The validity and reliability of these questionnaires were analyzed using SPSS 17.0. Subsequently, a survival analysis was conducted to verify the hypotheses proposed in this study. The results were used to verify whether the various dynamic capabilities, such as sensing, learning, and integration, as well as whether the possession of complementary assets, significantly influenced the feasibility of commercializing a specific patent. In addition, we examined whether company locations (within science parks or not) significantly influenced the feasibility of commercializing a specific patent.

## **TD-09.4 [R] Innovation of Telehomecare Service industry: A Patent-based Assessment**

*Ming-Yeu Wang; National Chiayi University, Taiwan*

*Jei-Heng Lin; National Taiwan University, Taiwan*

*Min-Chun Chiang; National Chiayi University, Taiwan*

With the advancement in information and telecommunication technologies, telehomecare can surmount obstacles in space and time and exchange clinical information between patients and experts, which fulfill the patients' needs of the aged society. Servitisation not only represents the developments of new products or technologies, but also includes the innovative activities in improving current products and services which can respond to market demands. Patent databases contain abundant information on technologies, in which the category of "business method" contains patents in innovating business models. Therefore, this study examines the telehomecare service patents which are embedded in the business method and telehomecare device technologies. This study presents the innovation outcomes and assesses the technological gaps in the telehomecare service industry. The results offer suggestions and guidelines for firms to deal with strategy planning in patent portfolio, collaborator searching and technological developments.

## **TD-10 Technology Management in Semiconductor Industry-1**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Hibari 2**

**Chair(s) Bi-Huei Tsai; National Chiao Tung University**

### **TD-10.1 [R] Partnership Ecosystem of IC Design Service Companies: Case of Taiwan**

*Naparat Siripitakchai; Tokyo Institute of Technology, Japan*

*Kumiko Miyazaki; Tokyo Institute of Technology, Japan*

*Jonathan C Ho; Yuan-Ze University, Taiwan*

The continuously evolving IC industry has driven an IC design service to become an emerging sub-industry to the semiconductor value chain. This emerging business manages the entire chip development manufacturing process and applies a third party's resources when and where its customer needs them. To keep the customer as their main focus and deliver what the customer truly needs, a strong and committed partnership ecosystem is more important than ever. Therefore, the objective of this study is to explore the partnership network of Taiwan's IC design service companies by applying the co-evolutionary theory in business ecosystem. The partnership network is analyzed together with the corporate data such as revenues and milestones. The finding shows that the firms have accumulated and created their competitive advantage through partnerships with various leading manufacturers, IP vendors, and EDA tool providers in order to leverage their technological capabilities over time. While the production ecosystem is being localized in Taiwan based on the benefit of the complete value chain, the IP ecosystem is more internationalized. This study contributes to the understanding of the characteristics of the emerging business in a highly competitive environment. It should also provide policy implications for the industry stakeholders and government about new opportunities in a highly competitive value chain.

### **TD-10.2 [R] Analysis of Patent Portfolio and Knowledge Flow of the Global Semiconductor Industry**

*Chien-Che Chiu; National Chung Hsing University, Taiwan*

*Hsing-Ning Su; National Chung Hsing University, Taiwan*

This study aims to analyze semiconductor patents in the following dimensions: characterizing patent, forecasting future trends, uncovering key patents, as well as proposing patent strategies for the development of the semiconductor industry. In addition, this research studies investigate of patents in 1) national, 2) industrial and 3) organizational levels, through social network analysis, two-dimensional contour map analysis and patent characteristics analysis. In this study, semiconductor patents are retrieved, on the basis of IPC, from the United States Patent and Trademark Office (USPTO) database. Furthermore, the development trend and knowledge flow are investigated and visualized through the analysis of the numbers of patents, litigated patents, technological life cycle, patent citations and patent information, etc.

### **TD-10.3 [R] Application of Vertical Disintegration Theory in R&D Effect on Firm Value in Semiconductor Industry**

*Shin-Bin Chou; LeeMing Institute of Technology, Taiwan*

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

This paper focuses on Taiwan's integrated circuit (IC) industry because the global market shares of Taiwan IC manufacturing industries are ranked number one. The purposes of this study are to compare the differences in the effect of innovation activities on the market value among the IC design, manufacturing, packaging and testing industries and to evaluate whether the tax shields can increase firm value. The results statistically indicate that R&D significantly enhances market values in IC design firms, while it does not in IC manufacturing firms, indicating that an IC firm's R&D has a significant impact on the market value in IC design firms. In addition, this investigation concludes that the coefficient of tax shield is insignificant. Finally, the coefficient of book value (equity) in the regression equation is larger than one. The results are consistent with the conservatism principle in the accounting field. Furthermore, we find that the marginal impact of R&D on market values

# SESSIONS

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in IC design industries is larger than those in IC manufacturing industries. Under the vertical disintegration structure of Taiwan's IC industry, each step of IC manufacturing, packaging and testing stages is fixed with standardized machinery and equipment, so these IC manufacturing stages do not rely on R&D as much as the IC design stage does.

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## **TD-10.4 [R] From Founding Company to Global Company: The Case of Taiwan Semiconductor Manufacturing Company**

*Yu-Shan Su; National Taiwan Normal University, Taiwan*

*Chih-Yuan Wang; National Sun Yet-Sen University, Taiwan*

In this paper, we argued that latecomer firms' attachment to the global outsourcing network is the result of interplay between institutions, technologies and firms' strategies with a co-evolution nature. Previous researchers on latecomer firms tended to focus on the upgrading of manufacturing technologies. In this paper, we argued that servitization is also an important strategic behavior in this process and use TSMC as an illustrative case study to support our arguments.

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## **TD-11 Science and Technology Policy-1**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Toki**

**Chair(s) Neslihan Alp, University of Tennessee at Chattanooga**

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## **TD-11.1 [R] Importance of Inclusive Service for Corporate Use of University Research Infrastructure in Japan**

*Yuko Ito; NISTEP, Japan*

Research infrastructure, especially research equipment, is essential to perform R&D activities. Previous studies have shown that many researchers have used external research equipment that is not owned by their laboratories. To promote innovation, universities are increasingly expected to make their research equipment available as shared core facilities not only on campus but also to other universities or private companies. However, private companies' current utilization of Japanese universities' research equipment is very low. Therefore, this study aims to identify hidden barriers to corporate utilization of core facilities in Japan, and proposes ways to overcome them. To accomplish this, an online questionnaire survey was conducted with R&D personnel ( $n = 926$ ) in 2012. Results revealed that purpose of use, respondent age, and price of research equipment in daily use differed significantly depending on whether or not the respondent used neighboring universities' research equipment in the workplace. Further, on-site interviews with core facility management staff indicated that corporate users often needed technological advice that facilities could not provide due to skilled staff shortages. These results indicated that universities cannot attract corporate users without providing more inclusive service according to users' needs.

## **TD-11.2 [R] An Examination of the Output Additionality of Japan's R&D Subsidies for Small and Midsized Enterprises**

*Shigenori Hata; RIETI, Japan*

This study examines the output additionality of R&D subsidies for small and midsized enterprises in Japan. Results show that there are no significant differences in business performance indicators, such as return on assets, sales growth rate, and employment growth rate before and after participating in the subsidy program. As for the innovative activity indicators, there are no significant differences in such variables as R&D expenditure and R&D expenditure-to-asset ratio (RDA) either. While R&D expenditure shows no significance change, the number of patent applications reduced significantly: patent productivity declined regardless of the subsidies.

## **TD-11.3 [R] Exploring the Relationships Between Science and Technology Input and Output Indicators: A Comparison Between Developed, Fast Developing World and Turkey**

*Hakan Yildirim; Marmara University Management Faculty, Turkey*

*Nihan Yildirim; Istanbul Technical University, Turkey*

From a scientometric perspective, this paper aims to discuss the relationships between the financial science and technology input indicators like R&D expenditures and payments for external technology transfer (royalties and license fees) to the science and technology output indicators like patents/patent applications and receipts from technology transfer (royalties and license fees). Although the efficiency of R&D and economical returns of R&D spending has always been questioned and searched by the scholars from developmental economics, scientometrics and technology and innovation management fields, the performance of developing countries for utilizing R&D investments is still worth searching. In this study, we explored the trends of and relationships between science and technology input indicators like R&D expenditure, payments (royalties and license fees) and science and technology output indicators like patents/patent applications and receipts from technology transfer (royalties and license fees) for developed countries that are referred to as G-7 countries, fast developing countries that are referred to as BRIC (Brazil, Russian federation, India and China), and Turkey. Based on the data of the World Bank, S&T input and output indicators are analyzed by calculating the spatial-index of each country for each indicator between the years 1996-2010 where data of all countries are available. Indicators are tested for their correlations. The differences among G-8, BRIC countries and Turkey are also outlined.

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## **TD-12 Environmental Issues-1**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: Houmeiden**

**Chair(s) Kunio Shirahada; JAIST**

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## **TD-12.1 [R] The Relationship between Environmental Governance and Other Dimensions of Corporate Social Responsibility**

*Naomi Zeitouni; HIT Holon Institute of Technology, Israel*

*Arik Sadeh; HIT Holon Institute of Technology, Israel*

Corporate social responsibility (CSR) is a multi-dimensional concept, which raises the question as to whether strong performance in one dimension predicts strong performance in other dimensions. This work sought to determine the nature and strength of relationships between business ethics, business's code for social management, and investment in the community dimensions of CSR and its environmental governance dimension. The entire system of hypothesized direct and indirect relationships among the four variables was modeled using structural equations modeling on IBM SPSS AMOS. Several path analyses were tested using maximum likelihood estimations of the parameters in the model. Hypothesis testing was conducted on the entire system of equations and on each coefficient. The results show that investment in the community, and the code for social management in the business, have direct positive effects on the environmental governance rating. However, the business ethics interacts with it only indirectly, via its direct effects on both the business social code and its investment in the community. The magnitudes of the effects of these two variables are more or less similar at 0.286 and 0.269, respectively. In conclusion, for the corporates rated in the "Maala" index, a strong performance in the human rights and working place dimension and in the community investment dimension, predicts strong performance in the environmental dimension.

## **TD-12.2 [A] Lessons Learned on Recycling of Solid Waste Program 'USP Recicla' of Sao Carlos, Brazil**

*Cassia M Vieira Martins da Cunha Menezes; Universidade Nove de Julho - Uninove, Brazil*

*Mauro S Ruiz; Nove de Julho University - Uninove, Brazil*

*Aleixo L da Cunha Menezes; Nove de Julho University - Uninove, Brazil*

*Patricia C Silva Leme; University of Sao Paulo - USP, Brazil*

*Pedro L Cortes; Nove de Julho University - Uninove, Brazil*

Currently there is an awareness of the negative externalities of poor management of natural resources and its consequences to both present and future generations. Environmental

# SESSIONS

management and technological development have advanced to provide the continued fulfillment of the economic, social and environmental well being to the world society. In many organizations, learnings coming from the establishment of environmental management systems are quickly growing up in importance. Environmental management has also been introduced in higher education institutions allowing reduction of natural resource use. In this regard, environmental education has played an important role in raising public awareness on recycling of solid wastes in academia. This research refers to a case study on the ongoing project named Recycle USP undertaken in the Sao Carlos campus of Sao Paulo University. Based on a literature review and interviews carried out with 13 program participants, the research identified lessons learned by their managers to be presented to the academic community. These lessons are considered to be important for the implementation of recycling programs in other higher education institutions in Brazil and abroad. It is possible to anticipate that the main lessons learned relate to communication, stakeholder engagement, proactivity of the manager in promoting synergy among participants, enhancement of collective learning, and dissemination of information about the program.

## **TD-12.3 [R] Eco-Value Co-Creation Towards a Sustainable Tire Scrap Recovery Network: Case of Bridgestone Thailand**

*Pitchayarin Sukholthaman; JAIST and Thammasat University, Thailand  
Kunio Shirahada; JAIST, Japan*

Fast economic growth has currently been accelerating demand for automobile technology although scrap tires are improperly managed. Many discarded tires cause adverse impacts to the environment, social, and significantly affect public health. Due to many growing concerns about environmental conservation and human well-being, sustainability has become a main focus of industries, including the tire industry. The Extended Produced Responsibility (ERP) Directive is another challenge for tire manufacturers to constitute an end-of-life (EOL) management system to promote collection, recycling, or reusing of EOL tires. Thus, it is essential to have an effective tire scrap recovery network to properly manage all the used tires in a sustainable way. Not only does this paper show cooperation of tire manufacturers, distributors, and recyclers, but it also includes government agencies, private sectors, and end users for the creation of an integrated tire scrap recovery network. Achieving sustainable development for stakeholders in the tire scrap industry, this study demonstrates an eco-value co-creation model based on a tripartite concept describing how value is co-created in service providers and recipient interaction along a scrap recovery network. The approach is taken by studying human aspects incorporated with expert opinions on tire scrap management, and literature reviews and secondary data analysis will be thoroughly conducted.

## **TD-12.4 [R] The Technological Challenges Towards Sustainable Municipal Solid Waste Management System Based on a Service Sustainability Perspective: A Case Study of Bangkok, Thailand**

*Pitchayarin Sukholthaman; JAIST and Thammasat University, Thailand  
Kunio Shirahada; JAIST, Japan*

Consumerism and waste generation should be managed to work concurrently. The more consumerism uses up resources, the more waste is generated. Municipal solid waste (MSW) is clearly witnessed as one of the most severe environmental problems, but waste management technology advancement is halting. Waste management services have failed to respond to an ever growing amount of waste. If technology remains unchanged, we need more resources to manage the waste generated. This study concentrates on technological challenges of a MSW management (MSWM) system and identifies success factors to overcome technological gaps, which can occur along the management chain. Thus, technologies used in the waste management system will be studied by questionnaire survey and direct interview together with secondary data analysis. Public participation is an essential key for successful MSWM system because residents are the main generators. As technology is a key factor for MSWM, a basic public service should be provided to residents to make the system effectively run itself and eventually contribute to a better system for quality of life. To identify the success factors for a sustainable MSWM transition, this study will trigger and incorporate the human aspect of technology for MSWM by studying service

providers and service recipients' experience and attitudes on MSWM.

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## **TD-13 Decision Making-2**

**Tuesday, 7/29/2014, 14:00 - 15:30**

**Room: C'est la Vie**

**Chair(s) Kazuo Hatakeyama; Federal University of Technology of Parana**

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### **TD-13.1 [A] Expert System Based on Fuzzy Rules for Monitoring and Diagnosis of Operation Conditions in Rotating Machines**

*Rui F Marcal; Pontifical Catholic University of Parana, Brazil  
Kazuo Hatakeyama; Federal University of Technology of Parana, Brazil*

This work provides a detection method for failure in rotating machines based on a change of vibration pattern and offers the diagnosis about the operation conditions using fuzzy logic. A mechanic structure (as an experimental prototype where faults can be inserted) called Rotating System has been used. The vibration standard of the Rotating System, called "The Spectral Signature," has been obtained. The changes in the vibration standard have been analyzed and used as parameters for detecting incipient failures, as well as their condition evolution, allowing predictive monitoring and planning of maintenance. The faults analyzed in this work are caused due to insertion of asymmetric masses for unbalancing in the axle wheel. The system for diagnosing fuzzy system was calibrated to detect and diagnose the conditions: normal, incipient failure, maintenance, and danger, using linguistic variables. The frequency of rotation and the amplitudes of vibration of the axle wheel are considered in each situation as parameters for analysis and diagnostic for the decision by the expert system based on fuzzy rules. The results confirm that the proposed method is useful for detecting incipient failures, monitoring the evolution of severity and offering grants for planning and decision making about maintenance or prevention of rotating machines.

### **TD-13.2 [R] A Sequential Order Picking and Loading System for Outbound Logistics Operations**

*K.L. Choy; The Hong Kong Polytechnic University, Hong Kong  
G.T.S. Ho; The Hong Kong Polytechnic University, Hong Kong  
H.Y. Lam; The Hong Kong Polytechnic University, Hong Kong  
Canhong Lin; The Hong Kong Polytechnic University, Hong Kong  
Tsz Wing Ng; The Hong Kong Polytechnic University, Hong Kong*

With short product life-cycles, frequent delivery schedules of products are demanded by customers. Efficient outbound logistics operations are key goals of companies wishing to maintain customer satisfaction and achieve competitive advantage. However, in current warehouse operations, order picking and loading are performed separately and products are picked manually from warehouses according to customer orders and stored temporarily in staging areas in order to fully utilize the capacity of carriers. In practice, the separation of order picking and the loading process usually results in problems of excess storage buffers, long operation time, and quality deterioration of sensitive products left in the staging area. In this paper, in order to tackle these problems, a sequential order picking and loading system (SOPLS) integrating order picking and loading processes is proposed. The Genetic Algorithm (GA) technique is adopted in the system to identify the optimum picking sequence of tours with minimal travel distance. In addition, parameter settings for GA generation are tested in the simulation to find the optimal solution. The validation of the feasibility of the proposed system is illustrated through a red wine storage scenario. By using the SOPLS in the case company, it is found that operation time for outbound logistics and product deterioration are greatly reduced.

### **TD-13.3 [A] New Idea of Multi-Objective Programming with Changeable Spaces for Improving the Unmanned Factory Planning**

*Gwo-Hsiung Tzeng; National Taipei University, Taiwan  
Kuan-Wei Huang; National Chiao Tung University, Taiwan*



# SESSIONS

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Ching-Wei Lin; *National Chaio Tung University, Taiwan*  
Benjamin J. C. Yuan; *National Chiao Tung University, Taiwan*

Business decision-makers need various decision analyses to meet highly competitive environments. With the increasing cost of an intensive workforce and lowering marginal-profit products, how to break the limitation of resources and optimally reallocate all of the precious resources are the major issues to create the competitive advantages in the high-technology industry. Moreover, the second industrial upgrading has developed industrial robots in some production processes for providing more value-added production activities. Therefore, this study proposes a new idea of multi-objective programming with changeable spaces (decision space and objective space) named changeable spaces programming, extending the concept of De Novo programming. The best production resources reallocation in re-designing the decision space can be considered how to improve the multi-objective of unmanned factory planning in a high-technology firm for achieving aspiration level. This method provides decision analysis planning, not only to reach the ideal point but also to achieve the aspiration level in resource reallocation/redesign. A numerical example illustrates how to release the trade-offs between industrial robots and a workforce subject to constraints of the wafer manufacturing and how stage by stage to improve each objective for closing aspiration level in objective space. Computational results are demonstrated supporting the proposed model and are easily implemented with flexible effort in practical.

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## **TE-01 Innovation Management-6**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Ootori 1**

**Chair(s) Jieun Kim; Hanyang University**

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### **TE-01.1 [A] Successive Product Innovation in Emerging Market**

Toru Takekura; *Shibaura Institute of Technology, Japan*  
Makoto Hirano; *Shibaura Institute of Technology, Japan*

This paper describes product innovation produced by market needs in an emerging country through globalization of manufacturing industry, in a case of fastener business by YKK. It is generally said that product innovation is mainly produced in advanced enterprises in advanced countries, and after maturity of domestic market of such countries, the new product will be popularized also in emerging countries. Manufacturing enterprises in emerging countries should catch up to the advanced technology and penetrate the market usually by reducing cost of production without producing new product innovation. YKK was one of such late-comer enterprises in Japan as an emerging country in the early 20th century, and they should absorb the advanced technology from the USA at the beginning. However, they successfully produced a second product innovation and enlarged their business even for advanced countries over the world. They have grown up so rapidly in these several decades, and still now they keep a high world-wide market share of over 40%. The detailed analysis on their business clarified that their second product innovation was led by specific market needs in Japan as an emerging country. The analysis implies how manufacturing enterprises produce a successive product innovation to overcome stagnation in the globalized market.

### **TE-01.2 [R] How Do Customer and User Understanding, the Use of Prototypes and Distributed Collaboration Support Rapid Innovation Activities?**

Laura Kanto; *Aalto University, Finland*  
Pekka Alahuhta; *Aalto University, Finland*  
Kirsi Kukko; *Aalto University, Finland*  
Jussi Pihlajamaa; *Aalto University, Finland*  
Jouni Partanen; *Aalto University, Finland*  
Matti Vartiainen; *Aalto University, Finland*  
Pekka Berg; *Aalto University, Finland*

Speed in product, service and business model development is widely recognized as a source of renewal and growth both in theory and practice. This paper explores, theoretically and empirically, how the innovation process can be better managed and accelerated

by constructing customer understanding, by using virtual worlds, and by using different prototyping methods in the front end of innovation process. Previous studies have not addressed the speed of the innovation process via these lenses. We expect that by integrating the knowledge of customers with the innovation process, firms are more likely to rapidly sense emerging market opportunities. We suggest the distributed mode of collaboration conveys a potential to enhance innovation speed by supporting teamwork of individuals with diverse backgrounds and expertise. This diversity is expected to nourish team creativity and possibly enhance team performance. Virtual worlds are an emerging option for global team collaboration. Finally, we expect that using different physical models will enhance sharing, describing and developing innovation. Especially 3D-printing has made it possible to quickly print a physical model that people can experience: feel the surfaces, weight and mechanical functions. We propose that the combination of these themes will lead to new insights in innovation management.

### **TE-01.3 [R] Ambidextrous Innovation Capabilities, Antecedents and Performance**

Yuan-Chieh Chang; *National Tsing Hua University, Taiwan*  
Ming-Huei Chen; *National Chung Hsing University, Taiwan*  
Hui-Ru Chi; *Asia University, Taiwan*  
Hsing-fen Lee; *Middlesex University, United Kingdom*

R&D intensive firms have faced many kinds of innovation dilemmas in which firms have to develop both radical innovation to tap new opportunities and incremental innovation to enhance existing capabilities. The designed organizational structure allows to excel at both conflicting modes of innovation can be termed as organizational ambidexterity. However, how R&D intensive firms deal with various kinds of innovation dilemmas strategically still remains understudied. Based on the schools of organizational learning, strategic management, organizational design, and innovation studies, the study develops a notion of ambidextrous innovation capabilities (AIC) and AIC scale. AIC is formed by three dimensions: commitment, searching, learning and structure ambidexterity. And elaborates antecedents into three dimensions: corporate entrepreneurship, creative support and contingency reward. This paper proposes two hypotheses addressing the relationships between AIC and performance, antecedents and AIC. The survey generated 718 usable questionnaire responses in 68 BUs from 32 firms. The results show that AIC is positively associated with performance and antecedents are positively associated with AIC. In the future work, the paper concludes that the development of AIC could overcome innovation dilemmas, and in turn enhance the performance. Firms could apply the proposed instrument to diagnose the condition of AIC in order to achieve higher performance.

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## **TE-02 New Product Development-3**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Ootori 2**

**Chair(s) Supachart Iamratanakul; Kasetsart University**

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### **TE-02.1 [A] New Field Product Development Management Through the Collaboration of a Traditional Crafts Company and an IT Apparatus Company**

Tomohiro Sunasaki; *Japan Advanced Institute of Science and Technology, Japan*

Ishikawa Prefecture has top-level traditional-handicrafts techniques in Japan and holds a large production value of traditional crafts. However, according to the Department of Commerce and Industry in the Ishikawa Prefectural Government, its production dropped by one-third compared with its best period (1990). Similarly, the output of traditional industries has been greatly reduced in Japan as a whole. The external factors of this tendency are the change in lifestyle and the increase in cheap imports, and the internal factors might be the delay in product development adapted to the needs, and the delay of new distribution channels development. In order to improve this decline, some new field products have been developed by the collaboration of IT equipment companies and traditional crafts companies. Among these, the USB memory with the box of traditional porcelain, the mouse painted with lacquer, and the iPhone cover decorated with gold lacquer are receiving good reactions

# SESSIONS

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from clients. This paper will propose a product development management in a new field, presenting a case study of the above-mentioned hot-selling products.

## **TE-02.2 [R] The Positive Effect of Inward and Outward Capability on New Product Development Performance**

*Ching-Hsun Chang; Tamkang University, Taiwan*

*Yu-Shan Chen; National Taipei University, Taiwan*

*Yu-I Lee; Far East University, Taiwan*

This study develops an original framework of inward and outward capability to explore the positive effect of adaptive ability (inward capability) and relationship learning (outward capability) on new product development performance through the partial mediator - resource integration. The study employed a questionnaire survey and collected data from 167 Taiwanese manufacturing companies. Confirmatory factor analysis and structural equation modeling (SEM) are applied to verify the hypotheses. This study classifies Taiwanese manufacturing companies into three groups: highly, medially, and lowly capable companies. The results show that resource integration of highly capable companies are the most, and those of medially capable companies are the next, while those of lowly capable companies are the least. This study asserts that companies should invest in both inward and outward capability. This study combines the concepts of inward and outward capability to develop an integral conceptual model of new product development performance to explore its managerial implications.

## **TE-02.3 [A] New Product Planning Process in the Age of Service Dominant Logic**

*Hirofumi Sakano; Japan Advanced Institute of Science and Technology, Japan*

*Michitaka Kosaka; Japan Advanced Institute of Science and Technology, Japan*

This study is about the Product Planning Process in the era of Service Dominant Logic (SDL). It had been said during the age of Goods Dominant Logic (GDL) that the key to success in marketing was effectively adapting the Marketing Mix (4Ps). However, in practice, most product planners at that time only focused attention on "products" (goods), mainly by implementing the latest technologies then as far as the "price" (expected cost) was within their target. Although it actually worked well until the late 20th century, it has no longer been functioning effectively from the early 21st century. Product Planning in the era of SDL now needs to be a far more sophisticated process in the new Service Marketing Mix (8Ps). Unfortunately, we have no concrete "product planning theory" in the SDL age yet. Thus, we adopted four frameworks, as a first step, that were originally developed as tools for service value creation, which were also proved to be empirically valid in case studies on product planning in our previous paper. This research is the second step on how to integrate these frameworks toward the goal of achieving a "general theory for a product planning process" in the SDL age of marketing.

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## **TE-03 Intellectual Property-6**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Ootori 3**

**Chair(s) Laura McKinney; Oregon University System**

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## **TE-03.1 [R] Assessing Innovation Capability and Scientific Impact of Industry Through Patented Technologies**

*Ching-Wen Kang; National Chung Hsing University, Taiwan*

*Hsing-Ning Su; National Chung Hsing University, Taiwan*

Due to the constantly changing nature of our society, the ability to make correct decisions is crucial for decision-makers. Understanding science-technology linkages and knowledge flows are of critical importance for decision-makers. A recent surge of research on patents has given us new opportunities and challenges; and there are many advances that have been made in the area of patent analysis. Therefore, this study aims to measure innovation capability and science-technology linkage by analyzing USPTO patents from 1976 to 2012. Implications obtained in this study are summarized as: 1) innovation capability can

be measured by a properly selected patent indicator, 2) the level of knowledge diffusion and knowledge flows across industries can be evaluated, 3) the proportion of large R&D-intensive companies that are patent holders and the impact of policies on patent output are analyzed, and 4) the relation between a nation's patenting behavior and global patenting activities can be compared.

## **TE-03.2 [R] Crafting IP Strategies to Tailor-Fit the Industry Evolution**

*Hoi Yan Anna Fong; National University of Singapore, Singapore*

*Yuhong Lan; National University of Singapore, Singapore*

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

As cloud-computing technology becomes mature and accepted by the public, more players are joining the game, especially small- and medium-sized enterprises (SMEs). It would be essential for SMEs to understand the cloud value network and where the battlefields are in the whole value network so that they can equip themselves strategically. In this research, we analyze the technology evolution of cloud computing from a network and historical perspectives. We summarize the existing literature on cloud value chain and value network and derive the patent portfolios of some players involved in the value network. We also identify the key turning points in the development of cloud computing and correspond them to the respective timeline in the patent landscape. As intellectual properties, especially patents, are critical elements in technology development, this correspondence between the technology milestones and patent landscape will provide new insights into the technology development. Through this, we aim to exemplify the IP strategies used by the cloud-computing players in the value network. We propose that the IP strategies should co-evolve with the development of the technology and should take into account the newer players, especially SMEs, in the whole value network. This new IP strategy involves the interplay between the incumbents and SMEs and the close unique co-opetitive relationships between them.

## **TE-03.3 [R] Publication Performance Evaluation for Academic Institutes by Their Contributions to the Most Visible Publications across Multiple Fields**

*Chung-Huei Kuan; National Taiwan University of Science & Technology, Taiwan*

*Dar-Zen Chen; National Taiwan University, Taiwan*

We propose a method for evaluating the publication performance of academic institutes across multiple fields. With this method, we first determine the most visible publications (MVPs) for each field from all assessed institutes according to the field's h-index. Then, we measure an institute's performance in each field by its contribution to the field's MVPs as (a) the percentage share of the MVPs that is produced by the institute; or (b) the percentage share of the total citations of the MVPs that is received by the institute. Finally, we obtain an institute's cross-field performance measure as the average of its contributions to all fields. The proposed method is reasonable, intuitive to understand, and uniformly applicable to various sets of institutes and fields of different publication and citation patterns. The field and cross-field performance measures obtained by the proposed method not only allow linear ranking of institutes, but also reveal the degree of their performance difference.

## **TE-3.4 [R] Follow or Find Another Way?: 'De-Opponent' Trend of Patent Acquisition Between Apple and Samsung Smartphones**

*Ming Chung Yang; Yunlin University of Science and Technology, Taiwan*

*Yu-Hsin Chang; Yunlin University of Science and Technology, Taiwan*

*Ping-Chun Chang; Yunlin University of Science and Technology, Taiwan*

*Kung-Ling Ho; Yunlin University of Science and Technology, Taiwan*

The current competition among technology firms is centered on initiating patent litigations which conduct the planned acquisition of patents to enhance patent portfolios and planning. These methods are commonly employed between dynamic competitive rivals. The topic of this study is the evaluation of patent acquisition. To examine firm intentions regarding patent acquisition for technological network planning, a technology network constructed by patent citations and the concepts of technology enhancement and expansion was used to perform structural analysis. Apple and Samsung smartphones were adopted as the subjects of analysis. In particular, the patent litigations and information prior to and following the

# SESSIONS

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patent acquisition and transfer of the Apple and Samsung smartphones were investigated. A modified PCA was employed for technology classification and to identify technological trends for patents. The results indicated that the external acquisition of patents for the original co-opetition upstream and downstream firms becoming rival intended to “de-opponent” technically.

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## **TE-04 Collaborations for Technology Management-2**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Zuiun 1**

**Chair(s) Beryl Z Kuo; Taipei College of Maritime Technology**

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### **TE-04.1 [R] Trust and Technology Acceptance Model: An Experimental Investigation Concerning the Idea Contributor's Acceptance of the Organizational Matchmaking Process**

*Peter E Harland; Technische Universitaet Dresden, Germany*

*Ann-Marie Nienaber; Coventry University, Great Britain and Northern Ireland*

The presence or absence of worthy ideas is often the reason for companies' success or failure on competitive markets. Companies invest a lot of effort into attracting stakeholders such as customers to submit their ideas to them. For this purpose companies use several open innovation channels such as idea contests, open innovation platforms and university partnerships to boost the number and quality of external ideas. After a gold-rush period of open innovation activities, external idea contributors are no longer willing to accept companies' terms and conditions. They compare companies according to how trustworthy a company or an open innovation channel is because they want to ensure that the company does not behave in an opportunistic way. Therefore, the question arises of how companies can enhance their trustworthiness so that idea contributors are willing to submit high-quality ideas. To answer this question we conducted an experimental setting with three groups of students to understand when idea contributors trust companies' terms and conditions and submit their ideas. The results demonstrate that, e.g., a mediator is able to enhance an organization's trustworthiness and therefore increase the willingness of a potential contributor to offer an idea to the selected company.

### **TE-04.2 [R] Massive Open Online Research: An Approach to Deal with Wicked Problems**

*Marcelo A Machado; Kwantlen Polytechnic University, Canada*

*George Verghese; Kwantlen Polytechnic University, Canada*

*Tero Peltola; Tampere University of Technology, Finland*

Humans are hardwired as problem-solvers. Professional education, in particular, enables us to solve complex problems. Even decades ago, we could safely send a crew to the moon and back. A moon-bound project is a very challenging and complex problem, but it is a tame one. The problem is clearly defined and the challenge becomes how to find the best solution. As the world and issues become more interconnected, there is a different type of problem in the horizon - “wicked” problems. A wicked problem is normally complex and challenging, but differs from the “tame” problem because there is no agreement in terms of problem definition. A wicked problem does not allow for the “choice” of best solution. Solutions tend to only mitigate the problem and sometimes generate unpredictable consequences. For instance, climate change is an issue that requires a level of ingenuity that cannot be achieved by a limited group of people, regardless how brilliant they are. It cannot be addressed by our dominant scientific, reductionist, discipline-based, and proprietary approach either. This paper proposes Massive Open Online Research (MOOR) as a better approach to deal with wicked problems. In terms of organization, this paper includes a literature review on online collaboration, focusing on the dynamics of knowledge creation and innovation. Selected open online research initiatives are used to contextualize the literature review. Based on the literature review and real cases, a MOOR framework is presented and discussed. Limitations and opportunities for future research are also included.

### **TE-04.3 [R] How to Perform Knowledge Creation Successfully in**

### **International Strategic Alliances: A Multilevel Perspective**

*Wei-Li Wu; Chien Hsin University of Science and Technology, Taiwan*

*Yi-Chih Lee; Chien Hsin University of Science and Technology, Taiwan*

For companies in emerging countries, international strategic alliances provide excellent opportunities for knowledge transfer and creation. In practice, it is easy to observe that there is a nested relationship between international strategic alliances and a company, and this relationship covers the micro-strategic alliances level and macro-organizational level. In order to more precisely explore knowledge creation in international strategic alliances, this study explores the antecedents of both the strategic alliances level and organizational level on knowledge creation. Empirical results show that knowledge transfer which is from the strategic alliance level has a positively significant impact on knowledge creation; company scale, R&D intensity and business group scale which are from organizational level have a positively significant effect on knowledge creation. And, both the company scale and business group scale have a cross-level moderating effect on the relationship between knowledge transfer and knowledge creation.

### **TE-04.4 [R] The Mediation Effect of R&D Expenditure and University-Industry Cooperation Income**

*Shian-Hung Shiu; Far East University, Taiwan*

*Yun Ken; National Yunlin University of Science & Technology, Taiwan*

This study aims to explore the mediation effect of R&D expenditure and university-industry cooperation income in Taiwan's vocational universities. Based on research purposes, literature review and secondary data analysis are employed in the study. The number of published papers and issued patents are assumed as mediation variables in the study. The research data is from the Ministry of Education authorized “Basic Data of Higher Technological and Vocational Education.” Samples of this research are 11,774 higher vocational education teachers with industry-university cooperation programs in Taiwan. Implementation of the research: First, the data is encoded and archived. Then, the SPSS17.0 software for Windows is used for statistical analysis. Finally, the analysis of the results and the literature are matched to offer suggestions and make recommendations. The empirical results confirm the existence of the following relationships: 1. The R&D expenditure does increase the number of published papers and issued patents. (2) The number of published papers and issued patents do increase industry-university cooperation income. 3. Published papers and issued patents do have a mediation effect between R&D expenditure and university-industry cooperation income. These conclusions can offer further suggestions for current educational administration, vocational universities and industries to formulate their industry-university cooperation policy and strategy.

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## **TE-05 Technology Forecasting-2**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Zuiun 2**

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

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### **TE-05.1 [R] Identification of Requirements for Focused Crawlers in Technology Intelligence**

*Guenther Schuh; Fraunhofer IPT, Germany*

*Andre Brakling; Fraunhofer IPT, Germany*

*Katharina Apfel; Fraunhofer IPT, Germany*

The fast and high availability of knowledge is at first seen as a benefit for knowledge workers in the information age. On closer examination the outcome of this is a big challenge: The amount of data that is available these days has to be reasonably structured and conditioned. Only the US Library of Congress collected 235 terabyte of data on its own by April 2011. Technology intelligence as a fundamental component of technology management is expected to monitor these data, so technology managers are able to respond to new developments and trends just in time. Possible tools to meet this challenge in an efficient way are the focused crawlers. These are programs which explore data collections independently to identify material related to the current working context. To implement such a tool, there

# SESSIONS

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exist a multitude of different approaches within the field of information retrieval, but they have to be used and combined on an individual basis to fit the requirements of a particular task. Hence, before a focused crawler can make the processes of technology intelligence more efficient, the dedicated requirements have to be identified. In this paper we develop a requirements model to close this gap.

## **TE-05.2 [R] Forecasting Emerging Technologies of Low Emission Vehicle**

*Samira Ranaei; Lappeenranta University of Technology, Finland*  
*Matti Karvonen; Lappeenranta University of Technology, Finland*  
*Arho Suominen; VTT Technical Research Centre of Finland, Finland*  
*Tuomo Kassi; Lappeenranta University of Technology, Finland*

The aim of this paper is to propose a patent search strategy in the case of emerging technology fields and to study the development patterns of the low emission vehicle (LEV) technologies. An Automatic Patent Classification (APC) system has been developed based on text mining techniques to facilitate the patent retrieval process. The data was collected from the Global Patent Index (GPI) database, and interviews were conducted to involve experts' opinions. The technology forecasting method utilized the collected patent data to define the technological life cycles of LEV technology. The growth curves estimates steady growth in LEV technologies including hybrid and battery electronic vehicles, and apparently reaching the saturation point in few decades is inevitable. Plus, patenting activity of hydrogen fuel cell vehicle technology was experiencing the infancy period so far, and further it is anticipated to reach higher growth rate in line with other energy alternatives. The proposed method can help patent researchers in terms of retrieving accurate patents based on their technology target. Moreover, the technology forecasting techniques provide an insight to investors, assisting them to allocate their resources properly. The results can benefit car industry stakeholders to anticipate the most promising technology areas in an uncertain dynamic market.

## **TE-05.3 [R] Trends and Typology of Emerging Antenna Propagation Technologies Identified by Citation Network Analysis**

*Yasutomo Takano; Tokyo Institute of Technology, Japan*  
*Yuya Kajikawa; Tokyo Institute of Technology, Japan*  
*Makoto Ando; Tokyo Institute of Technology, Japan*

Detection of emerging technologies is vital for R&D managers and policy makers, and a bibliometric approach analyzing papers and patents has been developed. In this research, we propose research classification schema (RCS), which uses citation network analysis to classify technologies into four categories: change-maker, breakthrough, matured and incremental. Each technology is plotted on RCS based on its publication profile. A case study in the field of antenna was conducted to evaluate relevance and to evaluate effectiveness of RCS. The method can contribute to the usefulness of the identification process of promising technologies, and therefore, to the convenience of target designing of research projects in universities and companies. We also discuss the effect of resolution limit of clustering algorithm on RCS to improve reliability.

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## **TE-06 Management of People and Organizations-2**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Chidori**

**Chair(s) James K Chen; Asia University**

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## **TE-06.1 [R] The Influencing Factors of Enhancement of Employee Enthusiasm in Mining Industry: Case Study of Mongolia**

*James K Chen; Asia University, Taiwan*  
*Amarbayasgalan Lkhagvajav; Asia University, Taiwan*

This research aims to investigate the principles of Enhancement of Employee Enthusiasm (EEE) in the mining industry. The methodology of study is through structural equation modeling to explain the relationship of each variable. Sampling through an online based survey was conducted, and 242 responses from workers of the mining industry of Mongolia were

analyzed. The result shows that job satisfaction (JS), leadership behavior (LB) and organizational commitment (OC) significantly influenced of EEE. But, the working condition (WC) no significantly influenced to EEE and obtain same result the WC through mediating variables JS impact to EEE. That indicate WC is master task to improve of enhancing employee enthusiasm in Mongolia. Organizational commitment also no significantly influenced to JS on mining industry in Mongolia. The stockholder should be upgrade employee working environment of mining company. This research also established a universal model of EEE. This study constructs revealed important implications for HR managers of mining company and recommendations for further research.

## **TE-06.2 [A] Key Success Factors to Promote Knowledge Co-creation in Technology Development Organizations**

*Kentaro Umeda; JAIST, Japan*  
*Kunio Shirahada; JAIST, Japan*

It goes without saying that technology companies are expected to innovate. However, the technical personnel need to follow the internal regulations of the company, which can conflict with the goal of innovation. Therefore, when a company changes its system of internal control, a technical organization learns new ways to work under the new system. This study aims to find the success factors for keeping workers complying with company regulations and improving the organizational climate for innovation when the corporate management system changes. We conducted longitudinal action research from 2009 to 2013 in a Japanese manufacturing company consisting of 50 business units and approximately 8,000 employees. Knowledge co-creation among employees and power relationships between managers and followers are units of analysis in this study. In the results, we found the headquarters plays an important role in creating an organizational climate where technical personnel can easily act under limited autonomy. In addition, the employees of the organization who understand how to comply with regulations can co-create new knowledge for innovation.

## **TE-06.3 [R] Improving Performance of Virtual Team: Lessons Learned from Online Game Players**

*Chien-Chiang Lin; Shih Hsin University, Taiwan*  
*Shih Yu Ni; Shih Hsin University, Taiwan*  
*Chih Chun Li; Shih Hsin University, Taipei, Taiwan, Taiwan*

With the advantage of bridging over the geographical and time restriction, the virtual team has been utilized by companies to make the best use of talents from different domains and areas to accomplish various objectives. However, it is always a challenging task to build up a perfect condition for virtual teams to generate outstanding performance. The current study collected data from online game players, which are considered a special type of virtual team, to understand the operational issues during the process of achieving goals. The major objective is to figure out relationships among different factors that are supposed to affect the performance of virtual teams. The results are: 1) the trust among virtual team members has positive influences on team cooperation; 2) the cohesion of a virtual team has positive influences on team cooperation; 3) team cooperation of a virtual team has positive influences on team performance; 4) communication among virtual team members would decrease the influence of team cooperation on team performance. Managerial implications and future directions are provided at the end of the current study.

## **TE-06.4 [R] Approach for Organizational Service Climate Creation: Action Research in a Japanese Monitor Maker**

*Belal H.M.; JAIST, Bangladesh*  
*Takahiro Yoneda; EIZO Corporation, Japan*  
*Naoki Takahashi; EIZO Corporation, Japan*  
*Naoaki Hirata; EIZO Corporation, Japan*  
*Kenichi Amemiya; EIZO Corporation, Japan*  
*Masato Yamamoto; EIZO Corporation, Japan*  
*Yasushi Ikeda; EIZO Corporation, Japan*



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*Kunio Shirahada; JAIST, Japan*

In matured manufacturing industries, many companies are trying to change their business model by adding the concept of service, which is a process of value co-creation between provider and recipient. The value proposition based on value-in-use is a key direction for corporate business success. In a manufacturing company, technical personnel should have not only technology oriented thinking but also service oriented thinking to generate new value propositions. Therefore, there is a need to create a service climate in organizations. This paper proposes a methodology to transform the way of thinking and support for knowledge co-creation with others about new corporate value propositions. We combined service dominant logic (SDL) with business model generation methodology to make a new method for a service climate creation. We conducted action research by introducing the method to 25 technical personnel in a Japanese monitor maker and obtained data, including feedback about its availability and the impact for corporate business models. This study will help personnel to generate a service-based innovation concept, thereby promoting servitization in manufacturing companies.

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## **TE-07 Strategic Management of Technology-2**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Shirasagi 1**

**Chair(s) Jing Hu; China Jiliang University**

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### **TE-07.1 [R] Innovation Intermediary of Technological Alliance**

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

*Hsien-Che Lai; National University of Tainan, Taiwan*

*Hsiang-Lin Cheng; National Chung Cheng University, Taiwan*

Technological alliances play an important role in generating innovations but face effective matchmaking in finding suitable partners in "open innovation" among networks of innovating firms. Intermediaries are external mechanism/institutions that can appropriately support companies in their innovative activities. They are frequently used to build a bridge between different competency constraints among companies. Thus, the purpose of this paper is to understand the role of a firm's alliance network in view of exploration. What do innovation intermediaries of a collaborative partner do? Based on the Strategic Alliance Database established by the National Science Council (NSC) in Taiwan, this paper empirically explores the brokerage roles in the alliance by which intermediaries facilitate technological innovation and innovation process, especially the relationship between cooperation networks. By using the technique of 2-mode network analysis of social network analysis, this research focuses on the question of which the capabilities a technological alliance creates a platform for firms that execute matchmaking for new and/or relevant technologies. The results of this paper reveal the fact that brokerage roles can be used to develop collaborations. The strategic positions of an intermediary can activate different resources from the ones embedded within the alliance network.

### **TE-07.2 [R] Tool Fingerprinting: Characterising Management Tools**

*Letizia Mortara; University of Cambridge, Great Britain and Northern Ireland*

*Robert Phaal; University of Cambridge, United Kingdom*

*Clive Kerr; University of Cambridge, Great Britain and Northern Ireland*

*Clare Farrukh; University of Cambridge, United Kingdom*

*David Probert; University of Cambridge, United Kingdom*

Academics have long been interested in understanding the nature of management tools such as roadmapping or scenario planning and to derive guidance on how they should be used. A typical approach to this challenge has been proposing rules and classifications to select and configure management tools. However, none of those proposed so far has been universally recognised. This paper argues that the characterisation of instances of tools implementation (tools-in-action) according to five key dimensions allows an easier and more robust approach to theoretically understand tools and to help practitioners with the configuration of toolkits. In order to highlight the advantages and the potential limitations of this characterization approach, a toolkit is examined.

### **TE-07.3 [R] The Study on the Relationship between the Openness Strategies and Innovation Performance: The Role of Intellectual Capital**

*Chih-cheng Lo; National Changhua University of Education, Taiwan*

*C. H. Wang; National Chiayi University, Taiwan*

*Lan-Hui Lin; National Changhua University of Education, Taiwan*

*Tsung Chi Huang; National Changhua University of Education, Taiwan*

*Pei-Yu Chien; National Sun Yat-sen University, Taiwan*

*Yi-chun Chen; National Changhua University of Education, Taiwan*

The study intends to clarify the relationship between open innovation and innovation performance through the examination of the mediation role of intellectual capital. A total of 948 valid samples of service firms are compiled from The Second Taiwan Innovation Survey (TTIS) from the year 2004 to 2006. Based on the research, hypotheses are being developed from reviewing literature, the conceptual model using hierarchical multiple regression (HMR) structural and equation modeling (SEM) has been employed to examine hypothesis and model fits. The results show that the impact of openness strategies on innovation performance becomes indirect through the partial mediator of intellectual capital. This study has both theoretical and practical implications. All of the hypotheses are supported. The model is able to assess what factors will affect the firm's collaboration and innovation in terms of intellectual capital. Results show that intellectual capital is crucial to the development of the relationship between open innovation and innovation performance.

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## **TE-08 Project/Program Management-2**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Shirasagi 2**

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

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### **TE-08.1 [R] Project Portfolio and Strategic Alignment through Technology Roadmapping for Medium Sized Organizations and Business Units**

*Camilo Alberto Castro Gama; Tecnologico de Monterrey, Mexico*

*David Guemes-Castorena; Tecnologico de Monterrey, Mexico*

The objective of this research is to provide a step-by-step guide with a mix of tools for managers to align strategic objectives with the business unit project portfolio. The proposed model is applicable for business units and medium enterprises. It is a sequential model that gives a smooth transition from strategic vigilance to a selection of projects and programs which helps the organization to attain a competitive advantage in an industry environment. Based on the most common tools of strategic planning and foresight, the main idea is to generate some sense of sequence and feedback process in order to select the best ideas for the resource allocation optimization. When the project portfolio is defined by a set of rules or criteria, the construction of a technology roadmap is the next logical step, not only to classify the projects but to create a path through which the organization can implement them. A methodology to plan all this process was developed. This proposed model helps in the integration of the strategic planning with the step-by-step process at the functional level to run the projects and programs.

### **TE-08.2 [R] How Different R&D Project Types are Terminated**

*Leandro R Goncalves; Universidade de Sao Paulo, Brazil*

*Adriana M Mello; Universidade de Sao Paulo, Brazil*

*Paulo T Nascimento; Universidade de Sao Paulo, Brazil*

This paper studies the main reasons given for early termination of different types of new product development (NPD) projects. Early termination here means before reaching its objectives. Our case study, a large Brazilian chemical company, is a B2B operation with three types of NPD projects: line extension, new application and innovation. We found that they mostly replace decisions to kill projects with project prioritization. Managers prefer to keep projects in the pipeline, even in stand-by, instead of terminating them. Moreover, they apply different criteria for deprioritizing/killing each type of project. The most used criteria for line extension and new application projects are the expected financial results, followed by customer interest in the resulting product. Customer commitment is also more relevant for

# SESSIONS

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line extensions than new applications. For innovation projects, the former criteria are less stringent and greater emphasis is put on the strategic fit.

## **TE-08.3 [R] Lessons from Terminated Projects as Means for Other Projects Success**

*Leandro R Gonçalves; Universidade de Sao Paulo, Brazil*  
*Alceu S Camargo Junior; Universidade de Sao Paulo, Brazil*  
*Paulo T Nascimento; Universidade de Sao Paulo, Brazil*

This paper explores the mechanisms of actually and consciously using the outcomes of terminated projects at new projects that enter the pipeline. The case study was made at an R&D Center of a Brazilian chemical company with B2B operations in many markets and countries. The authors analyzed a series of terminated projects linked to later projects to map the relations. The study found that the outcomes of killed projects may be formally or informally used. When formally used, the earlier project is used to build the scope of the new project mainly at phase zero of its development. When informally used, researchers and managers naturally bring the lessons learned to present and use it to bypass steps and accelerate development at any phase of development. The interviews show that the informal practice is considered to be the most common and natural mechanism for applying the lessons learned with earlier unsuccessful projects.

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## **TE-09 Management of Communication Technologies-1**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Hibari 1**

**Chair(s) Taehyun Jung; Hanyang University**

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## **TE-09.1 [R] Diffusions of Mobile Cellular Phones in East, Southeast, and South Asia**

*Chaiho Kim; Santa Clara University, United States*

This paper examines the patterns of diffusion of mobile phones of 25 countries in the East, Southeast, and South Asia (ESS Asia) for the period between 1995 and 2010. We first examine the growth patterns in the number of mobile phones in the world and in the ESS Asia. We then examine mobile and fixed phone uses per 100 inhabitants. Comparisons of the total number of mobile phone uses between countries are not as useful because of the differences in their population sizes. We examine how mobile phones per 100 inhabitants fared relative to their fixed phone per 100 households at several different points in time. We then examine how the rankings of the countries with respect to mobile phone per 100 changed at different points in time and explore their implications. Finally, we carry out the usual multivariate statistical analysis to identify the economics and cultural variable that may influence the behavior of mobile phone uses.

## **TE-09.2 [R] Co-Evolving Industry and Enterprise Architecture: Exploring the Platform Architectural Advantage of BT in the UK**

*Carlos E Sato; University of Sussex, United Kingdom*  
*Kazuo Hatakeyama; UNISOCIESC, Brazil*

Incumbent telecommunication service providers have a long history and strong capabilities in network services. With increasing competition with firms from various technological trajectories (internet, cable TV and satellite) boosted by technological and service convergence, leading incumbent telecommunication service providers have strategically repositioned themselves to include IT-driven services, offering integrated solutions to large customers. The ICT industry architecture has evolved in such a way that it favors those firms with enterprise architecture which cultivate (i) a platform-based approach for their organizational processes, products and services; and (ii) openness. This paper uses the case study methodology to explore the lessons from the case of BT in the UK that can be used to increase the architectural (and competitive) advantage of incumbent telecommunications service providers, aligning industry and enterprise architecture. We argue that more than on the technology itself, incumbent telecommunication service providers may focus more on their enterprise architecture by deploying technology aimed at conferring architectural

advantage dynamically engaged with the ICT industry architecture. A framework is offered to help incumbent telecommunication service providers to better understand and position themselves in the "battle of architectures" by aligning enterprise and industry architecture and by establishing platform "architectural advantage."

## **TE-09.3 [A] The Effects of Service Innovation on Customer Retention: An Integration of Customer Satisfaction**

*Thi Dao Ta; National Cheng Kung University, Taiwan*  
*Chia-Han Yang; National Cheng Kung University, Taiwan*

Services are becoming driving forces of economies currently, resulting in much attention on innovation of new services from firms to satisfy customer needs. Customer satisfaction and their behavioral intention play a critical role in firm's performance and have been investigated carefully in both business and academic practices. Many previous studies have been conducted to investigate the key role of service innovation on a firm's performance and competitiveness. But, few studies in the service literature have simultaneously examined the effects of service innovation on customer satisfaction as antecedents of customer retention, especially in telecommunication. This study focuses on addressing the end user issue of service innovation. This study examines service innovation from end consumers' perspective. A data of 400 telecom service users sample from Vietnam is collected for empirical hypotheses testing of relationships among variables. The conceptual model investigates the relevant relationships among the constructs by using confirmatory factor analysis (CFA) and structural equation modeling (SEM). Findings show that two components of service innovation, namely interactive and supportive, are the key determinants of customer satisfaction and customer retention. The paper also includes a discussion on the theoretical and managerial implications of the research results.

## **TE-09.4 [R] The Adoption and Effects of International Telecommunication Trends in South Africa: Technology and Market Perspectives**

*Grant Evert; University of Pretoria, South Africa*  
*Louwrence D Erasmus; CSIR, South Africa*

The evolution of the telecommunication industry, from both technology and market perspectives, is increasing at a rapid rate. At the forefront of this evolution are the telecommunication standards organizations and vendors. However, the evolution of the telecommunication standards is based on international norms formed by the market requirements of developed countries. The evolution of the telecommunication technology standards, as dominated by the developed countries, poses a definite challenge for emerging economies that hasn't been effectively managed till date. Similarly, it is imperative for the South African telecommunication industry to align definite market requirements with the technology deployed in the service provider networks. The objective of this research paper is to address the effects and required alignment activities between technology evolution (in terms of South African network operator involvement in standardization) and the actual South African telecommunication market requirements. The main contribution of this research paper is to highlight that the South African network operators should be actively involved in contributing to international telecommunication standards and establishing the required forums to address the concern of technology evolution for developing countries. This will consequently lead to the desired alignment between deployed technologies and market requirements in the telecommunication industry.

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## **TE-10 SPECIAL SESSION: Special Session in Japanese language - 2**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Hibari 2**

**Speaker(s) Shuji Kondou; Quad-Vision Research Institute and JAIST**  
**Yasuo Ikawa; Japan Advanced Institute of Science and Technology**

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"MOT Reform-Practice Community: Cases of In-house MOT Academy Activities." Ishikawa MOT School has been operated for 10 years by Ishikawa IT Human Resource Development Center in collaboration with JAIST (Japan Advanced Institute of Science and Technology),

# SESSIONS

with various supports from Ishikawa Prefecture and around 30 regional companies. Approximately 200 people completed the course. People who participated in the course have established the "MOT reform-practice community," which pursues a knowledge science approach to achieve human, organizational and entrepreneurial creation. From Monday through Wednesday, at the same session time each day, successful cases of such practices will be reported by the leading 12 companies/organizations, and application of "Quad Vision Thinking Methodology," which was developed by being inspired by the SECI model of Professor Nonaka, an author of "The Knowledge Creating Company," will be described in each presentation. In this session, Matsumoto Machine will present "All members play leading roles to have higher motivation resulting in better company performance"; BETSUKAWA will present "Cases of Betsukawa human resource development - Is MOT implemented in Betsukawa?"; Tohshin Group will present "Enthusiasm, fun and accomplishment through tutoring school activities"; and RB Controls will present "Reform-practice by way of three layer organizational structure - a golden matrix of 3 by 3."

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## **TE-11 Technology Management Education-1**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Toki**

**Chair(s) Walter W Buchanan; Texas A&M University**

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### **TE-11.1 [A] Some Educational Issues in Operations Management and Service Systems**

*Murat Kudret Yurtseven; Izmir University, Turkey*

*Orkun Kozanoglu; Izmir University, Turkey*

*Ebru Turanoglu Bekar; Izmir University, Turkey*

*Walter W Buchanan; Texas A&M University, United States*

The aim in this paper is to explore how the educational and research issues are handled in operations management and service systems in industrial engineering programs in major Turkish universities. Firstly, a review of the recent developments in the area is given. Based on this review, the performance of industrial engineering departments in major Turkish universities is assessed. The study identifies the strengths and weaknesses of the programs under study in this particular area. The paper also includes some suggestions for operations management education.

### **TE-11.2 [R] Study on Enhancing Citizens' Scientific Literacy Based on Interpersonal Communication in China**

*Zhang Feng; China Research Institute of Science Popularization, China*

*He Wei; China Research Institute of Science Popularization, China*

*Zhang Chao; China Research Institute of Science Popularization, China*

This paper explores the impacts of interpersonal communication on citizens' scientific literacy in China. The article claims that interpersonal communication has been an important channel of citizens' access to S&T information. This paper analyzes interpersonal communication as an important factor to enhance Chinese civic scientific literacy by the data of the civic scientific literacy survey in China in recent years. It demonstrates to attach importance to the function of interpersonal communication and gives some suggestion how to enhance citizens' scientific literacy currently in China.

### **TE-11.3 [R] Investigating Students' Satisfaction toward Network Learning Platforms**

*Wan-Yu Chen; TransWorld University, Taiwan*

Internet technology developed fast in recent years; it provided a more mature development environment for e-learning. E-learning technologies have been widely used in private business or schools, usually through a CAI system which has been established completely, then can make learners freely use after classes on the network platform. Web-based learning is a technology-mediated learning that learners acquire knowledge through the information technology environment. Using a network learning platform makes users enhance their learning ability, and continuously develop resource and improvement, strengthen the

learning convenience of users. The purpose of this study, based on the technology acceptance model, is to explore perceived ease of use, and perceived usefulness to students' e-learning efficiency. 297 valid responses of undergraduate students in Taiwan universities are our survey subjects. This study uses path analysis to test our hypotheses. The results found that Perceived Ease of Use has an influence on Perceived Usefulness, and Perceived Ease of Use and Perceived Usefulness also have an influence on Learning Satisfaction. All of the three hypotheses are supported.

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## **TE-12 Technology Management in the Energy Sector-1**

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: Houmeiden**

**Chair(s) Tugrul U Daim; Portland State University**

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### **TE-12.1 [R] A Business Strategy in the Lithium-Ion Battery Industry**

*Nobuo Yamazaki; Chiba Institute of Technology, Japan*

*Hiroshi Kubo; Chiba Institute of Technology, Japan*

Recently, modularization has progressed, particularly in the electronics industry, and is receiving considerable attention. This development of modularization can be explained using the business architecture concept. Based on architecture-based strategies that add some perspectives from organizational capability and the ability development environment to this concept, many industrial studies have been developed from automobile and electronics industries. This strategic idea includes the perspective of "analytical strategies" in strategic management. However, it may be recognized that actual business operations include activities that relate to the "process", and this strategic idea includes less perspective of "process", to be utilized to develop a business strategy from the analytical result. In this paper, citing the lithium-ion battery industry as an example, architecture-based strategies were reconsidered from the strategic management perspective and their relationship was identified. Moreover, a strategic approach that also includes a process perspective was proposed from the result and its validity was examined by making a concrete proposal of a business strategy for Japanese lithium-ion battery manufacturers.

### **TE-12.2 [R] Technology Assessment for Energy Efficiency Programs in Pacific Northwest**

*Ibrahim Iskin; Portland State University, United States*

*Tugrul U Daim; Portland State University, United States*

This paper introduces a hierarchical decision modeling framework for energy efficiency program planning in electric utilities. The proposed approach focuses on assessment of emerging energy efficiency technologies and is proposed to bridge the gap between technology screening and cost/benefit evaluation practices. The proposed approach is expected to identify emerging technology alternatives, which have the highest potential to pass cost/benefit ratio testing procedures, and contribute to effectiveness of decision practices in energy efficiency program planning. The proposed framework also incorporates a rank order analysis for testing the robustness of results from different stakeholder perspectives in an attempt to enable more informed decision-making practices. The proposed framework was applied for the case of Northwest U.S., and results of the case application and future research initiatives are presented.

### **TE-12.3 [R] Study on the Academic Landscape of Hydropower: A Citation-Analysis Based Method and Its Application**

*Zhidong Liu; the University of Tokyo, Japan*

*Hajime Sasaki; The University of Tokyo, Japan*

*Ichiro Sakata; The University of Tokyo, Japan*

Hydropower, with characteristics of superior storage capacity and speedy response, can meet sudden fluctuations in electricity demand. And its generation capacity could be doubled by 2050 according to IEA's recent estimation. Besides, hydropower doesn't require innovative technologies and can be operated with minimal cost. However, no big picture of knowledge related to hydropower can be found in the preceding research. This paper aims

# SESSIONS

to figure out the academic landscape in this field by analyzing the citation network of papers published in academic journals. We collected 7,521 target papers using specific search query from the Web of Science. By utilizing a topological based method, all the papers were categorized into clusters by their own characteristic topics. Results show the existence of six principal research clusters: renewable energy, optimization of system operation, environmental issues (greenhouse-gas emission), environmental issues (fish management), environmental issues (sediment) and pumped hydro storage systems. As the keywords of some major clusters seem to be general, in-depth sub-clusters analysis was also conducted to gain better knowledge of those clusters. Combining the analysis results, (sub) clusters related to pumped-storage and small hydropower are considered to be developing, as indicated by the average publication year of papers and recent increasing trend.

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## TE-13 Decision Making-3

**Tuesday, 7/29/2014, 16:00 - 17:30**

**Room: C'est la Vie**

**Chair(s) Nasir Sheikh; State University of New York, Korea**

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### TE-13.1 [R] Assessment of Solar Photovoltaic Technologies Using Multiple Perspectives and Hierarchical Decision Modeling: Manufacturers Worldview

*Nasir Sheikh; State University of New York, Korea, Korea, South*  
*Young-Jun Park; Open Innovation Laboratory, Korea, South*  
*Dundar F Kocaoglu; Portland State University, United States*

The assessment of photovoltaic technologies using multiple perspectives such as social, technological, economic, environmental, and political (STEEP) have become increasingly important in the last several years. Each perspective is composed of multiple criteria with the social and political perspectives gaining more significance. A hierarchical decision model using expert judgment quantification was developed to provide the relative ranking of the criteria. Such modeling is effective in assessing technologies considering multiple competing perspectives and criteria. The model was operationalized via desirability functions for each criterion. The combined results provide scores for each technology and indicate in which criteria the technology needs improvement. In earlier research the electric utility worldview was considered to assess multiple photovoltaic technologies. In this paper the solar photovoltaic manufacturer worldview case study is presented.

### TE-13.2 [R] Aging Consumers and Technological Rejection

*Jul Thanasravanitchai; Mahidol University, Thailand*  
*Randall M Shannon; Mahidol University, Thailand*

This paper aims to explore the reason why older consumers show less acceptance of technological innovative products or services by using the Control Theory framework because assuming all non-adopters as homogeneous may be inaccurate. Since many older consumers have rejected technological innovative products, we should learn more by focusing on understanding the reasons for innovation refusal rather than just on the reasons for adoption. The Control Theory framework is well suited to explore the concept of technological innovation acceptance for older consumer behavior because this theory focuses on the individual's goal and development regulation across the life-span. It is expected that goal influences directions, vigor, energy, persistence of action and finally termination. This study will also merge Aging Theory effects (moderators) with Control Theory because many aging theories are likely to be maximized under circumstances where primary control is lost. At the conceptual level, this paper seeks a better understanding regarding the differences between primary control (goal engagement strategy) and secondary control (goal disengagement strategy). Knowledge is needed as to whether different types of control strategy might affect aging consumer's behavior regarding technological innovative acceptance.

### TE-13.3 [A] Scenario Planning for Supporting of Disaster Risk Reduction Innovation Policy

*Hai-Chen Lin; STPI, National Applied Research Laboratories, Taiwan*  
*Yueh Wu; STPI, National Applied Research Laboratories, Taiwan*

*Ping-Lun Huang; STPI, National Applied Research Laboratories, Taiwan*  
*Liang-Huey Lo; STPI, National Applied Research Laboratories, Taiwan*  
*Yi-Ju Chen; STPI, National Applied Research Laboratories, Taiwan*  
*Albert C. T. Lee; STPI, National Applied Research Laboratories, Taiwan*  
*MC Teng; NCDR, National Applied Research Laboratories, Taiwan*

The natural geographical location of Taiwan is prone to disasters, and hence considerable resources have been invested for disaster reduction innovation and related applications. In the past, the planning of disaster risk innovation lies mostly on reactive mode based on the existing disaster problems and present S&T capabilities. Since the major natural and socio-economic environment change very fast and will have high impact for our society in the future, it is very important to alert the decision thinking process with a proactive thinking. Therefore, a proposed process for improving the present planning of disaster reduction is suggested through the collaborative causal thinking and scenario planning. Through this type of system thinking, key emerging needs can be identified with a holistic view, and help to identify the corresponding key portfolios with proactive solutions.

### TE-13.4 [R] An Evaluation Model of Hydrogen Storage Technology by a Fuzzy Delphi Method

*Chiung-Wen Hsu; Feng Chia University, Taiwan*  
*Pao-Long Chang; Feng Chia University, Taiwan*

Hydrogen energy is an emerging technology with benefits of energy savings and reduced carbon emissions. Development of hydrogen-related technologies is a top priority for advancing the hydrogen industry. However, hydrogen storage technologies vary based on energy savings and safety, making it difficult for decision makers to select appropriate technologies. Hence, research efforts have focused on selecting suitable hydrogen storage technologies. The purpose of this research is to develop an evaluation model to enable decision makers to select the most appropriate technology for development in Taiwan on the basis of 14 evaluation criteria. The weights of criteria and the ratings of technologies are collected by a seven-point linguistic scale using a Delphi questionnaire survey. The linguistic scores are then converted into fuzzy numbers, and the consensus of decision makers' opinions on weights and ratings are derived mathematically using fuzzy Delphi methodology. We used the model to perform an evaluation of four different types of hydrogen storage technologies. The results of the assessment model revealed that chemical hydride technology is the most feasible for investment in Taiwan, and, as such, it should be given top priority for further development to realize industrialization.

## WA-00 PLENARY - 3

**DATE: WEDNESDAY, 7/30/2014**  
**TIME: 08:30 - 10:00**  
**ROOM: OOTORI**  
**CHAIR(S): YASUO IKAWA; JAPAN ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY, JAPAN**

### WA-00.1 [K] Restructuring Japan's Governmental R&D Policy toward More Innovation-oriented Economy

*Yuko Yasunaga; Ministry of Economy Trade and Industry, Japan*

The Ministry of Economy, Trade and Industry (METI) is now restructuring its R&D policy under the current situation surrounding Japan's economy and industry. Japan has been facing serious deteriorations in the environment for enabling innovation, namely, a decrease in the input of financial/human capital to R&D, the downward trend of the qualitative factor of academic research papers, continuing stagnations in the industrial competitiveness of many industrial sectors behind newly emerging economies, and frustration that we have almost



# SESSIONS

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never seen “innovative” made-in-Japan products/services for more than a decade. METI just began restructuring its R&D policy in the following directions: i) to remodel its national laboratories - AIST (Research Institute of Advanced Industrial Science and Technology) - for more “bridging-oriented” organizations between basic research and commercial business, by applying a more German style such as Fraunhofer Research Institute, and ii) to remodel its funding and formulating procedures of NEDO (New Energy and Industrial Technologies Development Organizations) for further innovation-oriented manners, by involving more small/medium/start-up businesses and applying a more DARPA-like project management style. METI also calls for schematic changes with MEXT (Ministry of Education and Science and Technology) to enable “cross-appointing” for researchers between national universities and national laboratories in a more comprehensive manner.

## **WA-00.2 [K] Educating Technology Leaders for Design-Driven Innovation**

*Thomas L Magnanti; Singapore University of Technology and Design, Singapore*

Technology and design-driven innovation have always been vital to society's prosperity and well-being and will continue to be so in essentially all areas of importance to society, including the topic of service and infrastructure integration that is the theme of this conference. Education in this general arena has evolved over hundreds of years, with the emergence within engineering and management of particular disciplinary and departmental structures and teaching paradigms. Are these the best approaches in today's world? How should a contemporary technical-based university be structured? What degrees should it offer and how should it be delivering education? Using MIT and the development of the Singapore University of Technology and Design as reference points, Dr. Magnanti will touch upon these issues in the context of the changing landscape of higher education.

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## **WB-01 Technology Management Education-2**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Ootori 1**

**Chair(s) William T Flannery; University of Texas at San Antonio**

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### **WB-01.1 [R] Understanding Student Preferences in Online Education**

*David Raffo; Portland State University, United States*

*David Gerbing; Portland State University, United States*

*Merwan Mehta; East Carolina University, United States*

Higher education is at a crossroads. Universities face a combination of increased costs, increased competition, changing enrollments, and the introduction of new disruptive technologies with the potential to threaten their core product offerings. In response to these challenges, universities across the country are moving rapidly toward offering more online courses and programs. But in doing so, they are faced with questions with no clear answers: How should university courses (online and face-to-face courses) be designed? What do prospective and current students value about university level courses today and in the future? Are there factors that if included in the design of courses will increase student selection and retention in these courses? This paper presents results from a survey of over 390 respondents that address student characteristics and student preferences for different educational delivery options. The purpose of this study was to gain deeper insight by identifying factors that students value in university level courses so as to inform course and curriculum design choices. In the competitive environments faced by universities today, this research can be highly valuable to universities interested in improving their courses leading to increased enrollments.

### **WB-01.2 [R] On the Bridges Between Two Disciplines: Technology Management-Industrial Engineering**

*Turkay Dereli; Gaziantep University, Turkey*

*Gulhan Toga; Erciyes University, Turkey*

*Alptekin Durmusoglu; Gaziantep University, Turkey*

With the beginning of industrial engineering (IE), roles of the industrial engineers have been continuously expanding depending upon the requirements of the modern world. Up until

now, many different fields have been the major studying areas of the IE discipline, such as production planning, quality control, and optimization. Obviously, it has been impossible to manage and monitor these fields without taking the technology into account. In this respect, as an outstanding research area and business field, technology management (TM) knowledge and skills have been requested in the favor of industrial engineers. Thereby, this study outlines possible roles and expectations of industrial engineers in the TM field. With this purpose, content similarities of related educational curriculums, common tools and techniques used by the both disciplines are analyzed. In addition to that, some sample cases from job announcements for IE qualifications are presented to indicate the relations between IE and TM. Finally, this study focuses on academic similarities of both fields by examining the academic publications with IE affiliations in the field of TM.

## **WB-01.3 [R] Technology Management Education for Improving Systems Thinking**

*Sigal Koral Kordova; Holon Institute of Technology, Israel*

*Moti Frank; Holon Institute of Technology, Israel*

Systems thinking is a concept of thinking about an issue as a whole, emphasizing the inter-relationships among its components rather than the components themselves. The main goal of this study is to examine whether the ability for systems thinking can be developed through experience, education, courses, and training. We present graduate and undergraduate courses in management of engineering and technology, aimed at developing a capacity for engineering systems thinking (CEST) in students. The undergraduate course is based on executing projects in teams. The graduate course is based on systems engineering principles. At the start and at the end of the courses, CEST is evaluated by addressing and measuring four components: cognitive characteristics, abilities, personal traits, and knowledge. The data collected in the current study was used to analyze the four above-mentioned components of CEST. The study findings allow us to conclude that systems thinking can develop by participation in courses and other appropriate educational programs. Better understanding of the ways in which system thinking is developed can provide a better foundation for systems thinking educational programs.

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## **WB-02 New Product Development-4**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Ootori 2**

**Chair(s) Gloria Barczak; Northeastern University**

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### **WB-02.1 [R] Managing Knowledge in a Three-Stage New Product Development Project**

*Wenli Xiao; University of San Diego, United States*

*Cheryl Gaimon; Georgia Institute of Technology, United States*

*Janice Carrillo; University of Florida, United States*

We consider managerial decision-making regarding the evolution of knowledge in a three-stage new product development project. The manager invests in knowledge development activities (such as prototyping, pilot line testing, ramp-up experiments) at each stage throughout the project. The links between development activities at different stages are captured by recognizing that, as a result of knowledge transfer, the ability of the recipient team to generate new knowledge is enhanced. Over time as the levels of knowledge increase, product features and process characteristics improve. The performance of the new product in the marketplace, which drives net revenue, reflects the levels of knowledge attained at each stage of the project at the product launch time. The objective is to maximize the net revenue earned when the product is released to the marketplace less development costs. We show that the rate of each development activity follows an entirely different dynamic strategy during the project. In the first stage, development activities follow a front-loading strategy; in the second stage, development activities follow a moderate delay strategy, and in the third stage development activities follow an extreme delay strategy.

## **WB-02.2 [A] 'Customer Value Method' Which Change Technology into**

# SESSIONS

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## Customer Value & New Business

Yoshihiro Hosoya; *Japan Management Association Consultants Inc., Japan*

Over 30 years, our R&D division produces new business through technology & skills. This presentation explores a recent method which creates new business and execution examples in Japan's company. We call this "Customer Value Method" which changes technology into customer value and new business. The feature of "Customer Value Method" consists of the visible planning process in which engineers and marketers connect the technology strong points into customer value in the concurrent meeting. In this paper the authors present the procedure to develop customer value and implement on B2B examples, especially material resource company.

## WB-02.3 [R] Object-Mediated Innovation: Case Study of Adventures in the National Palace Museum in Taiwan

Hui-Fen Chen; *National Taipei University of Education, Taiwan*

Shao-Huan Chen; *National Cheng-Chi University, Taiwan*

Chia Ying Wang; *National Taipei University of Education, Taiwan*

In the new economic era, cross-boundary innovation is a critical topic, particularly in the cultural and creative industries. In this study, we introduce knowledge management literature to indicate that there are at least three frontiers of knowledge that cross domains: (a) knowledge that must be transferred to resolve syntactic differences, which requires establishing a common ground; (b) knowledge that must be translated to resolve semantic differences; and (c) knowledge that must be transformed to satisfy the interests of two parties. To facilitate the cross-boundary sharing of knowledge, a boundary object was proposed for establishing a communication interface. This study examined the collaboration between the National Palace Museum (NPM) and Digimax that was undertaken to develop a film "Adventures in the NPM." The research objective was to analyze the process of co-creating this film and the mutual exchange and sharing of knowledge. We examined the data by conducting triangulation through multiple sources. The results showed that the cross-boundary sharing of knowledge can be divided into three types, namely, translation, the process by which animated characters are converted into heritage; transformation from heritage significance into animated stories; and transcendence, the cultural implications derived from the symbolic meaning. We also identified the boundary objects of each process. In conclusion, this study contributes to the literature of cross-domain knowledge management and the practices of creative industries.

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## WB-03 Intellectual Property-7

Wednesday, 7/30/2014, 10:30 - 12:00

Room: Ootori 3

Chair(s) Bernhard R Katzy; *CeTIM/University of BW Munich/University of Leiden*

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## WB-03.1 [R] Standardizing Patent Data Cleaning in a University Technology Transfer Office

M Srihari; *Indian Institute of Science, India*

Mary Mathew; *Indian Institute of Science, India*

There are multiple goals of a technology transfer office (TTO) based in a university system. Whilst commercialization is a critical goal, maintenance and cleaning of the TTO's database needs detailing. Literature in the area is scarce, and only some researchers make reference to TTO data cleaning. During an attempt to understand the commercial strategy of a university TTO in Bangalore, the challenge of data cleaning was encountered. This paper describes a case study of data cleaning at an Indian university-based TTO. Three hundred eighty two patent records were analyzed in the study. The case study first describes the background of the university system. Second, the method to clean the data and the experiences encountered are highlighted. Insights drawn indicate that patent data cleaning in a TTO is a specialized area which needs attention. Overlooking this activity can have legal implications and may result in an inability to commercialize the patent. Two levels of patent data cleaning are discussed in this case study. Best practices of data cleaning in academic

TTOs are discussed.

## WB-03.2 [R] Exploring Technology Evolution Using Patent Classification: A Case of Cochlear Implant Technology Patents

Srigowtham Arunagiri; *Indian Institute of Science, India*

Mary Mathew; *Indian Institute of Science, India*

Understanding technology evolution through periodic landscaping is an important stage of strategic planning in R&D management. In fields like that of healthcare, where the initial R&D investment is huge and good medical products serve patients better, these activities become crucial. Approximately five percent of the world population has hearing disabilities. Current hearing aid products meet less than ten percent of the global needs. Patent data and classifications on cochlear implants from 1977-2010 show the landscapes and evolution in the area of such implants. We attempt to highlight the emergence and disappearance of patent classes over a period of time showing variations in cochlear implant technologies. A network analysis technique is used to explore and capture technology evolution in patent classes showing what emerged or disappeared over time. Dominant classes are identified. The sporadic influence of university research in cochlear implants is also discussed.

## WB-03.3 [R] Primary Research Related to the Design of China's Patent Pledge System

Fang H Zhang; *Tongji University, China*

Qiang Chen; *Tongji University, China*

China is improving its patent protection methods and understanding of those methods. The value of patents in China is not widely recognized by the country as a whole. Nevertheless, patent pledges act as a primary market behavior; for example, the United States has no such pledges for major high-tech companies (such as pharmaceutical companies) and in the investing banking industry. The Chinese government has issued a series of patent protection systems and related patent application pledge subsidy systems that are designed to promote an increase in the number of patent pledges made by companies and to help patented products transform new technology. The article analyses the number of patent pledges issued in more than 20 Chinese cities including Beijing, Shanghai, Wuhan and Chongqing. It analyzes the distribution of the pledges made to investors such as national banks, policy banks, local banks, investment guarantees corporations liability companies. The study analyzes the reasons for the existence of such pledges that are made mainly in private high-tech enterprises. We concluded that the role of the government in the transformation of the national patent pledge system and the ongoing reform of the design of China's financial system are the key factors driving the changes being made to the patent system.

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## WB-04 Technology Management in the Service Sector-3

Wednesday, 7/30/2014, 10:30 - 12:00

Room: Zuiun 1

Chair(s) David Kruger; *UNISA*

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## WB-04.1 [A] Integration through Services in the Tool and Die Making Industry in High Wage Countries

Guenther Schuh; *RWTH Aachen University, Germany*

Martin Pitsch; *RWTH Aachen University, Germany*

Nicolas J Komorek; *RWTH Aachen University, Germany*

The tool and die making industry is located on the critical path in the production industry between its customers in product development and in mass production. An increasingly competitive global production environment has eliminated the traditional advantage in tool quality of high wage countries. This requires the tool and die making industry in high wage countries to achieve differentiation through quick and reliable processes to enable on-time mass production for their customers. The quickness and the reliability can be increased significantly by offering specific services to integrate the customer at the interface with product development and mass production. Latest study results of the Laboratory for Machine Tools and Production Engineering (WZL) at RWTH Aachen University on value creation networks

# SESSIONS

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show that the tool and die making industry in high wage countries has identified the potential of integration through services, but is not able to realize this potential with the customer yet. To bridge the gap between the status quo in the industry and the demand for integration through services, solutions have to be developed. This paper addresses this demand and illustrates three generic tool and die making companies that master the integration through services and achieve differentiation against global competition.

## **WB-04.2 [R] Characterizing Product-Service Systems in the Healthcare Industry**

*Man Hang Yip; University of Cambridge, United Kingdom*

*Robert Phaal; University of Cambridge, United Kingdom*

*David Probert; University of Cambridge, United Kingdom*

Since the 1970s, marketing and innovation management communities have been investigating how to incorporate customer-desired functions into new product and service designs. These wide-ranging enquiries have shed light on the impact of lead-user engagement in new product development, demonstrated ways to examine service production and delivery, such as the use of "line of visibility" in service blueprints and the modeling of "service encounters," and have created new terms such as "value co-creation." Despite these efforts, recent reviews have identified the lack of a holistic approach to new product-service system (PSS) development. This deficiency needs to be rectified, especially for complex PSS developments in regulated industries such as healthcare, as often there are multiple stakeholders posing conflicting priorities to the development team. This paper describes a PSS characterization approach that supports the early stage new PSS development process. The approach is generated from 11 healthcare case studies, involving 25 new products, services and PSSs. Following the methodology of action research, further cases are selected for the application of the approach to a new product, service or PSS concept in facilitated workshops. Initial implications of employing this approach in three cases are discussed in this paper.

## **WB-04.3 [R] Service Oriented Cross-Industry Innovation as One Category of Open Innovation**

*Yu Song; Tohoku University, Japan*

*Tomoatsu Shibata; Tohoku University, Japan*

In open innovation, every company is seeking external resources for internal innovation activities. Meanwhile, other companies are also in desperate need of the internal resources owned by this company. Such resources can be either engineering technologies or managerial experiences. Hence, open innovation can be performed not only for engineering purposes but also for management purposes, such as business model, product or even service. In this article, we will only focus on one typical kind of open innovation named cross-industry innovation for discussion. Particular attention will be paid to the cases in which services are integrated together with a product. By introducing the product service system, the advantages of open innovation can be most obviously incarnated. This is only a theoretical research, which is composed based on the foundations of previous research. This paper will firstly compliment the theory structure of open innovation. And then special attention will be paid to customer integrated cross industry (CICI) open innovation because of its high level of openness. By taking the telematics service as an example, this paper will continue to discuss the industrial business model of CICI open innovation.

## **WB-05 TUTORIAL: Introduction to Open Source Technology Forecasting Tools** **Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Zuinn 2**

**Speaker(s) Timothy R Anderson; Portland State University**

**Scott W Cunningham; Delft University of Technology**

**Dong-Joon Lim; Portland State University**

Open source tools have made it easier to do sophisticated technology forecasting analyses. This tutorial session will provide an introduction to a variety of freely available tools for technology forecasting along with datasets that can be used for experimenting and teaching.

## **WB-06 Collaborations for Technology Management-3**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Chidori**

**Chair(s) Tero H. Peltola, CITER/Tampere University of Technology**

### **WB-06.1 [R] Creating a Plan for Building Information Modeling**

*Neslihan Alp, University of Tennessee at Chattanooga, United States*

*Chase Manning, University of Tennessee at Chattanooga, United States*

Building Information Modeling (BIM) is a relatively new technology emerging in the construction industry as it offers many advantages over typical construction drawings. However, new technology brings new problems and often uncertainty to an affected industry. Currently, the construction industry is experiencing much uncertainty as to how the BIM process works. There are very few industry standards, guidelines, or case laws assisting to govern the BIM process. Many industry professionals have stayed away from BIM to this point, because they are afraid of ending up in a costly dispute. This project looks at the importance of utilizing a BIM Execution Plan (BEP) in the contracts between the owner - architect and the owner - contractor. The paper will assist in managing the BIM process and define expected deliverables the BIM must model. Companies have already begun to incorporate a BEP into contracts. Nevertheless, each of these BEPs typically varies, because there are conflicting views on how the BIM process is to be conducted. The American Institute of Architects (AIA) published Document E202 in order to address this problem. It is recommended to use this document as a basis to develop a BEP that meets the project's needs.

### **WB-06.2 [A] Innovation Cluster for Creating Creative Industries**

*Deok S Yim; Science and Technology Policy Research Institute, Korea, South*

*Jong M Lee; Korea Industrial Technology Association, Korea, South*

*Hwang H Cho; Science and Technology Policy Research Institute, Korea, South*

Korea, with the aging population and matured manufacturing, is confronted with low economic growth and needs some breakthrough for the further development. The Korean government tries to move forward by promoting the creative industries using the science and technology potential while maintaining the competitiveness in manufacturing sectors. The evaluation of creative industry policy of Korea shows the following. First, the policy direction is quite relevant and appropriate for the current Korean economy. The strong Korean IT industry will bring some synergy when coupled with Korean entertainment culture (K-pop). Second, there has to be some preconditions to implement the creative industry policy such as creating technological eco-system with the open network among the university, industry, and research institute. Finally, it is suggested that strengthening of innovation cluster (Science and Technology Park) is one of the effective tools to realize the creative industry in Korea.

### **WB-06.3 [R] Traditional Collection Development: Lessons from Fast Fashion**

*Katia Lamarca; USP / EACH, Brazil*

*Adriana Marotti de Mello; USP/FEA, Brazil*

*Francisco Alvarez; USP / EACH, Brazil*

*Paulo T Nascimento; USP / FEA, Brazil*

The paper herein seeks to study which lessons can be learned from lean thinking, approached in fast fashion, and taken to companies with traditional launches, so that they become more dynamic in the response to the consumer. For such, a bibliographic research has been carried out about the development of collections in the traditional model and fast fashion analyzing the advantages and disadvantages of each one and the main objectives proposed in the literature of lean thinking. From such premises, a discussion was held about the adaptations to be carried out in the traditional model of the fashion industry aiming at reducing the lead time and minimizing the risk of collections to meet the demands of the consumers, without, however, losing the innovation differential of the collection.

## **WB-07 R&D Management-1**

# SESSIONS

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**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Shirasagi 1**

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

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**WB-07.1 [R] Exploring Research Institutes: Structures, Functioning and Typology**

*Simon P Philbin; Imperial College London, United Kingdom*

*David Jones; BG Group, United Kingdom*

*Nigel P Brandon; Imperial College London, United Kingdom*

*Adam D Hawkes; Imperial College London, United Kingdom*

Research institutes play an important role as part of the innovation landscape, which includes industrial, academic and governmental organizations. However, there is often much confusion over what constitutes an institute, and there can even be a number of different terms associated with such organizational forms, including centers, networks, programs and laboratories. Indeed, institutes can enable multidisciplinary research and the translation of knowledge generated to deliver societal benefits and address industrial requirements. However, despite the benefits offered by establishing research institutes, there has been a distinct lack of studies in this area. Therefore, this paper provides the findings from an initial research study into the structure, functioning and typology of institutes. Following a literature review on institutes, a benchmarking study involving examination of 25 research institutes associated with the energy sector has been carried out. This study identified key features of the institutes in regard to the research area, technology readiness level, funding, partners, organizational structure, leadership and governance arrangements. Subsequent analysis of these findings has resulted in three main types of institutes being identified. The pros and cons for each institute type are provided along with recommendations on the development and management of research institutes.

**WB-07.2 [A] Visualization of Research and Development Process State for Research and Development Management: Empirical Study of High-Purity NH3 Gas Business Case**

*Hideki Hayashida; Osaka University, Japan*

*Hiroki Funashima; Osaka University, Japan*

*Hiroshi Katayama-Yoshida; Osaka University, Japan*

This study is part of our attempt to understand the management of technology (MOT) through the lens of a quantitative model. We present here a six-dimensional quantitative analytical model (based on the Ising model, a physical phase transition model) that can be applied to the state of technology management activities with respect to the wider business context. We selected, as a case study, the new product development of a high-purity ammonia gas business for the blue light-emitting diode industry. The modified Ising model is discussed in this paper to evaluate this case study. The results of the quantitative model analysis are useful for visualizing the state of the MOT. The model could quantitatively analyze the high-purity ammonia gas of new business development together with product development and distinguish between the cases of two different companies. The results of the methodology indicate the R&D project status and how to improve the interaction network of the six elements of the MOT.

**WB-07.3 [R] Success Factors of Managing Japanese R&D Centers in China and the United States**

*Masayuki Kondo; Yokohama National University, Japan*

The purpose of this paper is to find out the success factors of Japanese companies in managing R&D centers in China and in the United States and the differences between the two countries. In parallel with interviews with managers of R&D centers of Japanese companies in China and managers in charge of overseas R&D in Japan, the research is mainly based on a questionnaire survey conducted in October 2009. Companies surveyed are Japanese companies that are listed on "Overseas Operating Companies 2008" issued by Toyo Keizai and that possess overseas production subsidiaries or R&D subsidiaries, their shares of which exceed 50 percent. The companies that possess R&D centers in China and those

that possess R&D centers in the United States are divided into three categories according to the satisfaction levels in light of the purpose of the establishment. Then, R&D management practices are analyzed by these categories. The differences of the success factors of Japanese companies in managing R&D centers between the two countries are then examined. The marked differences of the success factors in China and those in the United States are found. For example, in China one of the major positioning reasons is "for Japanese market" for satisfied companies; in the United States, one of the major positioning reasons is "for global market" for satisfied companies. On one hand, in China, localization is low for unsatisfied companies; on the other hand, in the United States, localization is low for satisfied companies. This paper finds out some successful management practices to make R&D centers of Japanese companies in China and in the United States satisfactory in light of the purpose of their establishment. The analysis is based on an original questionnaire survey reinforced by the interviews with Japanese R&D center managers in China and managers in charge of overseas R&D in Japan and others. Since Japanese companies established R&D centers in China only recently, this kind of research work is still scarce. The results provide valuable information input to multinational company managers responsible for R&D in China as well as to those responsible for R&D in the United States.

**WB-07.4 [R] Detecting Technological Originality through Cross-Domain Knowledge in Company**

*Chun-Chieh Wang; National Taiwan University, Taiwan*

*Mu-Hsuan Huang; National Taiwan University, Taiwan*

*Huei-Ru Dong; National Taiwan University, Taiwan*

Interdisciplinary knowledge flow results in the appearance of a research front and initiates a serious study on front evolution. Such a situation is also evident as novel technologies emerge. Many scholars consider the breakthrough technologies as a result of cross-domain knowledge obtained. The technological knowledge diffusion is commonly measured by patentometrics, and cross-domain knowledge obtained is analyzed by the spectrum of patent classifications cited. However, the reference cited by patent not only shows a patent-type document, but also a non-patent reference (NPR) that also presents the knowledge obtained from prior art. The purpose of this study is to advance our understanding of the advantage of employing cross-domain knowledge. U.S. patents acquired by IBM, Philips, and Samsung from 2004 to 2013 are used to identify the relationship between inventive output and cross-domain knowledge obtained. The technological originality of each company is measured by the spectrums of NBER technology field distribution in patent-type reference and ESI journal fields distribution in journal paper cited. Finally, we found Philips performs different patent originality to IBM and Samsung in computer hardware & software, semiconductor devices, and miscellaneous elec. fields.

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**WB-08 Manufacturing Management-2**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Shirasagi 2**

**Chair(s) Jing Hu; China Jiliang University**

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**WB-08.1 [R] Systems Engineering Management Process Maturity of South African Manufacturing Organisations**

*Ian Lemberger; University of Pretoria, South Africa*

*Louwrence D Erasmus; CSIR, South Africa*

The National Planning Commission's National Development Plan: Vision for 2030 (NDP) aims to promote economic equality by focusing on innovation within key sectors of the economy. It has been noted that systems engineering has the ability to integrate people, processes and technologies to deliver innovative complex systems. The investigation set out to improve the understanding of systems engineering (SE) with focus on organizations in manufacturing of coke, petroleum, chemical products, rubber or plastic products as they represent the largest income and employment provider in the manufacturing sector in South Africa. Ten process areas were identified to measure systems engineering management (SEM) activities using a capability maturity model (CMM). Data gathering was conducted



# SESSIONS

using a combination of face-to-face and telephonic interviews of six randomly selected organizations in the identified population using a six-level Likert Scale. Overall SEM process maturity measured 2.91, indicating a general lack of formal SE procedures.

## **WB-08.2 [R] Dynamic Network Innovation in Emerging Markets: From Supply Chain to Demand Chain**

*Youngwon Park; University of Tokyo, Japan*

*Paul Hong; University of Toledo, United States*

*Ryosuke Sugie; Tech. Development of Information-processing, Japan*

*Stephen K Callaway; University of Toledo, United States*

In this article, we aim to examine dynamic network innovation in emerging markets. We present a research model of a demand and supply chain integration system (DSCIS), which responds to customer's needs through the integrated information flows. DSCIS synchronizes the key processes in terms of frontend development, product planning, product design, procurement, manufacturing, sales and marketing, and maintenance activities based on customer needs as process routines. We further explore the following research questions: 1) what SCM practices do firms consider for an emerging market? 2) In the context of an emerging market, how are these SCM practices implemented? This paper discusses innovative practices of electronic firms and auto manufacturers that operate in China. What is noted in this study is that those firms that implement the deeper level of localization-initiated innovation bring amazing business successes. It is imperative for any global firms to 1) understand the rapidly changing market reality and 2) develop partnerships with the local governments for achieving effective market penetration. The scope of outsourcing is extended to the local firms that are strategically aligned to assume specific aspects of global supply chain management challenges. In brief, integration of both the supply and demand chain is crucial for emerging market markets.

## **WB-08.3 [R] Valuation on Flexibility in Daily Balancing Between Supply and Demand in Fresh Beverage Business: Based on Real Options Approach**

*Katsunori Kume; Toyohashi University of Technology, Japan*

*Takao Fujiwara; Toyohashi University of Technology, Japan*

This paper examines the possibility of flexible adjustments to more efficient lot size in supply chain management (SCM) for fresh beverage production using the real option approach (ROA). For deterioration, it is necessary for a supplier to produce just the same amount to demand of a buyer. However, a daily demand is not necessarily the suitable amount for a supplier. In a real case study of beverages, a supplier divides the demand into batch capacity (a basic unit shows a carton piece per a batch), each batch is produced up to the maximum piece except for the last batch. The pieces in the last batch may not meet the maximum. This may yield salvage and/or inefficient production to the supplier as producer. The authors considered the condition of the pieces in the last batch as uncertainty. ROA allows the buyer and the supplier to permit supplier's option exercise to respond to the demand uncertainty. In fact, the supplier was given the right to exercise options that can increase or decrease production pieces in the last tank. The authors simulated the flexibility of options using sensitivity analysis in one period. As a result, options can increase the pieces, reduce the salvage cost and improve cost per one piece. In a future study, the authors want to examine the impact of the exercise of options in a multi-period.

## **WB-08.4 [R] Integrated Manufacturing Information System (IMIS) for Sustainable Innovations: Case Study of Japanese Firms**

*Youngwon Park; The University of Tokyo, Japan*

*Paul Hong; University of Toledo, United States*

This article aims to present integrated manufacturing information system (IMIS) that fulfills multiple objectives simultaneously in the form of timely responses to customers' specific requests, design capabilities for products with high customer value, and excellent translation competence of embedded tacit knowledge into explicit applicable system knowledge. For this goal, this new IMIS should be able to evaluate the entire business strategy based on the internal product development information data base. We further provide an architecture

analysis framework as a specific IMIS implementation tool, and two relevant case studies are included for illustration purposes.

## **WB-09 Science and Technology Policy-2**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Hibari 1**

**Chair(s) Mike Freiling, Sigma Investment Management Co., USA**

## **WB-09.1 [R] Strategies of the Long-term Industry Development in Central Taiwan Science Park**

*Wayne Wang; Central Taiwan Science park Administration, Taiwan*

*I-Mei Huang; National Yunlin University of Science & Technology, Taiwan*

*Kwoting Fang; National Yun-Lin Tech., Taiwan*

This paper aims to explore the long-term industry development strategies of Central Taiwan Science Park (CTSP). To upgrade the technology industry in Taiwan, CTSP provides a strong foundation for a high tech company to enter and formulate the clusters, formulating the nature advantages and bringing the regional competitiveness. Cluster effect strengthens the overall development of Science Park, especially connects the related industry and support the combination of internet. As for Central Taiwan Science Park, it has optoelectronics, precision machinery and integrated circuits. By evaluating the movement of industry trends, the research benefits the study to the cooperation and competitiveness relations of Hsinchu Science Park, Southern Taiwan Science Park and Central Taiwan Science Park.

## **WB-09.2 [R] Research on the Evaluation of Nation Nanotechnology Innovation International Level Based on Patent Analysis**

*Yijie Cheng; Beijing Institute of Technology, China*

*Yun Liu; Beijing Institute of Technology, China*

*Wei Fan; Beijing Institute of Technology, China*

As competition in technology innovation among nations becomes more intense, there is a growing need for an improved assessment and analysis method. Patents are the manifestation of the country's technology innovation endeavor; therefore, this paper evaluates the technology innovation international level of the top10 countries ranked by the number of nanotechnology patents. Since the static methodology makes the interpretation of results unclear and makes time series analysis difficult, an improved multi-indicator dynamic comprehensive evaluation method is put forward to establish the evaluation index system. According to the finding from the analysis, the evaluated countries are divided into four types: the power, the emerging, the tradition and the weaker. The power should be aware that other countries are gradually narrowing the gap with it. The emerging's performance in patent quality needs further improvement. The tradition is always in the middle level and its development is stable. The weaker can draw on the typical internationalization patterns as the future development path selection. By providing objective insight into the international level evaluation of national nanotechnology innovation through the perspective of patent analysis, this paper hopes to propose some recommendations for future directions.

## **WB-09.3 [R] Two Poles in Global Nano Research: Structure and Evolution of the Global Nano Collaborative Innovation Network**

*Wei Fan; Beijing Institute of Technology, China*

*Yun Liu; Beijing Institute of Technology, China*

*Luciano Kay; University of California Santa Barbara, United States*

*Yijie Cheng; Beijing Institute of Technology, China*

Nano science and technology (S&T) is one of the core areas of S&T competition among developed countries in the 21st century and plays a supporting and leading role in social, economic and technological development. As an emerging international interdisciplinary subject, cooperation is of great significance to the development of Nano S&T. Current studies of international Nano S&T cooperation focus mainly on cooperation between countries [1-3] without much contribution to the understanding of these global networks at a global level. Based on the Web of Science (WOS) database, this paper presents a bibliometric, statistical and social network analysis to: (1) characterize the overall status of Nano Col-

# SESSIONS

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laborative Innovation Network (NCIN); (2) identify core and periphery countries; (3) analyze the evolution and characteristics of each node of NCIN; (4) evaluate the scientific publication output quality of each country from NCIN and analyze research hotspot changes of NCIN; and (5) visualize the NCIN network. A more detailed look at China in this NCIN provides support for improving the research quality and international influence of China's Nano S&T.

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## **WB-09.4 [R] Research on Policies of Chinese Strategic Emerging Industries' Cultivation and Development**

*Yuanyuan Hou; Beijing Institute of Technology, China*  
*Yun Liu; Beijing Institute of Technology, China*  
*Yijie Cheng; Beijing Institute of Technology, China*

Developing strategic emerging industries is not only the effective means of dealing with financial crisis and achieving economic transformation but also the vital strategic decision of achieving economic layout and building an innovation-oriented country during the Chinese Twelfth Five-Year Plan Period. The paper quantitatively analyzed Chinese policies of strategic emerging industries enacted by the State Council, ministries and local governments, and studied the impact of policy subjects' relation on policies formulation and implementation by drawing a collaboration network of policy subjects. The results show that the numbers of environment-type and supply-type policy instruments are larger; integral structure optimizes and policy subjects' function improves, policy subjects with some nodes at the core establish stable cooperative relationship; there are problems of excessive convergence on the local governments' selections of strategic emerging industries.

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## **WB-10 Technology Management in the Health Sector-1**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Hibari 2**

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

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### **WB-10.1 [R] Electronic Medical Record (EMR) Technology Acceptance by Healthcare Professionals in South Africa**

*Anju A Mammen; University of Pretoria, South Africa*  
*Richard V Weeks; University of Pretoria, South Africa*

South Africa is in the process of implementing a multi-billion Rand National Healthcare Insurance (NHI) strategy, the objective of which is cost effective healthcare service delivery to all South Africans. An electronic health record (EHR) system will form a vital component of the infrastructure that needs to be put into place for managing healthcare services. A brief review of the literature reveals that in the healthcare sector, even though high-end technology and detailed planning were incorporated during electronic medical record (EMR) roll-out at the healthcare hospitals and clinics, it is impossible to predict whether the system would be optimally utilized or not. The primary reason is that there exists some kind of resistance amongst healthcare professional towards the use of the EMR systems. Thus, managing the transformation from a paper-based to an electronic system is a complex process, and it highlights the importance of understanding the human aspect associated with the technology rollout and system utilization. Since the South African health care sector is in the preliminary stage of introducing EMR technology, it is deemed essential to gain an understanding of the human factors that will contribute to the successful adoption of the EMR system countrywide. With this in mind, this research study aimed at gaining an understanding of the perceptions of EMR technology implementation and use among healthcare personnel. It focuses on aspects related to the type of technological system deployed, user skills and organizational compatibility. It also aims to find possible solutions that will directly influence the healthcare professionals in either accepting or rejecting the technology.

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### **WB-10.2 [A] The Concept of Regulatory Frontier as a Boundary of Jurisdiction in Medicine: A Case of Regenerative Medicine in Japan**

*Shingo Kano; The University of Tokyo, Japan*

A proposed framework using the concept of "regulatory frontier," which describes decreasing of capability threshold for making the rules along with the maturation of technology

provides a new method to define "regulatory space." The regulatory frontier could divide regulatory space into "on the rule space" and "off the rule space," and explains why regulation inevitably delays against innovation. When technological development progresses at the point of maturity that needs the rule or regulation for clinical development for medical applications without the rule and the technical standard to utilize it, the technology is in the "off the rule space" and falls into the "regulatory gap." To explain this phenomenon and also discuss the interaction between innovation and regulation, the author introduces a case study of regulatory activities in Japanese regenerative medicine and then theorizes "regulatory gap" and rationalizes the alternative path, which is the so-called hospital exception, with some additional emerging rules in Japan to provide the authorized new therapy to the patients.

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## **WB-10.3 [R] Improving the Effectiveness of Interprofessional Work Teams Using EHR-based Data in the Treatment of Chronic Diseases: An Action Research Study**

*Hiromi Yamaguchi; Japan Advanced Institute of Science and Technology, Japan*  
*Yasunobu Ito; Japan Advanced Institute of Science and Technology, Japan*

The purpose of this paper is to focus on changing the consciousness of health care workers towards cooperation in the hospital hierarchy, which is a problem for achieving effective team medical care in medical institutions. Team medical care is important in order to enhance the effectiveness of medical services, and the Japanese government has been trying to incorporate team medical care into the medical system. Through the examination of a hospital's case, we tried to clarify that, with the assistance of visualization by a medical information tool, co-medical staff have the potential to become players who can express their professional opinion to doctors on their own initiative.

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## **WB-11 Management of Communication Technologies-2**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Toki**

**Chair(s) Chaiho Kim; Santa Clara University**

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### **WB-11.1 [R] How Do Mobile Technologies Affect Work and Private Lives? The Case of Turkish Banking Professionals**

*Nihan Yildirim; Istanbul Technical University, Turkey*  
*Hacer Ansal; Isik University, Turkey*

Mobile technologies (MTs) have become an important part of the infrastructure in service industries. The impacts of MT usage in work are shown to be significant, improving the productivity, responsiveness, effectiveness and flexibility of companies while reshaping the work place organization and making employees accessible on a 7/24 basis. However, there are great differences in terms of the types and levels of these impacts on organizations and individuals as the industry, region/country changes. Moreover, not much is known about the effects of MTs in developing countries like Turkey where there is a rapidly increasing mobile penetration (mobile phone and internet subscription rates), which is a critical infrastructure component of mobile working. Turkey has quite an advanced banking industry that has gone through serious industrial restructuring. The banking industry has always been among the early adapters and first users of new information and communication technologies, as well as first appliers of new organizational development and human resource management techniques. In the last few years, mobile technologies have become key technologies for banks and accordingly, the usage of mobile devices by banking professionals for work purposes increased. As happened in other new information technologies and human resources systems, experiences of the banking industry in mobile technology usage at the workplace can provide best practices or lessons for practitioners from other industries. This study provides insights on the perceptions of employees in the Turkish banking industry, about the impact of these technologies on their work practices and on their private lives. A structured survey is carried out with 107 white collar professionals from 5 major retail banks in Turkey. By conducting factors analysis and correlation analysis, 8 main factors are identified that represent the impacts of MT usage for work purposes, and their interrelations with each

# SESSIONS

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other and demographic factors are explored.

## **WB-11.2 [R] Hunger Marketing on Smartphone**

*Yuanchin Chen; Kainan University, Taiwan*

*Che Jung Kuo; Kainan university, Taiwan*

*Yong-Chun Jhan; Kainan university, Taiwan*

*Po-Ning Chiu; Kainan university, Taiwan*

"Hunger marketing," a kind of marketing strategy where the commodity provider deliberately restricts the supply of product to achieve the phenomenon of excess demand, has been applied in many promotion campaigns, especially smart phones in recent years. Apple's marketing strategy on iPhone reduces the quantity supplied, triggering a higher demand to gain a much higher profit. Such successful experience has been imitated by other brands but, nevertheless, leads to different consequences. Obviously, the success of hunger marketing depends on many conditions, while there is little academic research on this subject. This article compares the similarities and differences of hunger marketing strategies that are implemented by various firms, and attempts to find out consumer buying behaviors affected by hunger marketing. And we developed a questionnaire to investigate the influences of life style, brand image, brand experience, perceived value, and promotion campaign on the effect of hunger marketing in Taiwan. The conclusions include the benefits and potential risk of hunger marketing, and how the critical consumer and producer variables work to bring successful hunger marketing.

## **WB-11.3 [A] Digital TV: New Landscape for Thai Broadcasting Industry**

*Amon Tubtiang; Graduate School of Management and Innovation, Thailand*

The broadcasting industry in Thailand is considered to be an oligopoly due to its six free TV operators that dominate the industry. The six free TV operators earned advertisement income of more than 3.06 billion US dollars in 2013, and the number is expected to reach 6.2 billion US dollars in the next five years. Recently, the National Broadcasting and Telecommunication Commission (NBCT), the independent ICT regulatory body of Thailand, began to auction out operating license for the new digital TV campaign that is based on DVB-T2 technology (Digital Video Broadcasting Terrestrial version 2). Thailand's broadcast will be transformed into the new era through the newly established industry structure that has 3 layers that consist of a network provider, service provider and content provider. The forthcoming digital TV campaign will be diversified and will open itself to business opportunities for small- and medium-sized operators. It will enhance content development and consumers will get a variety of content from the six existing free TV stations and newly added 48 digital TV channels. This change will draw added investment of 3.06 billion US dollars via networks, set-top boxes, content and channel operation. Also, it will offer an opportunity for the satellite TV equipment manufacturing industry to surge. This occurrence will be considered as the second major change in the Thai broadcasting industry. The first took place four decades ago when black-and-white TV was converted to color. This paper first introduces the existing broadcasting scenario in Thailand, and then it investigates the new landscape, especially terrestrial TV, with its inherent opportunities as well as threats. Finally, the author proposes implications and recommendations for digital TV arrival.

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## **WB-12 Technology Management in the Energy Sector-2**

**Wednesday, 7/30/2014, 10:30 - 12:00**

**Room: Houmeiden**

**Chair(s) John Francis J Agwa-Ejon; University Of Johannesburg**

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### **WB-12.1 [R] The Potential for Bio-Ethanol Fuel from Molasses in the Southern African Sugar Industry**

*John Francis J Agwa-Ejon; University of Johannesburg, South Africa*

*C. Mbohwa; University of Johannesburg, South Africa*

This paper investigates the technical advancement in the production of ethanol in Southern Africa and examines the utilization of ethanol and of the by-products derived from its production process. Although numerous studies have identified the use of ethanol as an

alternative energy source, especially in Brazil and the USA, very little data and analytical attention has been given to Southern Africa. This paper therefore builds on that and on the study done on alternative energy in Southern Africa such as the coal to liquids processes by Sasol. The paper demonstrates that the expansion of bio-ethanol as an alternative fuel would result in the reduction of greenhouse gas emissions and an increase in the rural economic development in the Southern African region. In conclusion the paper emphasizes the need for a speedy upgrading of the ethanol technological methods in order to expand the use of bio-ethanol as an alternative energy. In addition the paper strongly recommends the supplementation of coal for the generation of electricity, as well as the progressive replacement of petroleum fuelled vehicles with the ethanol blend or the complete replacement with ethanol-fuelled ones.

### **WB-12.2 [R] Trajectory of Renewable Energy Policies Depends on 'Price Gap': Learning from Photovoltaic Energy Policies Lead to 'Grid Parity'**

*Yukihiko Nakata; Ritsumeikan Asia Pacific University, Japan*

Renewable energies cloud reduces the GHG emissions. However, renewable energies have "price gap" of electricity between renewable energy and grid power. Thus, government policies are important to lead to "grid parity." The renewable energy policies in Japan and Europe were analyzed. As a result, it was found that the policies depend on the "price gap" between renewable energy and grid power. The author proposes a "price gap" dependence model of the renewable energy policies. In the case of a large price gap, the R&D support policy is most important to reduce the electricity price from the renewable energy and reduce the price gap as the Japanese "Sunshine Project." In the next step of middle price gap, "subsidy policy" and "net metering" are effective policies to enhance the renewable energy as in the case of Japanese government and NEF. After the price gap ratio reduces to two or three, the Feed-in tariff (FIT) policy is most effective to lead to the "grid parity" as European and Japanese FIT. However, the "hard landing" FIT policy led the PV market to shrink and exhaust in Europe. Thus, the important point of FIT policy is "soft landing," which smoothly leads to "grid parity," keeping the sustainable society, PV market and industry.

### **WB-12.3 [A] Analysis of Infrastructure and Electric Power Services from ESS Solutions**

*Yoichiro Tashiro; Tokyo Electric Power Company, Japan*

*Michitaka Kosaka; Japan Advanced Institute of Science and Technology, Japan*

We tend to imagine the infrastructure of electric power companies as power plants and power transmission lines. However, it has recently included services and solutions according to evolving technologies and changing governmental regulations. We have considered the services and infrastructure at an electric power company by analyzing the solutions that the electric power company would provide using energy storage systems (ESS) in this paper. Regional electric power companies in Japan had been required to provide highly reliable and uniform services before the industrial electric power market was opened in 2000. After that, electric power companies were required to provide high quality and inexpensive services. In addition, electric power companies faced new regulations where the market for electricity was fully open. Regulation changes created opportunities for service innovation. For example, our company could provide peak shaving services to our customers by using ESS. This service could reduce electrical charges and avoid power outages by ESS being installed at 100 customer sites. When we analyzed the characteristics of these services, we found two keywords. The first was distributed and the second was cooperation. We created a model of electric power services and we would like to expand electricity services with this model.

## **WD-00 PLENARY - 4**

**DATE: WEDNESDAY, 7/30/2014**

**TIME: 14:00 - 15:30**

**ROOM: OOTORI**

# SESSIONS

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CHAIR(S): TIMOTHY R ANDERSON; PORTLAND  
STATE UNIVERSITY, USA

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**WD-00.1 [K] The Changing Role of Management in Technology-Intensive Project Environments**

*Hans J Thamhain; Bentley University, United States*

The role of management is changing in our complex world. New technologies have radically transformed the workplace and our global economy, focusing on effectiveness, value and speed. Project management has become increasingly important to many business activities and performance. It provides more sophisticated capabilities for cross-functional integration, resource mobility, effectiveness and market responsiveness, but also requires more sophisticated skill sets, both technically and socially, dealing effectively with a broad spectrum of contemporary challenges, such as conflict, change, risks and uncertainty. As a result of this paradigm shift, we have seen a change in managerial focus from efficiency to effectiveness, and from a focus on traditional performance measures to include a broader spectrum of critical success factors that support innovation, work integration, organizational collaboration, human factors, business process agility, and strategic objectives. Effective project leadership involves not only managing the work, but also building people relations across diverse organizational and cultural boundaries, support functions, suppliers, customers and partners. The presentation will explore the leadership lessons learned from this shifting paradigm, including the barriers, drivers, critical success factors, and the organizational conditions most conducive to managing project teams effectively in our complex business environment.

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**WE-01 Innovation Management-7**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Ootori 1**

**Chair(s) Andre J Buys; University of Pretoria**

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**WE-01.1 [A] Conceiving New Advanced Technology Business from Research Group Activities at a Japanese Engineering Industrial Organization**

*Kotaro Nakamura; eCraft Inc. & JAIST, Japan*  
*Makoto Morioka; Fujitsu Limited, Japan*  
*Youichi Aoki; Tokyu Construction Co., Ltd, Japan*

Stronger service business orientation and cooperative conceiving of new industries require that technological experts apply management of technology (MOT) beyond organizations' boundaries. Over the last 16 years the New Industries Research Group (NIRG) of the Engineering Advancement Association of Japan (ENAA) has been bringing together experts from different industries and corporations for bi-annual research groups on advanced technologies and business in new emerging industries. The authors participated as NIRG director or research leader, respectively, in NIRG's projects on knowledge-intensive services, electronic-tag (RF-ID) using services, robotized services for care welfare, etc., and are currently in positions to pursue innovation leading and managing successful service-design and ICT-infrastructure companies. Reflecting on the authors' activities over the years, the paper presents results of MOT collaboration in the course of NIRG research and in the authors' own businesses. The study offers valuable insights for fostering "technology and service producers" in multi-client contexts.

**WE-01.3 [R] Innovation Measurement Framework to Determine Innovativeness of a Company: Case of Semiconductor Industry**

*Kenny Phan; Portland State University, United States*  
*Dundar Kocaoglu; Portland State University, United States*

Innovation is one of the most important sources of competitive advantage. It helps a company to fuel the growth of new products and services, sustain incumbents, create new markets, transform industries, and promote the global competitiveness of nations. Because of its importance, companies need to manage innovation. It is very important for a company

to be able to measure its innovativeness because one cannot effectively manage without measurement. A good measurement model will help a company to understand its current capability and identify areas that need improvement. This paper developed a framework to determine the innovativeness of a company in the semiconductor industry by using output indicators. Output indicators are used because they cannot be manipulated. A hierarchical decision model (HDM) was constructed from output indicators. The hierarchy consisted of three levels: innovativeness index, output indicators and sub-factors. According to the experts, the top three sub-factors to measure the innovativeness of a company are revenue from new products (28%), market share of new products (21%), and products that are new to the world (20%).

**WE-01.4 [R] Knowledge Sharing, Social Capital and Firm Performance in Technological Clusters of Taiwan Science Parks: An Innovation Strategy Perspective**

*Ming-Huei Chen; National Chung Hsing University, Taiwan*  
*Hong-Yan Wang; National Chung Hsing University, Taiwan*  
*Yu-Yu Chang; National Chung Hsing University, Taiwan*  
*Ava Hung; National Chung Hsing University, Taiwan*

Many scholars illustrate that innovation is the most important determinant of technological firm performance, and the existing evidence has indicated the crucial role of knowledge flow and social interaction among partners in innovation activities, but little research has linked knowledge sharing and social capital with firm performance from a holistic perspective of innovation strategy. This paper, therefore, aims to explore the relationships among knowledge sharing, social capital, and firm performance with regard to the effects of innovation strategies, which consist of collaboration strategy, in-house R&D strategy, and outsourcing strategy. To test the proposed hypotheses in this study, a sample of 209 technology-based companies in Taiwan Science Parks was examined through structural equation modeling. A variety of research streams, including innovation, systemic innovation, strategic alliance, knowledge management and social capital, has been used as the theoretical lens in this paper. By embracing multiple perspectives, the paper's findings contribute to a better understanding of how collaborative knowledge sharing and social capital impact firm performance through affecting the three distinct innovation strategies. Based on our empirical findings, managerial implications to technological firm leaders and interesting phenomena in clustered Science Parks are discussed.

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**WE-02 New Product Development-5**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Ootori 2**

**Chair(s) Elma Van der Lingen, University of Pretoria**

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**WE-02.1 [R] An Investigation into the Internal Business Logic Required for Successful Strategic Customer Service Initiatives in Organisations Offering Clients an Integrated Package of Products and Services**

*Gregory A Mountford; University of Pretoria, South Africa*  
*Richard V Weeks; University of Pretoria, South Africa*  
*Lourence D Erasmus; University of Pretoria, South Africa*

This paper is directed at gaining an understanding of the internal business logic of an organization in order to better determine the requirements for a successful customer service initiative in an organization offering an integrated package of products and services. Customer service strategies rarely have any meaningful impact within the product development departments of service-oriented organizations. A different approach is therefore required to engender a service culture within product development. A literature study was undertaken to gain an understanding of the concept of service-dominant logic and service-transition strategies (such as servitization); the problem statement was supported and research objectives empirically achieved through a series of open-ended interviews and focus groups (qualitative, narrative enquiry) following a purposive sampling strategy. The results revealed that a service-dominant environment or service culture are not natural phenomena that



# SESSIONS

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occur following a customer service initiative. Rather, a service culture can be borne from a service-dominant environment when a complex-adaptive systems theory to organizational management is utilized. A positive impact on customer satisfaction was also identified due to the organizational culture at play within the product-development departments. The results suggest that product development strategies that address the “mind of the customer” rather than just the “voice of the customer” can, through the use of a complex-adaptive systems management theory, engender a service orientation which will lead to better customer satisfaction and therefore a higher degree of competitiveness for the organization at large.

## **WE-02.2 [A] Successful Risk Management Approaches in Product Development Organizations: A Case Study Experience**

*Evelina Ericsson; Royal Institute of Technology, Sweden*

*Liv Gingnell; Royal Institute of Technology, Sweden*

*Joakim Lillieskold; Royal Institute of Technology, Sweden*

This article discusses experiences from case studies conducted in product developing organizations at four multinational companies. All organizations are outstanding product developing companies with a long and successful historical background within product development. Therefore, it is interesting to understand how these companies deal with risks in their product development processes. The aim of the paper is to find out if the Design for Six Sigma (DFSS) concept supports the need in industrial companies to deal with risks in their product development projects. The results show that DFSS promotes the company needs to some extent. There is a great method support in DFSS regarding how to consider technical risks. On the other hand, all companies included in this study would need more support to highlight the holistic perspective concerning cross-functional collaborations, increased communication and avoiding sub-optimizations in the development project, a requirement that is not sufficiently supported.

## **WE-02.3 [R] Expectations and Benefits of Utilizing Social Media Tools in New Product Development**

*Tero H Peltola; CITER / Tampere University of Technology, Finland*

*Saku J Makinen; CITER / Tampere University of Technology, Finland*

This paper discusses drivers of the use of social media tools by organizational members. Specifically, we contrast the expectations of senior managers of social media tool adoption with the benefits perceived by organizational members after the implementation of these tools. We analyzed empirical findings from 252 respondents to a survey of three global companies before and after social media tool adoption. The respondents to the survey held various internal functions and were from several organizational layers. According to our results, the working practices, notably in terms of information sharing, among organizations become more similar due to the social media tool adoption. We present individual-level drivers of the use of social media tools based on expectations and perceived benefits, such as increased transparency inside the organization. Additionally, based on the empirical evidence, we present both managerial and theoretical implications. The identified drivers can be used by practitioners as guidance in social media tool implementation. From a theoretical perspective, the study contributes to discussions on absorptive capacity, new product development (NPD) performance, and company-level social media tool adoption.

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## **WE-03 Intellectual Property-8**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Ootori 3**

**Chair(s) Yoshimasa Goto; Nagoya University**

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## **WE-03.1 [R] Implicit Patent Alliance Acquiring the Appropriability of Innovation: A Case Study on Inkjet Printer Companies**

*Yoshimasa Goto; Nagoya University, Japan*

*Kiminori Gemba; Ritsumeikan University, Japan*

This paper proposes a new innovation management scheme called “implicit patent alliance,” and discusses its effectiveness and the conditions required to enact such a scheme

with a case study of inkjet printers. “Implicit patent alliance” is a patent management scheme in order to create appropriability of innovation. In many markets except a few such as medicine and chemicals, essential patents may not help patentees to dominate the market because products consist of many essential patents distributed among companies. This situation gives opportunity for many companies to enter the market and makes the existing patent system ineffective in the process of innovation appropriability. If few companies have essential patents and they cross-license only among them and do not license to their competitors that have no essential patent, a collection of these cross-licenses would work as a virtual alliance which can occupy essential patents. We call this virtual alliance “implicit patent alliance.” Implicit patent alliance is capable of creating appropriability of innovation thanks to occupying essential patents even in the markets such as electronics and machinery, where one product consists of many patents. In the ink-jet printer market, three patentees of essential patents, Canon, EPSON and Hewlett-Packard, have been in the relation of cross-license only among them. They did not license to an outside alliance and dominated the market.

## **WE-03.2 [R] About Technology Valuation**

*Bing Wang; Portland State University, United States*

*Joseph C Edmondson; Portland State University, United States*

The research is based on a review of the literature about technology valuation. First, it illuminates the mechanism of the valuation of technology, which is rooted in the intrinsic value of the technology, and how the price is set by negotiation during the trade of intellectual property. Then the study examines the existing pricing methodology for new technologies. Three approaches, the market approach, the cost approach and the income approach, are compared. The research differs from the prior literature by considering the process of technology transfer and the bargaining considerations of the supplier party, the licensor, the negotiating parties, the licensee, and of a technology itself. The result of the research provides a template for the process of technology pricing in view of the negotiation process, taking into consideration the market, cost and income aspects of a technology.

## **WE-03.3 [A] Improved Management of Patent Litigation by Front-Loaded Allocation of In-House Resources**

*Ahmed Bohliqa; Portland State University, United States*

*Joseph C Edmondson; Portland State University, United States*

*Maria Ibarra Prado; Portland State University, United States*

*Jessica Lucas; Portland State University, United States*

*Xiaowen Wang; Portland State University, United States*

A patent infringement lawsuit against the SME (small to medium enterprise) presents a difficult challenge for management. The manager is faced with either 1) paying a license fee, thus hurting the competitive position; or 2) paying outside counsel, thus incurring significant legal expenses and hurting the competitive position of the company. This paper proposes a revised management model that shifts the task to in-house counsel and engineers. The objective is to reduce cost and uncertainty for a SME involved in patent litigation by using relatively inexpensive in-house resources. Further, it provides management with a degree of cost certainty by using in-house expertise in the initial phases of the case to reduce overall cost and to reduce the overall project cost. This paper reviews one ongoing legal dispute involving a relatively simple technology (plastic magnifiers) and illustrates how, by using these techniques, litigation risk may be reduced by over 60%.

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## **WE-04 Technology Management in the Service Sector-4**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Zuin 1**

**Chair(s) Peter J Sher; National Chi Nan University**

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## **WE-04.1 [R] A Conceptual Framework to Determine the Digital Forensic Readiness of a Cloud Service Provider**

*Mpho P Makutsoane; University of Pretoria, South Africa*

# SESSIONS

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*Awie C Leonard; University of Pretoria, South Africa*

In the digital age, organizations tend to invest large sums of their finances into technology because of the demand from business to handle their data efficiently. As these organizations grow, ubiquitous systems are required to securely store their big data. Cloud computing has emerged as a solution to this demand for a reliable and cost effective alternative to organizations. However, some organizations are skeptical about cloud computing as an ideal solution because of its pronounced susceptibility of privacy, data leakage and cyber-attacks through virtual networks. Hence, it is pivotal for organizations to have a certain level of confidence in the cloud service provider (CSP) that they select as their cloud vendor. Digital forensic readiness is one of the metrics that organizations can use to measure the CSPs' ability to thwart cyber-crimes. This paper proposes a framework based on literature and risk analysis techniques that organizations may apply when they want to migrate to the cloud. The proposed framework is a process tool to select a CSP that can provide an organization with a digital forensic readiness cloud solution.

## **WE-04.2 [R] Proposition for an Enhanced Service Business Model by Developing Service Communities**

*Daisuke Sugiyama; JAIST, Japan  
Kunio Shirahada; JAIST, Japan  
Michitaka Kosaka; JAIST, Japan*

In a servitized economy, it is necessary for technology industry to introduce the service concept into their business model. This paper aims to propose a framework of a sustainable service business model by developing a service community as a social infrastructure. As a result of building close relationships between the customer and service provider, both parties begin to form a community involving other customers or stakeholders such as local community, natural resources or related organizations. We conducted three advanced cases of supermarket, public service, and NPO activity to identify how customer communities are developed and what the main drivers to promote the community building are. The paper finally proposes how the service value is co-created among the community members. Major actors for the community could be curator, follower and promoter, and the each actor has a specific role in the process of forming a core group in the community. And the group would be sustainable when it contains an economical routine to earn constant economic results. Understanding such a framework will be the key to establishing a community that will be an essential infrastructure for sustainable growth of the service business model. We also refer to the technological factors such as internet virtual community or social media.

## **WE-04.3 [A] Service System Design**

*Yuriko Sawatani; Waseda University, Japan*

This discusses the shift of design focus looking at innovation history, and points out the importance of research on designing a service system. The focus of innovation is shifting from seeds or needs oriented products to a service system creating values by the interactions of providers and receivers, and to open innovation. At the same time, the scope of design becomes wider, including the whole system design. Because of these shifts, the new research on service system design is emerging. In this paper, a framework based on two viewpoints, such as systems with value sharing condition and scopes of system layers, are proposed identifying technical and social difficulties of designing a service system.

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## **WE-05 Knowledge Management-3**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Zuin 2**

**Chair(s) Charles M Weber; Portland State University**

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## **WE-05.1 [R] Systematic Management of Knowledge as an Integral Part of the Infrastructure of Tool and Die Making Companies**

*Guenther Schuh; RWTH Aachen University, Germany  
Martin Pitsch; RWTH Aachen University, Germany*

Due to its key role in the value chain between the product development and the mass pro-

duction, the tool and die industry is one of the most important industries in the manufacturing sector. In an increasingly global production environment, the tool and die industry in high wage countries like Germany or Japan stands in an aggressive competition with suppliers from Eastern Europe or China. Additionally, there are the three major trends in production engineering that have a direct impact on the tool and die industry: low factor costs in Eastern Europe and Asia, an increasing product derivation as well as a demographic change in society. To cope with those trends and to stay competitive, the tool and die industry has to manage both organizational and technological challenges. One of those challenges is the systematic management of the organizational and personal knowledge. Especially in technological focused industry sectors like the tool and die industry, the establishment of knowledge management methods has been neglected. However, knowledge management is an integral part of the infrastructure in manufacturing. This paper, therefore, defines the key methods for an effective knowledge management in the tool and die industry.

## **WE-05.2 [A] An Across Data Sources Environmental Scanning Mechanism for Issue Analysis**

*Te-Yi Chan; STPI, NARLabs, Taiwan  
Hai-Chen Lin; STPI, NARLabs, Taiwan  
Wan-Hsu Tsai; STPI, NARLabs, Taiwan  
Yi-Ping Hsu; STPI, NARLabs, Taiwan*

This study proposes a mechanism that provides researchers an efficient way to conduct environmental scanning from different data sources with consideration of the consistency between research issue and retrieved data. The international trend reports, foresight databases, scientific literature, US patents, R&D investment and human resources databases are linked by this study. Furthermore, each of the developing trends, technologies from international trend reports, and foresight databases are categorized into societal demand and technology support respectively. As a result, an overall view of world societal demands will be unveiled, with possible solutions. This article proposes Taiwan as a case study by using the government R&D investment database, literature, and US patent database and human resource database as proxies to reflect the responses and output when facing the challenges in such a rapidly changing world. The solar energy, one of the renewable energy technologies, is adopted as a target in the case to examine the effects of the proposed environmental scanning mechanism. The world future energy development will be illustrated from both social demand and technology perspectives, and the hierarchical technology tree of solar energy is further discussed together with Taiwan's R&D input and output.

## **WE-05.3 [R] Double-Loop Bench Marking Methods in the Era of Data Deluge: An Empirical Scientometric Study and Assessment of Japan's Galapagos Syndrome in Scientific Research Activities**

*Nobuyuki Shirakawa; Keio University, NEDO, NISTEP and IFTECH, Japan  
Takao Furukawa; Kyoritsu Women's University, Japan  
Kauhiro Hayashi; National Institute Science and Technology Policy, Japan  
Masatoshi Tamamura; Keio University, Japan*

This paper addresses the need for reliable measurement guidelines for organizations or entities in the turbulent environment of our era of data deluge. Based upon conceptual and empirical research in bibliometrics, we suggest an analytical approach to benchmarking the technology management of surprising and potentially damaging phenomena. In order to do so, we propose a method called "double-loop benchmarking," which consists of two steps: (1) structural benchmarking, based upon social relationships between actors and actants, and (2) projecting transaction data accumulated through daily business processes as benchmark indicators based upon the social relationships empirically measured in the first step. This paper can be seen as part of a broader agenda for how to manage during continuous but unpredictable change in circumstances of open ignorance. As an empirical study in bibliometrics, we propose a methodological improvement in scientometrics using data repurposing and triangulations. An international comparative analysis reveals empirical evidence that Japan's dynamic technology portfolio on research activities in the fields of electrics, electronics, information, and communications has consistently deviated from that in global trends since the 1990s. This phenomenon, which may be described as the "Gala-

# SESSIONS

pagos Syndrome," is a strategic pitfall under the dynamic technology paradigm change.

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## **WE-06 Science and Technology Communication-1**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Chidori**

**Chair(s) Chen Keke; China Research Inst. for Science Popularization**

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### **WE-06.1 [R] A Study on the Impact of Science Venues upon Chinese Students' Creative Imagination**

*Huiliang Zhang; China Research Institute for Sci. Popularization, China*

*Ling Chen; China Research Institute for Sci. Popularization, China*

This study examines the development of students' creative imagination and its relation to students visiting science venues. A nation-wide survey had been conducted to assess school students' creative imagination and factors influencing it. Data consisted of 4162 students from grade 4 through grade 12. Findings showed that frequently visiting science venues such as science and technology museums, science centers, natural science museums, botanical gardens, zoos, and aquariums is related to the development of students' creative imagination. Some implications and recommendations for science venues regarding nurturing students' creative imagination are also proposed.

### **WE-06.2 [R] A Case Study Analysis of Social Organizations Participate in Science Communication in China**

*Guo Xiaoyan; China Research Institute for Sci. Popularization, China*

*He Wei; China Research Institute for Sci. Popularization, China*

*Zhang Chao; China Research Institute for Sci. Popularization, China*

*Ren Lei; China Research Institute for Sci. Popularization, China*

The research mainly uses the case studies method, the qualitative research method, and the comparison study method to analyze whether social organizations that participate in science communication in China are valid. The study firstly introduces the establishment of the Activity Center in the First Senior High School in Hong he county, Yunnan province. Secondly, the study describes the management and operation mode of the center. Next, the study focuses on whether the Activity Center as a science communication approach is a feasible way, and in this part of the paper, it compares the functional properties of the Activity Center in the case and the general science and technology activity centers in China. The conclusion of the study is that the Activity Center in the case can be used as a carrier for science communication, for it disseminates science knowledge, has a scientific concept, puts emphasis on scientific training methods, and can improve the scientific literacy of students. The research also analyzes the conditions for social organizations involved in science communication. The conditions include establishing interests sharing, investment, motivation and supervision mechanisms to form a multi-win-win situation.

### **WE-06.3 [R] A Study on Science Popularization Projects for Rural Youth in China**

*Wang Lihui; China Research Institute for Sci. Popularization, China*

As the status quo that the rural population is half the population in China, science and technology communication to rural youth can lead them to know more about new technic and skills. The paper introduces some science communication and popularization projects for the youth in the countryside, such as the Rural Informal Science Education project, Intel Learn program and extracurricular scientific activities for rural youth projects. Through the analysis of the projects' effects, which have been carried out and the role that plays in science education of young people in rural China, the findings and suggestions of the study are: 1) living environment has an important impact on the rural youth, 2) the projects have positive effect on rural youth, especially on their scientific literacy, and it is essential to keep the further exploration on new pattern of science popularization in rural area, and 3) pay more attention to the rural left-behind children's living ability and employability training.

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## **WE-07 R&D Management-2**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Shirasagi 1**

**Chair(s) Kiyoshi Niwa; The University of Tokyo**

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### **WE-07.1 [A] An Index of R&D Productivity: To Estimate R&D Contribution for Profit**

*Masami Asai; Hitotsubashi University, Japan*

Some indexes of R&D productivity have existed such as sales vs. R&D expense, operating income vs. R&D expense, and they are used for relative evaluation among competitors, etc. Though top managements would like to know the contribution of R&D expense to sales and profit in a company, the above indexes are not satisfied for them. It is an issue as to how R&D expense contributes sales and profit by using appropriate indexes. This paper presents an index of R&D productivity to use the R&D contribution for profit. At first, contribution profit is calculated, and then the contribution profit is divided into two parts, one is R&D,M contribution and the other is Non-R&D,M contribution. Finally, technology development/product development/research contribution becomes clear. As a result, the contribution of R&D for profit is represented as an index of R&D productivity. It is important to compare the current index with the past index of R&D productivity.

### **WE-07.2 [A] Approach for Evaluation and Prioritization of a Technological Idea Portfolio Supporting the Management of an R&D Lab of Multinational Corporation in the Brazilian Consumer Electronics' Industry**

*Luciana C Lenhari; Samsung R&D Institute Brazil, Brazil*

*Marcus V Leite; Samsung R&D Institute Brazil, Brazil*

*Miguel G Lizaraga; Samsung R&D Institute Brazil, Brazil*

The paper proposes an approach for evaluating and prioritizing a technological idea portfolio, supporting an R&D Lab, to select the ideas that can produce better outputs in innovation technology projects in partnership with universities. The research methodology is based on analysis of the literature about project and technology portfolio management, the criteria for measuring innovation (Oslo Manual), and the collaboration between research institutions. As a result it was proposed five multi-criteria drivers, with different weights, in order to strategically evaluate and prioritize ideas: Strategic Contribution (40%), which has evaluated the adherence of the ideas to the strategic areas of the R&D Lab; Technological Contribution (20%), which has assessed the contribution of an idea to the state of the art in that research area; Institutional Relationship (20%), which has verified the elements needed for establishing a partnership with universities and intellectual property clauses; Technology Transfer (10%), which has evaluated the potential for creating and improving internal competencies; and Social Impact, which is related to the contribution to local social development. This approach also can support others R&D Labs that need to evaluate ideas based on strategic drivers that go besides of the innovation funnel for products.

### **WE-07.3 [R] Investor Sentiment, Chairman-CEO Duality and R&D Investment**

*Zhaohui Zhu; Zhejiang Gongshang University, China*

*Wensheng Huang; Zhejiang Gongshang University, China*

With a sample of Chinese listed firms during 2007-2010, the paper studies the impact of the investor sentiment on firms' R&D investment, and the results suggest that the firms' management does not cater to investor sentiment significantly. But when the study imports the variable of chairman-CEO duality and its interaction with investor sentiment, it is suggested that the stock mispricing which induced by investor sentiment and chairman-CEO duality have a positive effect on firms' R&D investment. Furthermore, the coefficient of the interaction of investor sentiment and chairman-CEO duality is negative significantly, which suggests that the firms with board member acting as CEO will cater to investor sentiment through R&D investment, while the firms which have a separate chairman and CEO will make investment decisions more rationally.

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## **WE-08 Collaborations for Technology Management-4**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Shirasagi 2**

**Chair(s) Deok S Yim; Science and Technology Policy Research Institute**

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## **WE-08.1 [R] High-Performance Inter-Organizational Interaction for Disaster Response: An Evolutionary Game**

*Fred Y Phillips; Stony Brook - State University of New York and SUNY Korea*  
*Daniel Chang; Stony Brook University / SUNY Korea, Korea, South*  
*Shameem Heetun; Alliant International University, United States*  
*Brian Kim; Stony Brook University / SUNY Korea, Korea, South*  
*Ho-Joong Lee; Stony Brook University / SUNY Korea, Korea, South*  
*Sehee Park; Stony Brook University / SUNY Korea, Korea, South*

Disaster response requires cooperation among many aid agencies, some of which may never have worked together in the past. What enables such agencies to rapidly establish the trust and cooperative behavior necessary for effectively aiding victims of a disaster? The literature presents two main candidates for the enabling mechanism: probability assessment and indirect reciprocity. This paper describes a spreadsheet-based game that may be used to determine which of these is the dominant mechanism. The game also tests whether an agency's response strategy is evolutionary, i.e., whether the agency finds it best to shift resources between technical training (e.g., firefighting) and training in inter-agency coordination.

## **WE-08.2 [A] Option-Games on Infrastructure Investment in Vietnam: Focused on Smart City Project**

*Nguyen Thu Ha; Toyohashi University of Technology, Japan*  
*Takao Fujiwara; Toyohashi University of Technology, Japan*

Successful countries provide economy and society with infrastructure needed to maintain growth. Over the last decade, the government of Vietnam has maintained a high level of infrastructure investment. However, the electricity shortage, natural disasters and the emission of greenhouse gasses still have been challenges that Vietnam has to confront to sustain high economic growth in the long term. Japan, one of the most developed nations, is moving forward aggressively to become a major global player in Smart Cities. For this reason, we focus on this promising "Smart City" project for considering the investment in Vietnam. This project requires huge investment amounts and long term to profitability under uncertainty. Hence, PPP (public-private partnership) is an attractive scheme to optimize the trade-off between Vietnamese government owned firms (for technology and capital) and foreign private firms (for market demand and regulation). In a context of a strategic partnership as a co-competition method, how the option-games as a methodology can find the optimality on the trade-off between flexibility and commitment for irreversible investment under uncertainty and competitiveness. Then the result is proposed to value the boundary of cooperate investment opportunities for both sides in this project.

## **WE-08.3 [R] The Impact of Collaboration in the Business Performance Perception: A Study on the Influencing Factors**

*Kumiko O Kissimoto; USP - University of Sao Paulo, Brazil*  
*Fernando Laurindo; USP - Universidade de Sao Paulo, Brazil*  
*Claudia A Mattos; FEI - Faculdade de Engenharia Industrial, Brazil*

Collaboration is gaining importance, especially those in which there is the participation of external individuals or groups in the innovation process both in the academy and in companies. However, measuring the impact of collaboration on business performance is not a trivial task, particularly if it is considered that business performance should be measured through not only accounting measures but also on a wider range of factors like project efficiency, impact on the internal team, preparation for the future, among others. This paper investigates the different aspects that affect the perception of improvements in the business performance due to collaboration. Companies that are using collaboration platforms as a new business approach were interviewed, analyzing the collaboration purpose, information technology (IT) infrastructure and the user acceptance of IT resources. Results show the relationship among these factors, and how they influence the business performance perception.

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## **WE-09 Decision Making-4**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Hibari 1**

**Chair(s) Nasir Sheikh; State University of New York, Korea**

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## **WE-09.1 [R] Managing Issues Through the Lifecycle of IT Service Offshoring Projects**

*Rosine H Salman; Portland State University, United States*  
*Tugrul Daim; Portland State University, United States*  
*David Raffo; Portland State University, United States*

Western countries' information technology and software intensive firms are increasingly producing software and IT services in developing countries. With this swift advancement in offshoring, there are many issues that can be investigated to enable companies to maximize their benefit from offshoring. However, significant challenges can happen throughout the lifecycle of offshoring IT service projects which turn the potential benefits into losses. This research investigated CMM/CMMI best practices and their effect on managing and mitigating critical issues associated with offshore development.

## **WE-09.2 [R] When Integration Works Better than Segregation Does in Multiple-Gain Situations: The Revised Coding Rules in Mental Accounting**

*Chia-Chi Chang; National Chiao-Tung University, Taiwan*  
*Po-Yu Chen; National Chiao-Tung University, Taiwan*

Mental accounting based on the S-shape value function in prospect theory has been widely accepted since it was posited. The coding rules in mental accounting (CRMA) further suggest that segregating gains in multiple-gain situations and aggregating losses (to one big loss) in multiple-loss situations are preferred. CRMA have been then successfully applied to many fields. However, in our daily life, we can find occasions when people tend to aggregate gains in multiple-gain situations (accumulate small money from colleagues for a bigger wedding gift) or segregate losses in multiple-loss situations (phase a monthly donation amount to a smaller daily amount). The only study to date showing experiment results conflicting with CRMA, though, focuses on comparing the utility losses of two losses that happen on the same day and on different days. In this study, in order to resolve the inconsistency, we replicate Thaler's experiments with different dollar amounts used in both gain and loss scenarios and propose that mental threshold could be the major reason why in some situations CRMA may not be applicable. Our results show that in multiple-gain (or multiple-loss) situations, CRMA reverse when the accumulated gain (or loss) is over people's mental threshold while the individual gains (or losses) are not. Another finding is that in prior-gain or prior-loss situations, the original reference points can serve as a natural mental threshold. When the accumulated gain (or loss) of multiple gains (or losses) is over the original reference point (anchored by prior gains or losses) while the individual gains (or losses) are not, our experiment results show that people's preference on segregating gains and aggregating losses is reduced.

## **WE-09.3 [A] Research on Development Efficiency of Chinese Science Popularization Industry Based on DEA Model**

*Fujun Ren; Research Institute for Science Popularization, China*  
*Weihong Ren; Research Institute for Science Popularization, China*  
*Guangbin Liu; Beijing Institute of Petrochemical Technology, China*

The development of the science popularization industry in China has been elevated to a strategic height. It plays an irreplaceable role in the improvement of national scientific literacy and the construction of an innovation-oriented country. However, the current Chinese science popularization industry is still "scattered, small, slow and weak" and has a great gap compared with that of developed countries. This paper conducts empirical research on the input and output efficiency of the science popularization industry in 11 provinces in east China from 2006 to 2011 with DEA evaluation method according to statistical data of science popularization in China. The research result shows that the Chinese science popularization industry has a strong development momentum and is in the rising stage.



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## **WE-09.4 [A] Knowledge Management to Deal with Risk in the Process of Software Development: A Case Study**

Ana Lucia F Facin; *University of Sao Paulo, Brazil*

Fernando Jose B Laurindo; *University of Sao Paulo, Brazil*

Mauro M Spinola; *University of Sao Paulo, Brazil*

Improving the efficiency of the risk management process in highly complex environments such as the software development industry has been drawing the attention of researchers that seek to understand how knowledge can help reduce those risks, and how it can help in the decision-making processes related to them. The present study was developed to contribute to understanding the role of knowledge management in reducing risks in the software development process. The qualitative research, conducted through a case study, tried to emphasize the mechanisms of conversion and the style of knowledge management employed to deal with the elements of knowledge related to risk. The work is restricted to the conditions found in companies certified by quality management programs. The results include the observation that risk management helps to obtain and to organize knowledge about risks, creating the conditions to re-utilize knowledge and thereby improve the efficiency of the risk management process. It was also observed that most of that knowledge is to be found within the sphere of explicit knowledge, more common in the style of knowledge management oriented to systems.

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## **WE-10 SPECIAL SESSION: Special Session in Japanese language - 3**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Hibari 2**

**Speaker(s) Shuji Kondou; Quad-Vision Research Institute and JAIST**

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

"MOT Reform-Practice Community: Cases of Traditional Craft Industries, Inter-company Academy Activities and Medical MOT Model." Ishikawa MOT School has been operated for 10 years by Ishikawa IT Human Resource Development Center in collaboration with JAIST (Japan Advanced Institute of Science and Technology), with various supports from Ishikawa Prefecture and around 30 regional companies. Approximately 200 people completed the course. People who participated in the course have established the "MOT reform-practice community," which pursues a knowledge science approach to achieve human, organizational and entrepreneurial creation. From Monday through Wednesday, at the same session time each day, successful cases of such practices will be reported by the leading 12 companies/organizations, and application of "Quad Vision Thinking Methodology," which was developed by being inspired by the SECI model of Professor Nonaka, an author of "The Knowledge Creating Company," will be described in each presentation. In this session, Asahi Electric will present "Japanese Traditional Craft's MOT Season 7 - Beyond Cool Japan Policy"; Nomi Apparatus Cooperative will present "Tutoring school activities at Nomi Apparatus Cooperative - Application of Quad Vision Thinking Methodology"; Public Central Hospital of Matto Ishikawa will present "Branding of medical enterprise - Achieving a regional alliance"; and Houju Memorial Hospital will present "Nobi Nobi Nomi; Creation of Health Care Community - MOT Innovation Saves Health Care in Our Community." "Nobi Nobi Nomi" means Nomi city will be growing up."

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## **WE-11 Science and Technology Policy-3**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Toki**

**Chair(s) Nihan Yildirim; Istanbul Technical University**

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## **WE-11.1 [R] Development of the Case-Based Reasoning System for Regional Science and Technology Policy: An Interim Report**

Akiya Nagata; *Kyushu University, Japan*

Toshiya Kobayashi; *CSTIPS, Kyushu University, Japan*

Koichi Hasegawa; *CSTIPS Kyushu University, Japan*

Kana Moroga; *CSTIPS Kyushu University, Japan*

Yasutaka Kuriyama; *CSTIPS Kyushu University, Japan*

Tadahisa Ohno; *CSTIPS Kyushu University, Japan*

Various types of policies to promote regional science and technology have been introduced in Japan since the 1980's. Although those policies have achieved a degree of success in fostering entrepreneurs and developing human networks, some remaining problems have been pointed out regarding the fact that the policy target of sustainable revitalization of regions has not been realized. In this paper, we report an interim result of the project aims to develop a decision-making support system with applied case-based reasoning to contribute to the resolution of these problems. Case-based reasoning is a technique for problem-solving based on the solution of similar past cases. The system of reasoning has been put to practical use in engineering problem-solving, diagnosis, decision making on managerial issues, legal reasoning and so on. By applying the technique of planning and problem-solving to regional science, technology and innovation policy, the sharing of useful knowledge for regional revitalization among regions becomes possible. The scheme of this project includes a large-scale acquisition of case information, construction of database, analyses of success factors of policies, and the development of rules of inference and their implementation.

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## **WE-11.2 [A] Quo Vadis? 20 Years of Supporting Regional Economic Development in the Western Cape Province of South Africa: Towards a Framework for Embedding Innovation**

Sara S Grobbelaar; *University of Pretoria, South Africa*

Nigel Gwynne-Evans; *WCDED&T, South Africa*

The paper builds on a regional economic development framework that was developed as an advisory guide to regional governments internationally as part of a UN-Habitat funded project. The original framework was based on 10 case studies that served as illustrations of the implementation of the introduced economic development mechanisms. This paper provides an in-depth investigation into the practical aspects of the mechanisms through a case study at the provincial government level in South Africa, at the Western Cape Department of Economic Development and Tourism (WCDED&T). We consider the evolution of the system over a 20-year period and develop an argument that the economic development support mechanisms in the Province have now been developed up to a satisfactory point so that greater focus for an innovation function and focus may be put into play. The case places the originally suggested mechanisms for regional development within a wider framework for economic development mechanisms that are available to regional governments by mapping and synthesizing mechanisms through which innovation can be stimulated at the regional level. The paper outlines the key considerations and trade-offs in the design of such mechanisms.

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## **WE-11.3 [R] An Analysis of Science Communication Policy in European Union Framework Programme**

Xiuju Li; *China Research Inst. for Science Popularization, China*

Many science and technology developed countries take the science and technology communication as an important component of research projects. The European Union has made important efforts to study and develop the science-society interface and to improve communication between scientists and the European citizens in order to assure that public awareness keeps pace with rapid scientific and technological development. There are two ways for improving the science communication in the European Union's Framework Programmes. The first way is setting an independent science communication section, and the second way is integrating science communication content into research projects. The aim of this paper is to analyze the Framework Programmes' science communication policies and give some suggestions to science and technology policy decision makers in China.

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## **WE-12 Competitiveness in Technology Management-3**

**Wednesday, 7/30/2014, 16:00 - 17:30**

**Room: Houmeiden**

**Chair(s) Xiangdong Chen; Beihang University**

# SESSIONS

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## **WE-12.1 [R] A Parallel-Running-Type Growth Model in Asia: A Case of Clean Technology**

*Ichiro Sakata; The University of Tokyo, Japan*

*Hajime Sasaki; The University of Tokyo, Japan*

*Masahiro Hashimoto; The University of Tokyo, Japan*

*Keiko Kayukawa; The University of Tokyo, Japan*

A significant structural change in the pattern of economic development in Asian countries has been observed in recent years. In this situation, the existing studies on development economics, political science and innovation research cannot sufficiently explain the driving force and the mechanism of catch-up or economic growth. Therefore, it is now required to model this new type of economic development. In this paper we analyzed their scientific catch-up status using the data of four fields of clean technology to clarify the structural change. The results show that, while Asian countries have received matured technologies such as energy saving from advanced countries, they are accelerating research and development activities on emerging technologies. China, Korea and Singapore have caught up with advanced countries by conducting pioneering research for clean energy technologies to support their industrial development. On the other hand, India has conducted relatively path-following catch-up. International collaboration still remains among the US, EU and Japan as it has been developed over a long time. However, it is now changing with the emergence of Asian countries.

## **WE-12.2 [R] The Influence of R&D Partnership Network on Firm Performance Based on the Perspective of Social Network: The Case of Taiwan LED Sector**

*Chao-Chih Hsueh; National Pingtung Univ. of Science and Tech., Taiwan*

*Chun-Chieh Wang; National Taiwan University, Taiwan*

Scholars have drawn on network literature to highlight the importance of external resources available to the firm through its networks. This purpose of this study is to investigate whether the position of an R&D partnership network affects the firm performance. Based on this perspective, we examine the effect of the government-sponsored R&D consortia in Taiwan. This kind of policy encourages firms to take part in innovative technology fields, to develop technologies with strong potential for huge economic benefits, and to encourage academia and industry to collaborate and ultimately increase industrial competitiveness. We construct the R&D partnership network in the liquid crystal display (LED) industry by using 140 firms and test the hypothesis by using 60 listed public firms. The results show that a firm joined in government-sponsored R&D consortia has better centrality and the structure hole than the others. The results also indicate a positive relationship between centrality, and patent number and structure hole and patent number, but the network position of firms did not influence the firm financial performance. This study may lead to a better understanding of the effect from the government-sponsored R&D consortia and of the relationship between the firm network position and firm performance. The article concludes with implications for theory, research, and practice.

## **WE-12.3 [R] Empirical Research about the Regional Innovation Capability Based on China's Patent Application Activities**

*YanRu Qi; Beijing Institute of Technology, China*

*Yun Liu; Beijing Institute of Technology, China*

*Yuanyuan Hou; Beijing Institute of Technology, China*

The paper selects the invention patent applications as measures of China's innovation capability and utilizes the characteristic index of patent influence factors. It is based on type B grey correlation between two of which to calculate and determine the Lag and index weight of influence of different characteristics of the indicators on China's innovation capability. On this basis, we calculate the regional innovation capability of 30 Provinces, municipalities and autonomous regions in 2011 and divided these regions into four echelons.

## **HA-00 PLENARY - 5**

DATE: THURSDAY, 7/31/2014

TIME: 8:30 - 10:00

ROOM: OOTORI

CHAIR(S): TUGRUL U DAIM; PORTLAND STATE UNIVERSITY, USA

## **HA-00.1 [K] Safeguarding Growth and Prosperity: What Successful Innovators Have in Common**

*Hans-Joerg Bullinger; Senator of the Fraunhofer-Gesellschaft, Germany*

In the future, people will need affordable medical care, mobility, access to modern communication technologies, green energy, security, and resource efficient methods for our planet. These are not only the major challenges for the 21st century, but also the prevalent opportunities for growth, employment, and wealth. Companies need to analyze and exploit major, observable strands of social, scientific, and technological development and long-term trends. The knowledge obtained about markets, customers, competitors, and technologies reduces innovation risks and makes a sustainable contribution to the company's strategic orientation, organizational structure, and workflow organization. Those who want to change the existing processes and procedures or to implement sustainable concepts into practice require vision and expertise. Companies are successful when they master the dynamic, rapidly changing markets of the future. For this to happen, companies must be quick to identify upcoming market trends and opportunities for innovative technologies, and incorporate them in their business strategy. Creative and passionate individuals who have knowledge of the requirements of the economy can acquire a vision for the future. From the laboratories of the Fraunhofer-Gesellschaft, Professor Bullinger gives fascinating insights on the development and outlines some secrets about what top innovators have in common.

## **HA-00.2 [K] Lessons from History: How the West Surged Ahead, and How the East Finally Caught Up**

*Bulent Atalay; Scientist, Artist and Author, United States*

Five hundred years ago a number of conditions existed in Europe that enabled Western civilization to make unprecedented progress and to surge ahead of the rest of the world. While the empires of the East gained inertia and remained largely stagnant, relatively small countries in Europe - England, France, Spain, Portugal, and Holland - embarked on the Scientific Revolution, which eventually led to the Industrial Revolution of the eighteenth-century, fueled by an irreversible fusion of science and technology. Europeans colonized the New World, as well as Africa and Asia. By the mid-16th century the Ottoman Empire could have claimed the Mediterranean as the "Ottoman Lake." It had reached its greatest extent and would soon begin a decline. Three hundred years later Czar Nicolas I of Russia would characterize the Ottoman Empire as "the sick man of Europe." And by then, the English could claim, "The sun never sets over the British Empire." We will investigate the conditions that gave rise to the Scientific and Industrial Revolutions, and for the West to peak. The East - first Japan, and then Korea, and finally China - only after changing its operating system would accelerate and catch up with the West.

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## **HB-01 Innovation Management-8**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Ootori 1**

**Chair(s) Dietmar H Winzker; University of Pretoria**

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## **HB-01.1 [A] 'Carve-Out' Scheme to Develop Technology Driven Strategic Businesses**

*Seiichi Watanabe; TechGate Investment Inc., Japan*

*Hitoshi Masuya; TechGate Investment, Japan*

*Seiichi Kato; TechGate Investment, Japan*

Today the Internet together with the progress of semiconductor technology are dramati-

# SESSIONS

cally changing the business environment, threatening existing businesses as well as offering new opportunities. K. Doi and the authors formalized a scheme that "carves out" key personnel and technology from established companies and research institutes to incubate them as start-ups and create technology driven strategic businesses, following the earlier examples of Sony Play Station and Japan Display Inc. The "Technology Carve-Out Fund" was successfully raised in 2005, with a commitment of approximately 40 million U.S. dollars. Under the scheme, 10 start-ups have been "carved out." A series of "carve-out," incubation and exit exercises demonstrate the effectiveness of the scheme, and lessons have been learned. Understanding these lessons may allow for greater success in the future.

## **HB-01.2 [A] A Preliminary Study on Manufacturing Servitization in Machine Tool Industry**

*Hsiao-Chen Mei; Precision Machinery R&D Center, Taiwan*  
*Peter J Sher; National Chi-Nan University, Taiwan*  
*Chu-Wen Chen; National Chi Nan University, Taiwan*  
*Shihmin Lo; National Chi-Nan university, Taiwan*

Manufacturing servitization will be a turning point for machine builders to build competitive advantage to fight against cost-down oriented competition from emerging countries. We conduct a preliminary study on manufacturing servitization with the model of Product Life Cycle Service to identify the progress of manufacturing servitization in machine tool industry. Five cases of global machine tool manufacturers not only show the difference between each other but also point out how they approach manufacturing servitization.

## **HB-01.3 [R] An Empirical Study on University-Industry Collaborative Innovation from Science of System Perspective**

*Liang Mei; Zhejiang university, China*  
*Yangxue Xiang; Hangzhou Normal University, China*  
*Jin Chen; Zhejiang University, China*

The collaborative innovation of university-industry was discussed from the science of system perspective. On the basis of the synergetic perspective, this paper analyzes the dynamic evolution law of innovation capability of university under the process of university-industry collaborative innovation. The research indicates that the science of system can be used to solve the uncertainty of administrative decision. This paper established the logistic model composed of university knowledge production capability, knowledge transmission capability, and knowledge dissemination capability on the basis of "B-Z" model. Through stability analysis and simulation, we discussed these three capabilities' evolution law and determined dominate capability elements, then the evolution law of the three Chinese universities in the process of university-industry collaborative innovation will be studied by confirmatory empirical analysis. The study tried to provide policies of internal capability coordination for university-industry collaborative innovation.

## **HB-01.4 [R] Exploring the Effects of Knowledge Characteristic and Self-Efficacy on Employees' Innovative Behaviors: The Moderating Effect of Environmental Uncertainty**

*Huei-Mei Liang; National Sun Yat-sen University, Taiwan*  
*Rui-Hsin Kao; National Quemoy University, Taiwan*  
*Yu-Shan Hung; National Sun Yat-sen University, Taiwan*  
*Pei-Yu Chien; National Sun Yat-sen University, Taiwan*

Along with global marketing competition and shortened product life cycle, many firms attempt to engage in product innovation in order to create new products for sustaining their competitive advantage. Prior studies have indicated that firms' successful product innovations are intimately linked with employees' innovative behavior. Furthermore, some previous studies also indicate that knowledge characteristic and self efficacy are important factors to improve organizational development; however, few studies investigate the relationship among knowledge characteristic, self-efficacy, and employees' innovation behavior. Therefore, we attempt to explore these relationships in this study. On the other hand, environmental uncertainty is a key influencing factor in the competitive environment, especially for

the knowledge intensive manufacturing industry. However, few studies explore the moderating effect of environmental uncertainty among knowledge characteristic, self-efficacy, and employees' innovation behavior in manufacturing industry. Therefore, we address the research gap by investigating sales and R&D employees in the manufacturing industry. Our results show that knowledge characteristic has positive effect on employees' innovative behavior for the R&D employees. Furthermore, self-efficacy has a positive effect on employees' innovative behavior for both sales and R&D employees. Finally, environmental uncertainty has a positive moderate effect on the relationship among knowledge characteristic, self-efficacy, and employees' innovation behavior.

## **HB-02 New Product Development-6**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Ootori 2**

**Chair(s) Supachart lamranakul; Kasetsart University**

## **HB-02.1 [A] Managing Document Scanner Development at PFU**

*Masahiko Kobako; PFU Limited, Japan*

A document scanner is a capture device to digitize paper documents. In corporate activities, the digitization of paper documents is an effective way for quick information searches, reduction of the storage space and the transportation cost, and business continuity in case of disaster. Today, many people employ document scanners for their businesses worldwide. In addition, the number of individual users who digitize their own books has been increasing as mobile devices (e.g., tablet computers) become popular. PFU Ltd. has been engaged in the development of scanners for more than 20 years, and in order to satisfy the changing user and social needs, paper feed and control technologies have evolved as the core technologies. As a result, we have the world No.1 share in the document scanner market. Now, "ScanSnap" has become the most popular scanner for personal use worldwide. This paper describes our efforts, development concept, market creation and functional evolution in this successful case of the "ScanSnap."

## **HB-02.2 [A] Study on Enhancement of the Mobility for New Product Development in SMEs**

*Mayumi Yoshida; Matsumoto Machine Co.,Ltd., Japan*  
*Takashi Sasakawa; Matsumoto Machine Co.,Ltd., Japan*  
*Kaname Matsumoto; Matsumoto Machine Co.,Ltd., Japan*  
*Koichi Murata; Nihon University, Japan*

In most small and medium enterprises (SMEs) in Japan, which is recognized as an advanced country of manufacturing industry, they have polished their core technologies and delivered new values to a society through the collaboration with members of their supply network of the world. This study discusses small and medium manufactures which are concerned in a social infrastructure construction. In particularly, Matsumoto Machine Corporation is forced as one case company of the object field. They have manufactured machine tool accessories and supplied the products to their customers who contribute to a construction of social infrastructures. This paper tackles with a systematization of a procedure of new product development to match customer needs under the limited management resources. And then, in order to confirm the utility of the proposed procedure, three stories of new products are described such as 1) a chuck for an exchange time reduction, 2) an electric chuck for friendly environment and 3) a rotary table of numerical control machine utilized in the factories for cars, airplanes and power facilities.

## **HB-02.3 [R] Degree and Type of Inter-organizational Learning Required in Strategic Alliance's First New Product Development Project: The Tradeoff Between Benefits and Risks**

*Yuosre F Badir; Asian Institute of Technology, Thailand*

We draw on theories of inter-organizational learning, social networks, and transaction cost economics to examine two strategic options available to a firm in managing a new strategic alliance's first NPD project. These two strategic options are "benefits-driven strategy" and

# SESSIONS

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"risk-driven strategy." In the first option, the management may encourage its project team to have a highly intense level of communication, and use rich communication media with the firm's partner team so as to reap maximum benefits of inter-organizational learning. In the second option, due to transaction-cost-economizing considerations and the fear of partners' opportunistic behavior, the management may encourage its project team toward low intensity level of communications, and a lower degree of media-richness. Under each option, we identify: the amount and type (tacit vs. simple) of inter-organizational learning required and the risks of partner's possible opportunistic behavior and cost of communication with this partner. We examine the strategic option that would be selected under several conditions and propose the optimum option, based on the trade-offs between the benefits and risk. These conditions are: i) type of innovation (radical/incremental), ii) competitor/non-competitor partners (high/low partners' market overlapping), iii) NPD mode of work (separate vs. integrated) and iv) partners with similarity/complementary technical skills.

## **HB-02.4 [A] Generic Customer Self-service Options for Developing Country Markets**

*Ganesh N Prabhu; Indian Institute of Management Bangalore, India*

Customer self-service options reduce delivered cost of products and enable customers to customize their product during final assembly. Cost reduction by self-service is clearly higher in developed countries given lower labor availability and higher labor cost, and their customers are often more adept in the use of self-service. In contrast, developing country customers use cheap local labor, are less adept in the use of self-service, and are unlikely to favor self-service options unless they are significantly cheaper. Lower literacy and inability to follow written instructions can make usual self-service options unviable in many developing countries. However, the cost savings in moving final assembly to customers can be significant even in developing countries as compact packing can significantly reduce packaging costs, transit damage and transport costs. We identify a set of generic self-service options for developing countries that can leverage such cost reductions and low cost local labor to enable greater market penetration through lower prices. We draw insights from several industries in India that have created viable product-service combinations that leverage cheap local labor to create "last mile" customization. These self-service options have high potential as developing country markets are highly price sensitive and yet require robust and customized products.

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## **HB-03 Intellectual Property-9**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Ootori 3**

**Chair(s) Mary Mathew; Indian Institute of Science**

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## **HB-03.1 [R] Evaluation Method for Nature of Basic Invention by Patent Analysis**

*Takashi Miyazawa; Toyo Gosei, Co. Ltd., Japan*

*Hiroshi Osada; Tokyo Institute of Technology, Japan*

The acquisition of so-called basic inventions which can cover a broader scope is one of most important purposes in research and development of companies and research institutions. However, there have been few quantitative studies on the nature of basic invention. The authors have explored an evaluation method for the nature of basic invention. The authors found that claimed inventions can be categorized into two types according to the description of specification regardless of technical fields. One is the invention which has a patent claim based on quantitative and factual description of embodiment of specification, while the other is the invention which has a patent claim based on qualitative description of embodiment. The former is referred to as "quantitative embodiment type" while the latter is referred to as "qualitative embodiment type." The two types are closely related to a number of limitation terms (L) included in the patent claim, which functions as terms providing limitation to the scope of the patent claim, and number of specifying words (S) included in the patent claim, each of which specifies a term that has already appeared in the patent claim. Compared to qualitative embodiment type, quantitative embodiment type has patent claim

including extremely fewer L and S. This indicates that quantitative embodiment type has a broader scope than qualitative embodiment type.

## **HB-03.2 [R] The Relationships Between the Patent Deployment Strategy and Patent Value**

*Ke-Chiun Chang; Wuhan University, China*

*Juan Hao; Wuhan University, China*

*Chihchang Chen; Taiwan Shoufu University, Taiwan*

*Chien-Chung Yuan; National Yunlin University of Science & Technology, Taiwan*

In addition to a patent's basic characteristics such as claims and citations, patent value is embodied in the company strategy as well. We apply two variables to measure company strategy: patent family depth and earn plan ratio. Patent family depth presents the degree to which certain fields and markets are valued by its company. Earn plan ratio indicates the degree that a patent family could be cited by later innovators and contenders. This study applies a logistic regression model to analyze a sample of LED industry. The results demonstrate that patent value has a positive relationship with patent number of patent claims, number of backward citations, patent family depth, and earn plan ratio.

## **HB-03.3 [R] The Determinants of Valuable Patents**

*Ke-Chiun Chang; Wuhan University, China*

*Juan Hao; Wuhan University, China*

*Chihchang Chen; Taiwan Shoufu University, Taiwan*

*Chien-Chung Yuan; National Yunlin University of Science & Technology, Taiwan*

Patent litigation has become an important strategic instrument through which firms exercise their patent rights, reflecting competition and conflicts between R&D contenders. A patent more likely to be litigated can be considered as a more valuable patent. Therefore, the objective of this paper is to investigate the patents that non-practicing entities would be interested in, the characteristics of patents that they would consider valuable, and the difference between patents under litigation or not.

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## **HB-04 Technology Adoption-3**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Zuun 1**

**Chair(s) Joe Amadi-Echendu, University of Pretoria, South Africa**

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## **HB-04.1 [R] User Perception of Computerised Maintenance Information System Implementations**

*Joe Amadi-Echendu; University of Pretoria, South Africa*

*Frederick de Wit; University of Pretoria, South Africa*

Computerized information systems are increasingly being used to capture, record, store and retrieve data to manage the maintenance of equipment and physical infrastructure. The justification for the costs incurred in implementing computerized information systems subsumes that acceptance of the associated technology by the users will provide the desired future benefits to the business organization. The study applied the premise that perception influences acceptance to assess the implementation of computerized maintenance management software systems in a number of user organizations. Respondents to the study indicated that ease of use, usefulness and system characteristics were strongly dependent on the level of training of the user during the implementation of the computerized maintenance management software system, thus reiterating that user training influences perception which, in turn, influences user acceptance of technology.

## **HB-04.2 [A] Applying DNA Chip Technology to Distribution of Agricultural Products**

*Yuichi Washida; Hitotsubashi University, Japan*

*Nobuhiro Gemma; Toshiba Corp., Japan*

*Hiroaki Goto; Toshiba Corp., Japan*

*Masayoshi Takahashi; Toshiba Corp., Japan*



# SESSIONS

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Ryuji Nakajima; Toshiba Corp., Japan  
Hideyuki Mannen; Kobe University, Japan

Toshiba invented an electrical current detection type of DNA (deoxyribonucleic acid) chip technology, and holds the basic patent. However, penetration has not been quick. The reason lies in the difficulties found in the business model for medical DNA testing of the human body. Difficulties concerning a social consensus on genetic testing, finding applications, and pharmaceutical approval are major cost factors. So the Ministry of Agriculture, Forestry and Fisheries, Toshiba, and several researchers plan to apply this technology to value-added branding for agricultural product exports to create more business opportunities. Another aim is to improve agricultural productivity by preventing highly infectious diseases. A questionnaire survey of agricultural producers was completed, and more than 70 percent of respondents supported application of this technology to agriculture. However, where should this technology be introduced in the very long supply chain of the agricultural export market? According to our findings, we should try to introduce this technology into wholesaler sectors of local governments in Japan, as well as quarantine authorities at export destinations. This finding offers significant suggestions for thinking about where the technology should be inserted in the supply chain in order to promote market penetration.

## **HB-04.3 [R] Convergence or Divergence?: A Comparison of Acceptance and Use of Technology for Smart Phones and Tablets**

Chih-Hung Hsieh; Yuan-Ze University, Taiwan  
Chong-Guang Wu; Yuan Ze University, Taiwan  
Che-Pei Hsu; Yuan Ze University, Taiwan

The market position of smart phones is similar to that of tablets, since many similar new products co-exist in the market, i.e., the "phablet." Therefore, we applied the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model to explore the differences and similarities between smart phones and tablets. Six hundred and seventy questionnaires, including 365 for smart phones and 305 for tablets, were collected. The result shows that these two devices differ in some aspects. For smart phone users, the factors Facilitating Conditions, Price Value, Hedonic Motivation, and Habit affected Behavioral Intention and Use Behavior. For tablet users, the factors Performance Expectation, Hedonic Motivation, and Habit affected Behavioral Intention and Use Behavior. The no significant effects were seen for any moderating variables (i.e., age, gender, experience). Finally, we concluded that mobile device users choose a device on the basis of different needs. People who use smart phones need more software resources and capabilities and tend to compare prices before purchasing a smart phone. However, tablet users tend to consider how the device can help them improve work efficiency or the quality of their daily life. The results can serve as a reference for manufacturers of these devices to improve their products and services.

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## **HB-05 Project/Program Management-3**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Zuiun 2**

**Chair(s) Dongdong Jiang; University of Pretoria**

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### **HB-05.1 [A] Case Study on Project Management at a Mineral Sand Organization**

Ntokozi Nhlengethwa; University of Pretoria, South Africa  
Elma Van der Lingen; University of Pretoria, South Africa

A study on project management maturity has been conducted in the mining sector, specifically a mineral sand organization, in order to compare this company's project management maturity with other industries in South Africa. The study further identifies gaps in the company's project maturity and makes recommendations to address these. The 5-level project management maturity model has been applied, and an average measurement of 2.92 out of 5.0 was obtained. On the project management maturity scale, this is close to level 3 or the Defined stage. The results obtained for this company compared very well with previous project management maturity results for South African industries, although not in the same sector. Due to the nature of the mining industry, the Risk knowledge area scored

remarkably higher for this company than what was found for other South African industries. Various suggestions are provided to overcome the identified gaps and enhance the project management maturity of the company in this case study.

### **HB-05.2 [R] Personal Relationship (Guanxi) Behavior Effect on International Project Management: An Empirical and Comparative Study between South African and Chinese Project Managers**

Dongdong Jiang; University of Pretoria, South Africa  
Leon Pretorius; University of Pretoria, South Africa

With increasing globalization, more and more project managers will be involved in managing projects in foreign environments. Knowing the behavioral differences of foreign cultures is a requirement in international project management. Personal relationship (Guanxi) is an important cultural issue for achieving project success in the Chinese community because it is critical for getting favors through these relationships and thus businesses can be conducted successfully. In this study Guanxi of Chinese project managers is assessed in a cultural context and is examined in five project activities (i.e., project communication, negotiation, conflict resolution, contract process and team building). Although the questionnaire is designed based on Chinese culture, South African project managers have also been asked to participate in order to illustrate the differences where applicable. The results showed significant differences as well as similarities between the Chinese and South African project managers in various behaviors related to Guanxi in these five project activities.

### **HB-05.3 [A] Infrastructure for Knowledge of Development in a Japanese ICT Company**

Tomonori Yamashita; Japan Advanced Institute of Science and Technology, Japan  
Kunio Shirahada; Japan Advanced Institute of Science and Technology, Japan  
Michitaka Kosaka; Japan Advanced Institute Science and Technology, Japan

Further functions and enhanced performance requirements made to various information and communication technology (ICT) equipment have improved technical standards and the scale of development in design. Computer aided design (CAD) systems that support those developments are becoming increasingly more complicated and extensive than they were several years ago. CAD system engineers have to learn not only software, but also hardware design knowledge to make CAD systems. Engineers try to share and utilize knowledge on technologies that they obtain from designers who are participating in development. However, it is hard to share and utilize information due to the increasing fluidity of engineers who are involved in development due to diversified technologies and short-term development. The authors researched the sharing and utilization of development knowledge at an ICT development company that they worked at, and report the current situations that were found from interviews with engineers, and show the consideration of the future knowledge management infrastructure.

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## **HB-06 Science and Technology Communication-2**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Chidori**

**Chair(s) Fujun Ren; China Research Institute for Science Popularization**

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### **HB-06.1 [R] Relationships between Government and Media in S&T Crisis Communication: A Study Based on Cases of S&T Crisis in China**

Jie Ren; China Research Institute for Science Popularization, China  
Hongbin Gao; China Research Institute for Science Popularization, China  
Qiutan Shen; Bank of Guizhong, China

Since the beginning of the Industrial Revolution, science and technology have been making a profound impact on every aspect of human society. While scientific and technological progress has provided various modern conveniences, it has also brought negative effects on human life. People have become increasingly aware of the role science and technology play in environmental pollution, ecological damage and weakened social morality, and their questioning of science and technology per se has led to what is termed the crisis in science

# SESSIONS

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and technology. The government, media and public are three basic elements for S&T crisis communication. They interact and game with each other and yet are so close to each other as to form a whole system. In S&T crisis communication, therefore, information transfer between the government and public is equally as important as communication between the government and media. The government is the source of information. In resolving crisis, it should use the platform and communication channel offered by the media to provide the public with adequate scientific information in a timely manner, as this is crucial to reassuring the public, mobilizing its strength, building popular trust in the government, and raising the credibility of the media. This paper defines S&T crisis as well as its causes and categories, analyzes the interaction among the government, media and public, and addresses the following issues: the separate functions and the interrelationship of the government, public and media in S&T crisis communication; their interactive behaviors as reflected by media coverage; and how to help create a positive pattern of S&T crisis communication involving the government, public and media.

## **HB-06.2 [R] A Case Study of Mobile Popularization of Science and Technology Infrastructures in China**

*Ren Fujun; China Research Institute for Science Popularization, China*  
*Chen Keke; China Research Institute for Science Popularization, China*

The primary purpose of this paper is to summarize the history and status of China mobile science and technology museums, as well as the trend being predicted. The method used in this paper is documentation, theoretical analysis, investigation research and case study. It is analyzed that the mobile science and technology museums are characterized in social fund using and target audience service, and the regulations are concluded. It is also concerned with how the mobile popularization of science and technology infrastructures (including mobile science and technology museums and science wagons) promote the science popularization enterprise in China, and the social impacts are also mentioned. It is providing experiences for international counterparts.

## **HB-06.3 [R] Comparison Study on China-UK Scientists' Engagement in Public Outreach Activities**

*Fujun Ren; China Research Institute for Science Popularization, China*  
*Xuan Liu; China Research Institute for Science Popularization, China*  
*Xiaojiang Wang; Institute of Policy and Management, CAS, China*  
*Lin Yin; China Research Institute for Science Popularization, China*

Nowadays, scientists are supposed to have the obligation to inform the public about what they are doing and what effect their research has on society, and compared with other professionals, scientists have incomparable advantages in public science communication activities. In China, scientists' engagement in public outreach activities has attracted more and more attention of both government and science communities in recent years. But Chinese scientists' engagement in outreach activities has remained at a lower participation rate compared with western countries. In the meantime, UK universities and research institutes have abundant experience in promoting and supporting their scientists to get involved in public outreach activities. This paper conducted a comparative study between UK and China scientists' outreach activities. Two typical groups of researchers were selected from each country. The analysis covered four dimensions in scientists' public outreach activities: the policy and regulation environment; the main forms and methods; the major content and range of audience; and the incentives and evaluation of their efforts. From the comparison findings, the author intends to learn more about the status and local features of outreach activities in each country. At last, the paper will provide policy recommendations on how to promote more scientists to get involved in the public outreach activities, as well as how to improve the efficient and quality of outreach activities in China.

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## **HB-07 Environmental Issues-2**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Shirasagi 1**

**Chair(s) Carlos E Atoche-Kong; Universidad de Monterrey (UEM)**

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## **HB-07.1 [A] A Cost-Benefit Analysis of Investing in Safety and Risk Engineering: The Case of Oil & Gas Transportation Services by Pipelines**

*Alexander Guzman; Ritsumeikan Asia Pacific University, Japan*  
*Behrooz Asgari; Ritsumeikan Asia Pacific University, Japan*

Most decision frameworks regarding the implementation of activities to mitigate the risk of failure in pipelines are based on a screening process under a considerable degree of uncertainty, which is generally derived from a subjective judgment or lack of sufficient information. Since the screening process is designed mainly to prioritize the risk mitigation activities according to an acceptable level of risk, the risk index cannot be used to perform a cost benefit analysis. Therefore, the current challenge to pipeline operators concerning pipeline sustainability is implementing risk mitigation activities, such as environment protection initiatives or safety measures. This study attempts to introduce a framework to measure the benefits of the investment in safety measures for pipelines using fuzzy logic as a tool for dealing with uncertainty. Thus, this paper provides a way to determine the surplus between the value of mitigated risk and the costs of the activities associated with such mitigation, using the possibility theory from the fuzzy logic to determine the values of the risk. Therefore, it is possible to determine if the costs associated with these risk management activities are reasonable or not, dealing with a degree of uncertainty of the data. The proposed framework is considering variables such as threat and consequence scenarios, probability of adverse events, vulnerability, failure modes, percentages of risk reduction and mitigation costs.

## **HB-07.2 [A] The Initial Study of Industrial Competitiveness in Accordance with the Indicator of the Accreditation of Environmental Management: The Case of Shoes Industry**

*Sheng-Tsai Yu; Feng Chia University, Taiwan*  
*Pao Long Chang; Feng Chia University, Taiwan*  
*Ying-Chyi Chou; Tunghai University, Taiwan*

The International Organization for Standardization (ISO) published the standard of ISO 14001 environment management system in September of 1996. After the publication of ISO 14001, many environmental accreditation systems were developed. Many famous brands developed their environment system, for example, the system of restricted substance limit of Nike. This study focused on the supply chain of the shoe industry to research how the environmental management systems were maintained and what were their approaches to save energy, reduce the production cost and pass the environment accreditation. In this study, we interviewed one shoe factory, five leather tanneries, and also finished a survey of 15 leather tanneries, and as the result, they all passed the ISO 14001 or the Leather World Group accreditation which are required by many worldwide athlete brands. This study found that the environmental accreditation became a basic element to become more competitive; however, it is not the guarantee for new orders. However, in the process to have the environment system, the leather tannery fulfilled the management system to achieve the synergy of quality, reduction of the material loss and power energy, and water resource saving. In this fashion, they not only enhanced the satisfaction of customer but also reduced the cost of production and strengthened their competitiveness.

## **HB-07.3 [R] Measuring and Explaining Government Performance for Developing Solar Electricity Market**

*Chien-Huei Wu; Academia Sinica, Taiwan*  
*Feng-Shang Wu; National Chengchi University, Taiwan*  
*Wei-Ying Chen; National Cheng Chi University, Taiwan*

This paper evaluates the productivity of countries worldwide for developing a solar electricity market by addressing the following questions: (1) To what extent should governments further decrease their support while maintaining the electricity utilization at the current level? (2) To what extent should governments increase the production of solar electricity generation and decrease the emission of CO<sub>2</sub> air simultaneously? To comprehensively address both questions to improve energy utilization efficiencies, those of countries are evaluated by using Non-Separable DEA model (DEA measure with non-separable desirable

# SESSIONS

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and undesirable outputs for evaluating efficiency). This case study of 25 solar-development countries with the panel data covering the period of 2009 - 2012 reveals that pure technical efficiency of developing countries is slightly more efficient, on average, than that of developed countries. However, the total efficiency of developed countries does appear to be significantly more efficient than that of developing countries. Besides, the results of this paper point out that inefficient countries could reduce their total expenditure and investment, days for getting electricity, total electricity generation and CO2 emission in a given output and/or increase their proportion of solar electricity based on a constant input respectively to become efficient countries among their peer groups.

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## **HB-08 TUTORIAL: Daikin Industries - Next Generation's Innovation Management**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Shirasagi 2**

**Speaker(s) Katsuni Kawahara; Daikin Industries**

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In Daikin Industries, various approaches for generating innovations have been initiated within the company's innovative and comprehensive management. Today, as a part of its innovation management initiatives, the overview and objectives of the Technology and Innovation Center (TIC) – a newly established technological development base scheduled to be opened in fall 2015 – will be introduced along with the TIC's innovation management endeavor.

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## **HB-09 Information Management-1**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Hibari 1**

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

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### **HB-09.1 [R] The Impacts of Safety Climate and Computer Self-Efficacy on Near-Miss Incident Reporting Intentions**

*Wen-Jywan G Su; Far East University, Taiwan*

Near-misses management has drawn the attention of safety specialists to reduce the likelihood of future catastrophes and improve employee safety and process reliability. Though near miss reporting systems could be implemented successfully from a technical perspective, success may depend on employees being willing to use the delivered system. This paper examined the impact of safety climate on near miss reporting intention. We defined a model of near miss reporting system usage intention by incorporating safety climate with behavioral intention theory, including theory of reasoned action (TRA) and extended technology acceptance model (TAM2). In our analysis, we found out that the behavioral intention to use a near miss incident reporting system was affected indirectly by safety climate and self-efficacy. And computer self-efficacy had less impact on intention than safety climate. Also, the behavioral intention was directly influenced by subjective norm, perceived usefulness and perceived ease-of-use. Subjective norm exerted almost the same impact on intentions as perceived usefulness did. Managerial implications are then discussed.

### **HB-09.2 [R] Building Information Modelling as an Information Management Tool: A South African Perspective for Contractors Who Take on Design Responsibility**

*Ursula O Eicker; University of Pretoria, South Africa*

*Richard Weeks; University of Pretoria, South Africa*

Measures need to be in place during the construction phase to insure that the final project design adheres to the contract specifications and that the project progress is in line with the contract document and that the resources are managed accordingly. This is where information technology would benefit the project management aspect of construction and provide information integration throughout all facets of construction. Building information modelling is an information technological process that aims to streamline the control of a construction project throughout all the different stages of the project life span. The preliminary investigations suggests that there may be shortcomings on how projects are managed

in terms of information, especially with regards to time (scheduling data) and cost, from the initial estimating and budget data. Based on the findings of the investigation, it is explored how implementation of Building Information Modeling, as part of Information Management, can provide more efficient project control within the South African construction industry.

### **HB-09.3 [A] Building Communications System: Takenaka's M2M Platform for Building Management & Application Interface**

*Yasutomo Matsuoka; Takenaka Corporation, Japan*

In this presentation, we introduce Takenaka Corporation's Machine to Machine (M2M) communications platform for building management with its system architecture and some implementation case studies, including energy data visualization, demand response, and utilization of building information modeling (BIM) data at building operation. While conventional buildings have been practicing various energy savings and building management measures by each building individually, the recent innovation of information and communication technologies (ICT) proposes valuable solutions by enabling interconnection between building systems and miscellaneous devices, such as end-use appliances, mobile phones, automotive, and power grid. To enhance the synergy of state-of-the-art ICT and building engineering, Takenaka Corporation has developed an open-source, multi-connection, extensible information and control platform called "Building Communications System." Takenaka Corporation is one of the largest planner, architect, engineer and contractor firms in Japan, with yearly sales of \$9 billion, 20 overseas offices, and the largest construction R&D laboratory in the world. One of the fields of research is building environment and energy management, including building control systems and strategies, net-zero energy buildings, and smart community.

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## **HB-10 Technology Management in the Health Sector-2**

**Thursday, 7/31/2014, 10:30 - 12:00**

**Room: Hibari 2**

**Chair(s) David Kruger; UNISA**

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### **HB-10.1 [R] Development of a Hierarchical Decision Model (HDM) for Health Technology Assessment (HTA) to Design and Implement a New Patient Care Database for Low Back Pain**

*Liliya Hogaboam; Portland State University, United States*

*Brian Ragel; Oregon Health & Science University (OHSU), Portland, Oregon*

*Tugrul Daim; Portland State University, United States*

Decision-making in healthcare towards the use, implementation and design of assistive information technologies like a patient care database is looked at from multiple perspectives. We propose utilization of hierarchical decision model (DHM) for new patient care database design for low back pain at Oregon Health and Science University (OHSU), Portland, Oregon. An extensive literature review provides justification for the criteria used. The model could be used for other patient care software assessment in healthcare. The strategies (2nd layer of the model) could be revised to further fit the needs of a particular department. The next stage of the current research is model implementation, expert quantification gathering and analysis at OHSU.

### **HB-10.2 [R] Exploring the Current and Future Role of ICTs in HIV/AIDS Intervention Programs in South Africa**

*Babasile D Osunyomi; University of Pretoria, South Africa*

*Sara S Grobbelaar; University of Pretoria, South Africa*

At 10.0% of the population in 2013, South Africa has the highest percentage of people living with the HIV/AIDS virus in the world, with the total number of people living with the HIV/AIDS virus in South Africa estimated at 5.63 million. Although the mortality rate of the epidemic is on a steady decline, the HIV/AIDS epidemic has adverse impacts on the socio-economic development status and human capital of South Africa. The key aim of this article is to gain a thorough understanding of the potential benefits of employing information and communication technologies (ICTs) in HIV/AIDS intervention programs. We review the status

# SESSIONS

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quo of the implementation of such technologies for selected interventions in the service delivery and care HIV/AIDS value chain and provide suggestions made by ICT specialists on how activities along the HIV value chain can be strengthened through ICTs. Quantitative and qualitative data was gathered to conduct this study. A survey was completed by managers of 20 HIV/AIDS intervention programs followed up by semi-structured in-depth interviews with these respondents. A further 5 in-depth interviews were conducted with experts in the ICT area for exploring how ICTs can be used to strengthen activities along the HIV/AIDS value chain. Through the research we discovered that the level of ICT implementation in HIV/AIDS programs is still nascent due to the existence of some infrastructural barriers, inadequate access to funding, inadequate ICT implementation policies, governance and structures, and a low level of maturity of the country's eHealth system.

## **HB-10.3 [A] Preparing to Use Informatics Medicine, and Trends in the Age of Meaningful Use**

*Shu-Hui Hung; National Center for High-performance Computing, Taiwan*  
*Chin-Hsien Wang; National Center for High-performance Computing, Taiwan*  
*Hsin-Hung Lin; National Center for High-performance Computing, Taiwan*

Mistaken or wasted medicine has been a problem to the Taiwanese government, not only the worsened condition of patients' health by mistaken medicine but also the wasted or thrown away medicine that may lead to costly medicine expense and environmental pollutions as well. According to Taiwan government records, more than 130 tons of medicine was abandoned in the year 2011. The most obvious reasons for people abandoning medicine are self-adjusting or self-stopping medicine by themselves; sharing medicine with friends; and forgetting or mistiming of taken medicine. In the experiment, we intended to provide a web-based portal to assist patients for searching the medicine side effects information via our dataset of medicine definition or compounds, usage notice, side effects and so on. The dataset contained and integrated from medicine manufactures prescriptions and pictures and two medical centers, which, based on the Taiwan government's provided medicine database, and in addition, the resulting information from web surfing in the text mapping search engine will also be considered as well. The dataset itself needs to be leveraged and structured as the promise of meaningful use. We consider linking the chronic disease management such as kidney disease and asthma for medicine suggestions between patients and health providers.

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## **HD-01 Innovation Management-9**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Ootori 1**

**Chair(s) Marcelo A Machado; Kwantlen Polytechnic University**

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### **HD-01.1 [R] Innovation as a Solution to an Airline's Operations Crisis**

*Thiago H Imai; University of Sao Paulo, Brazil*  
*Alceu S Camargo Jr.; University of Sao Paulo, Brazil*  
*Paulo T Nascimento; University of Sao Paulo, Brazil*

In this paper, we distinguish "crisis management" from "disaster management". We employ "disaster management" when human lives are lost. "Crisis management" refers to the solution of an operations crisis without lost lives. Our empirical illustration will be a 2010 Brazilian Airline operational crisis, which had its origin in the crew schedule planning, analyzed through the extended case method. We have found that a very proactive "disaster management" does not imply even a mild reactive "crisis management". We have also found that the solution of a crisis may lead to many good ideas and operational progress. To avoid new operational crisis, the company adopted process improvements and created a dedicated permanent group, a new administrative structure.

### **HD-01.2 [R] A Study of Creativity in Technology and Engineering**

*Andre J Buys; University of Pretoria, South Africa*  
*Herman L Mulder; University of Pretoria, South Africa*

Innovation is the creation of new products, processes and services, and their acceptance in

the market. Creativity is central to the innovation process. Creativity has been the subject of intense multi-disciplinary research and a huge volume of academic literature exists on the subject. It has been studied from many perspectives, such as psychology, psychometrics, cognitive science, aesthetics, design research, and management. This study focuses on creativity in technology and engineering and the management thereof. In this paper a conceptual framework of creativity is proposed that attempts to unify and synergize much of what is known about creativity. Three case studies of recognized creative engineers were conducted to investigate their creative behaviors. The findings were used to test the theory of creativity and specifically the validity and utility of the proposed conceptual framework in an engineering environment. It was found that the most important dimensions of creativity in an engineering environment, particularly during product design and development, are technical challenges, a conducive environment for creativity, and personnel that is studious and has high self-efficacy and that are able to think both laterally (right-brain) and analytically (left-brain). This research has value for the management of creativity in technology and engineering. The framework as presented here can be a useful tool to structure and manage creativity in a technology-based organization.

## **HD-01.3 [A] Insignia's Technological Innovation Ecosystem for Implementing the Strategy of Green Smart City**

*Kun Wang; Zhejiang University, China*  
*Jin Chen; Tsinghua University, China*  
*Zongxi Zheng; Zhejiang University, China*

In 2004, in the report of "Innovative America" by the Council on Competitiveness, an innovation ecosystem was first proposed, which has provided a new way for companies to compete in such a competitive society. Then, several literatures have focused on this area, and Chinese scholars have especially done some research about the enterprise technological innovation ecosystem. Insignia, as one of the excellent IT service providers in China, has constructed a successful technological innovation ecosystem in implementing its strategy of "Green smart city." In this article, we will first make a literature review about the enterprise innovation system focusing on the structure and operation mechanism. Then, we will provide a case analysis which comprehensively describes how Insignia builds its own enterprise technological innovation ecosystem and how the system works. We will also introduce a kind of international innovation institute, which works like a regional technological innovation ecosystem as the support of Insignia's strategy.

## **HD-01.4 [R] Conception of the Inductive Reverse Innovation by Developed-Country Multinational Enterprises**

*Nanami Furue; Hitotsubashi University, Japan*  
*Yuichi Washida; Hitotsubashi University, Japan*

In recent years, international enterprises in developed countries have tended to develop goods on the spot for emerging markets in emerging countries. This has been done in an effort to find cheaper manufacturing routes. However, a recent study on reverse innovation has shown a completely new type of dramatic innovation produced in developing countries "reversed" to advanced developed markets. The goal of this study is to show the availability and utility of the reverse innovation framework, when employed by developed-country multinational enterprises (DMNEs). First, we explain the theoretical structure of reverse innovation, using previous innovation studies as well as some similar concepts, and hypothesize why and how specific innovations generated in developing countries reverse to developed markets. Second, we propose a two-type classification system to explain multiple cases of reverse innovations, Inductive Reverse Innovation (IRI) and Coincidental Reverse Innovation (CRI), and discuss the characteristics of goods likely to achieve reverse innovation. In order to examine these hypotheses, we interviewed a variety of global Japanese companies, which play an active role in emerging markets. Finally, we also discuss challenges in achieving IRI by developed country enterprises.

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## **HD-02 Strategic Management of Technology-3**

**Thursday, 7/31/2014, 14:00 - 15:30**



# SESSIONS

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**Room: Ootori 2**

**Chair(s) Awie C Leonard; University of Pretoria**

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**HD-02.1 [A] Light-Weighting Innovation Strategy: A Roadmap-Portfolio Toolkit**

*Clare Farrukh; University of Cambridge, United Kingdom*

*Clive Kerr; University of Cambridge, Great Britain and Northern Ireland*

*Robert Phaal; University of Cambridge, United Kingdom*

*Nikoletta Athanassopoulou; University of Cambridge, Great Britain and Northern Ireland*

*Michele Routley; University of Cambridge, Great Britain and Northern Ireland*

The field of strategic technology management contains a number of practical tools to help align technology investment with business objectives and so support successful innovation. However the application of such tools is often seen by organizations as being difficult to configure, combine, and also resource consuming to deploy. Thus, the research question is: can a light-weighted intuitive approach deliver valuable results in a short time and thus provide companies with a tested process that they would be more willing to apply? The aim of this research was to develop and test an efficient roadmap-portfolio toolkit approach for supporting the development and implementation of innovation strategy by selecting and exploring opportunities. Drawing on literature and practice, the workshop process was developed around structured templates and run in eight organizations (four small companies and four units of larger companies), with the approach refined using learning from each application. The roadmap-portfolio toolkit was robust and delivered valuable insights to the companies, many of whom plan to use or adapt it for themselves in further workshops. From a practical perspective, companies can obtain value from light-weighted interactions if framed correctly; however, a single workshop does not create a whole innovation strategy. It has been demonstrated that efficient, pre-configured toolkits are highly useful and functional when packaged as a template-based workshop process to support, not replace, wider strategic discussions and decision-making.

**HD-02.2 [R] The Effect of Firm's Routine on Product Evolution: The Mobile Phone**

*Jungsub Yoon; Seoul National University, Korea, South*

*Euy-Young Jung; Korea Institute of S&T Evaluation and Planning, Korea, South*

*Jeong-Dong Lee; Seoul National University, Korea, South*

*Seong-Jin Kim; Korea Institute of S&T Evaluation and Planning, Korea, South*

*Myeonggyu Kim; Seoul National University, Korea, South*

This paper aims to identify how products evolve by the interaction between consumers' purchase decision-making and firm's routine. This paper applies the agent-based model to a simulation focused on a mobile phone industry with five firms. The attributes of firms' routines are classified as imitation, incremental innovation, radical innovation, and routine. Furthermore, consumers' purchase behavior is estimated by adopting a hedonic pricing model that reflects the shadow price of the products. The results show that there is more product diversification when firms have similar entry strategies but different new product development strategies. Market share of a firm tends to increase when it improves existing product characteristics rather than introducing new characteristics. Thus, firms that focus on imitation or incremental innovation dominate the industry.

**HD-02.3 [R] Understanding the System Dynamics of the University-Industry Technology Transfer Process and the Potential for Adverse Policy Creep**

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

*Bernd Wurth; University of Texas at San Antonio, United States*

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

Numerous investigators have explored the growth and value of the technology transfer process from universities to industry. Regional and national organizations have extolled the virtues of technology transfer, and the growth in technology entrepreneurship has been touted as a major contributor to regional economic development. The characteristics and

structure of technology transfer organizations and processes have been discussed in literature, but from a policy perspective the effects of technology transfer policy decisions have not been modeled for their impact. This paper provides a systems dynamics approach to modeling the technology transfer process, tuned using data from the Association of University Technology Managers (AUTM) annual report. The systems dynamics model shows that a pure internal focus of a technology transfer office policy on short term licensing revenue maximization via tough licensing terms will result in a suboptimal revenue position for the university, and that a relaxation of these terms actually leads to a more optimal returns position for the university. This has broad impacts on the technology transfer process and suggests further modeling scenarios that may introduce secondary dynamics.

**HD-2.4 [R] Understanding Servitization: A Resilience Perspective**

*Ditshegofatso D Milanzi; University of Pretoria/ BHP Billiton, South Africa*

*Richard R Weeks; University of Pretoria, South Africa*

The economic environment is consistently challenging the ability of organizations to see the future boldly. In addition, customer value has moved from a products specific requirement to a bundle of solutions inclusive of the product and the services associated therewith. Manufacturing companies not only need to adapt to the client pull effect but also require a sense of positive adaptation in the face of dynamic or significant change. The primary objective of this research study was to gain an understanding of the concept "servitization" from a resilience incorporation perspective. An additional aim of the research study was to gain an appreciation of the impact of resilience on a servitized organization or the implementation of a servitization process. The research study suggests that T-shaped skills profile and relationship management are critical aspects of consideration in fostering the ability for servitized organizations to adapt to adversity.

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**HD-03 Entrepreneurship / Intrapreneurship-3**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Ootori 3**

**Chair(s) Kamijo, Yukiko; Kanazawa Institute of Technology**

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**HD-03.1 [A] Research on Intellectual Property Management for 'Technology Branding'**

*Yukiko Kamijo; Kanazawa Institute of Technology, Japan*

*Kazunari Sugimitsu; Kanazawa Institute of Technology, Japan*

In this study, we investigated some cases of how to brand the technology held by manufacturers and how to maximize the value of their products and services. We also investigated the intellectual property management for "technology branding." In particular, the method of technology branding utilizing intellectual property law by global companies will be described.

**HD-03.2 [R] Future Issues of the Intellectual Property System in Japan in Consideration of a Decade of Pro-Patent Policy**

*Hiroshi Kato; Nihon University, Japan*

In Japan, the Intellectual Property Basic Act entered into force in March 2003. Over the last decade, a pro-patent policy has begun to be rapidly promoted in accordance with the principles of the Basic Act with the objective of creating an intellectual property-based nation. In particular, reforms of the legal system such as the Patent Act have been promoted, while regulations have been enhanced and strengthened with respect to the creation, protection, and utilization of intellectual property. Many issues remain, however, and it will be necessary in the future to promote legal system reforms in order to strengthen competitiveness and achieve international harmonization. Japan has been advancing several intellectual property policies as pro-patent policies for the past ten years as above. However, in other countries, there are some trends against pro-patent policies. In this paper, two cases (India and U.S.A.) are focused on as trends against pro-patent policies, and discussed as a comparative study. In the future, Japan should internationally advance pro-patent policies in consideration of those trends against pro-patent policies.

# SESSIONS

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## **HD-03.3 [A] Patent Map for Emerging Technologies: A Case of Solar Cells Technology**

*Xin Li; Tsinghua University, China*

*Yuan Zhou; Tsinghua University, China*

*Lan Xue; Tsinghua University, China*

*Lucheng Huang; Beijing University of Technology, China*

In recent years, emerging technologies have been attracting increasing attention worldwide, due to the emergence of these emerging technologies may have a profound influence on the global industrial and economic structure. How to identify and grasp the opportunity to develop emerging technologies is an important issue for companies, enterprises, and governments. This paper, therefore, proposes a framework that integrates patent map with experts' intelligence, attempts to identify emerging technologies, map the development of the emerging technologies, and find China's status in the emerging technologies domain. The solar cells technology is selected as a case study. This paper will contribute to the emerging technology studies, and will be of interest to solar cells researchers, business managers, and policy makers.

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## **HD-04 Technology Management in the Service Sector-5**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Zuiun 1**

**Chair(s) Pule A Kholopane; University of Johannesburg**

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### **HD-04.1 [R] Servitization: An Integrated Strategic and Operational Systems Framework**

*Richard V Weeks; University of Pretoria, South Africa*

*Siebert Benade; University of Pretoria, South Africa*

The global marketplace is increasingly characterized as being both turbulent and extremely competitive in nature. It is within this context that the servitization strategy assumes relevance in positioning traditional manufacturing institutions to gain a strategic advantage and enhance their revenue streams. Based on a multi-disciplinary literature review, a strategic and operational systems framework was developed and used as a source of reference in analyzing a servitization strategy implemented at a South African manufacturing institution. The framework in effect served as a means to gain an understanding of the integration and interaction relationship that exists between the various systems concerned. An important finding emanating from the research study was that the institution's business model itself needed to be significantly adapted in order to implement the servitization strategy. This in turn engendered the need for an integrated systems perspective of the change management process adopted. In summary, the research findings and the systems framework developed form the focus of this paper, and it is suggested that it could serve as a source of information and reference for management practitioners, engineers, and technologists involved in managing similar servitization strategies.

### **HD-04.2 [R] Consideration of Model of Service Value Structure for Internet Information Providing Services: Proposed Multi-value Structure Layered Business Model for Services**

*Akira Kondo; Japan Advanced Institute of Science and Technology, Japan*

*Michitaka Kosaka; Japan Advanced Institute of Science and Technology, Japan*

*Naoko Kondo; DHI Co., Ltd., Japan*

Service businesses have recently been expanding, and economic activities have focused on service value exchanges. The Internet has recently become a crucial infrastructure in our lives, and the number of Internet information service companies has increased. They are recognized as being a new industry. Business relations are not simple value exchanges between clients and providers in this area of business, and they mutually co-create value by utilizing one another's information. This information exchange process is stored as data and is subject to feedback from third party users. This business activity is not only described by using a simple model of a one-to-one money economy but it is also necessary to consider such factors as reputation and economic business models. As a result, service business

companies need to use new management methods that are not based on conventional indices to sustain their service businesses. We attempted to build a multi-value structure layered business model with variations on the time axis. The model was newly generated in information providing services on the Internet. Here, we propose an effective method of managing the new business model.

### **HD-04.3 [R] Lean Application in Student Finance Department within a Learning Institution Can Lead to High Academic Throughput: A Case Study**

*Pule A Kholopane; University of Johannesburg, South Africa*

*Candice Vandayar; University of Johannesburg, South Africa*

The knowledge of lean principles is just as applicable to offices and other work environments as it is to manufacturing plants. Lean is a theory that can help organizations to simplify and organize their working environment so that waste can be reduced, avoid high employee turnover, and proper equipment and workspace is used. Although services can be consumed and perceived, they cannot be measured easily and objectively, like manufacturing products. An objective measurement is a critical aspect of lean, which requires data-driven decisions to eliminate defects and reduce variation. Waste and the misuse of time could cost the company and the clients' money and time, and in an academic environment, this is known to be extremely valuable. The study focuses on the finance department supporting students in one of the leading South African institutions. There have been a number of incidents of wastage and non-professionalism identified in that department, which led to some students not getting their tuition and study material on time and some unable to register for the current year. The research attempts to highlight these problems and provides a solution as to how they can be resolved in order to assist the university to reach its expected throughput.

### **HD-04.4 [R] Heuristics of Frugal Service Innovations**

*Ganesh N Prabhu; Indian Institute of Management Bangalore, India*

*Shreya Gupta; Shri Ram College of Commerce, India*

Frugal innovations in products are vital in developing countries to reach price sensitive customers that seek robust products at low prices. Similarly, frugal service innovations can create larger markets among customers that cannot afford expensive conventional services. While frugal innovations in products are easily identified by expert examination, frugal innovations in services cannot be identified without comprehensive mapping of all service processes. We identify three broad innovation heuristics used to achieve frugality in services: (a) innovatively combining existing materials, processes and resources at hand through bricolage, (b) innovatively reducing wastage of time, materials and human resources and (c) innovating on creating self-service options for users. We use a diverse set of Indian cases of service frugality to identify and analyze the specific techniques used to achieve frugality within these three heuristics. We then synthesize a conceptual frame of innovation heuristics for frugal services. Our framework is of value to service firms attempting to achieve frugality without conceding service quality and reliability. It is also relevant to product firms that can add frugal services to reduce commoditization and enhance value of their products. Finally, the heuristics we identify in creating frugal services can be adapted to achieve frugality in physical products.

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## **HD-05 Project/Program Management-4**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Zuiun 2**

**Chair(s) Leon Pretorius; University of Pretoria**

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### **HD-05.1 [R] Can We Manage Agile in Traditional Project Environments?**

*Hans J Thamhain; Bentley University, United States*

Agile has gained much attention and controversy as a contemporary project management approach. While many management practitioners and researchers report great benefits and advantages over traditional execution methods, others experienced disappointments or outright failures with this contemporary process, which differs from established principles and

# SESSIONS

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standards of conventional project management. This paper reports the results of a three-year field study into the practices of Agile project management at 37 technology-intensive companies. It shows that the principles of this contemporary technique are applicable to most projects independent of their nature, size or IT-orientation, improving resource effectiveness, project execution time and overall project success. However, the study also shows that for large and highly complex projects, and for most situations outside of software and IT, the Agile methodology must be carefully modified to fit the organizational processes and cultures of the enterprise.

## **HD-05.3 [R] Differentiating the Role of Ex-ante and Ex-post Relational Governance Mechanisms in Regulating Client-Contractor Relationships**

*Seyed Yaser Banihashemi; The University of Sydney, Australia*  
*Li Liu; The University of Sydney, Australia*

Poor project governance is the main cause of project failures for complex projects. Historically, formal contracting has been the mainstay of project governance for outsourced projects. However, subsequent studies found that reliance on formal contracting typically results in adversarial relationship between clients and contractors in large construction projects, which exacerbates chances of project failure by thwarting exchange of information, hindering collaboration and increasing hostility between the parties. Moreover, due to high levels of uncertainty and complexity in practice, it is often impossible or excessively expensive to construct "complete" contracts upfront or the institutional structures needed to enforce the contract do not exist. Consequently, relational governance mechanisms have been proposed as an effective alternative in such situations. Subsequent literature has shifted to the effects of contractual and relational governance mechanisms on the performance of exchange relationships as well as the interactions between those mechanisms. In particular, the relationship between contractual and relational governance has been the focus of a substantial body of literature and the findings are contradictory. Whilst some studies find the relationship to be substitutive, others indicate it is complementary. In this study, drawing from transaction cost economics (TCE), social capital theory, and social exchange theory, we re-examine the relationship by distinguishing two forms of relational governance, namely ex-ante and ex-post relational governance, and argue that the relationship between these two forms and contractual governance are substitutive and complementary, respectively, thereby reconciling the contradictory findings on the relationship. Our conceptual model is validated using survey data collected from 40 client-contractor partnerships in large construction projects in Australia. Contributing to literature, the results show that ex-ante relational governance has both substitutive relationship as well as complementary relationship (mediated by ex-post relational governance) with formal contracting, while ex-post relational governance has a complementary relationship with formal contracting. In addition, the results indicate that formal contracting has a direct effect on project performance, while ex-post relational governance has a direct effect on relationship performance.

## **HD-05.4 [R] An Investigation of the Role of Project Culture in Team Efficacy and Success in Project-Based Work**

*Zvi H Aronson; Stevens Institute of Technology, United States*

We examined the effect of project team culture on the evolution of team efficacy in a sample of 118 project teams. Little is known about the factors responsible for the development of team efficacy - the collective belief of a project team that it can be effective. Results reveal that culture in project-based work is related to the project team's efficacy, and the project team's efficacy is related to success. Our findings provide project leaders with an alternative informal lever to enhance project success, by influencing team efficacy in project-based work.

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## **HD-06 Science and Technology Communication-3**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Chidori**

**Chair(s) Dan Wu, China Research Inst for Science Popularization**

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## **HD-06.1 [R] The Contrast of the Two Evaluation Systems of the Development of Popularization of Science and Technology Infrastructures**

*Keke Chen; China Research Institute for Sci. Popularization, China*  
*Zhaohui Li; China Research Institute for Sci. Popularization, China*

The primary purpose of this paper is to analyze how the evaluation system of the development of popularization of science and technology infrastructure was built in 2008 and why and how it was improved in 2012. The method used in our study is documentation, quantitative analysis, expert interview and summarization. The analysis strongly suggests that in today's China, it is quite necessary to build an evaluation system to measure the development of popularization of science and technology infrastructures, enabling the researchers to afford good advice to the government in policy-making in the science popularization field. It is concluded that the evaluation system has its academic value and works quite well. Furthermore, it would develop in accordance with the changing of the social environment.

## **HD-06.2 [A] To Delve into Establishment of Science Popularization Industry Statistical System**

*Weihong Ren; Research Institute for Science Popularization, China*  
*Guangbin Liu; Beijing Institute of Petrochemical Technology, China*

This paper analyzes the necessity of establishing a statistical indicator system of the Chinese science popularization industry on the basis of absorbing and drawing lessons from existing researching achievements of the science popularization industry; it preliminarily defines the industry classification of the science popularization industry based on national economic industry classification standard (GB/T754-2011); it puts forward a preliminary and tentative thought concerning establishing a statistical system of Chinese science popularization industry; and it comes up with constructive opinions and references for the establishment and improvement of a statistical system of Chinese science popularization industry.

## **HD-06.3 [R] To Make a Study of Science Popularization Modes Conducted by Chinese Academy of Sciences**

*Zhifang Wang; China Research Institute for Sci. Popularization, China*  
*Junping Li; China Research Institute for Sci. Popularization, China*  
*Ling Chen; China Research Institute for Sci. Popularization, China*

The thesis makes a systematic review of science popularization (SP) work conducted by the Chinese Academy of Sciences over the years, and simultaneously makes an in-depth analysis of its policies, operating system, contents, operating modes, media operation, and featured activities. The thesis delves into the issue concerning how science popularization is conducted, the problems needed to be resolved currently, and finally puts forward some good advice in terms of how to give full play to a better performance of SP work carried out by research institutes in China.

## **HD-06.4 [R] Study on the Effects of Internet for Science Communication in China**

*Dan Wu; China Research Inst for Science Popularization, China*

With the continuous development of Internet technology, not only the number of Internet users is increasing, the contents of dissemination are abundant, but also communication forms change rapidly, such as micro-blog, micro message and so on. For science communication, the Internet has become an effective scientific communication media and plays a great role in communication. But at the same time, the spread characteristics of the Internet itself also can produce some negative effects during the communication process. The main content of this paper is the analysis of the positive and negative effects of the Internet for science communication in China, and it explores the fundamental reasons that make the two side effects, so as to find the better ways of using the Internet for science communication. To be specific, this paper includes three parts: the first part is the analysis of the positive and negative effects of the Internet for science communication through the Shanghai World Expo, robbing salt storm, and so forth; the second part is through the analysis of the propagation characteristics of the Internet to explore the fundamental reasons that make

# SESSIONS

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the two side effects; the third part gives some proposals about how to make better use of the Internet for science communication.

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## **HD-07 Environmental Issues-3**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Shirasagi 1**

**Chair(s) Charles M Weber; Portland State University**

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### **HD-07.1 [R] The Determinants of Demand Intention for Energy Management Services**

*Phil Y Yang; National Taichung University of Education, Taiwan*

*Jian-Hang Wang; National Tsing Hua University, Taiwan*

*Yi-Chang Yang; Shih Chien University, Taiwan*

Enhancing the efficiency of energy usage and lowering energy costs have gained attention in the recent years. Prior research has neglected the transaction structure of energy management service. This study investigated the ex-ante and ex-post transaction costs with respect the contracting between energy service companies (ESCOs) and energy demanders. Combined with the internal control mechanisms and the external environments of ESCOs, this study conducted a large-scale survey of 835 energy demanders and a focus group as well. Four key determinants of energy management services were identified including asset specificity, task complexity, market competitiveness and institutional supports. These results showed that asset propriety and task complexity significantly increase the transaction costs and reduce the demand intention for energy management services. However, market competitiveness and institutional supports are negatively related to the transaction costs and increase demand intention for energy management services. This study further verified the importance of formal control mechanisms, which not only strengthen the industrial development, but also increase the demand intention of energy management services.

### **HD-07.2 [R] Profiting from Environmental Economic Regulations: The Mediating Role of Innovation Capabilities**

*Santos Saenz; EGADE Business School, Monterrey, Mexico*

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

Literature is concerned about whether environmental economic regulations hamper or incentivize firm performance, aside from their objectives of pollutant reductions. This paper adds to the discussion the inclusion of the effects of innovation capabilities on performance when a firm confronts environmental economic regulations, which impose limits to the products, processes or services, which are pollutant intensive. It is proposed here that in the presence of the innovative capabilities, the firm has the capacity to assimilate and respond to the environmental economic regulation, increasing its performance, and thus the notion of regulations boosting firm performance through such innovativeness dimension. On the other hand, in the absence of the innovative capability, the firm does not have the capacity to either assimilate or respond to the environmental economic regulation, being hampered by it, thus the notion of regulations decreasing firm performance. This study uses the Kyoto Protocol Clean Development Mechanism (CDM) projects as the strategic response of firms to changes in regulation, using the UNEP Risoe Centre's CDM projects database. 1,497 CDM projects were analyzed using econometric analysis, finding quantitative support to the effects of innovation capabilities on the performance of firms confronting environmental economic regulations.

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## **HD-08 Collaborations for Technology Management-5**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Shirasagi 2**

**Chair(s) Yuya Kajikawa; Tokyo Institute of Technology**

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### **HD-08.1 [R] Governance Structures in Clusters: A Case Study on Software Cluster in the State of Sao Paulo**

*Joao Paulo L Oliveira; Institute of Aeronautical Technology, Brazil*

*Jose Henrique S Damiani; Institute of Aeronautical Technology (ITA), Brazil*

Cluster governance concerns the way of coordination, control, intervention and involvement of actors from local arrangement. Owing to a substantial increase in the importance of public policy in clusters, it is important to understand the dynamics of stakeholder participation in these arrangements. Thus, this study aimed to analyze the governance structure at the Ribeirao Preto's Software Industry. In order to achieve that, in-depth interviews were conducted with arrangement's actors to identify the different influences on the coordination of the arrangement. The interview results showed: a) governance positively influenced the cooperation and business development, b) the development of the cluster depends, in the case analyzed, on much of the private governance, c) powerful actors and holders of coordination mechanisms determine the relationships, resources and rules, proposing new institutional orders. In the end, this study contributes to the understanding of governance relations between the actors and their consequences for the arrangement.

### **HD-08.2 [R] Mechanisms of Network Formation: A Structural Analysis of the Emerging Nanotechnology R&D Alliance Network in Japan**

*Balazs Fazekas; Kyoto University, Japan*

*Naoki Wakabayashi; Kyoto University, Japan*

This paper looks at the newly materializing nanotechnology industry in Japan and attempts to answer the question of what processes shape the formation and change of the organizational field network. Nanotechnology is a loosely coupled field and includes organizations from a diverse set of industries and fields that evolved through different historical pathways. To understand the boundaries of the industry, the authors compiled a relational database of nanotechnology R&D alliances during the 2005-2010 period, including more than 600 Japanese organizations and 1784 unique alliances. Through examining the structural and dynamical properties of the network and performing a cluster analysis, the authors identified four underlying mechanisms that drive network formation and change: 1) force of existing relationships, 2) force of top-down systemizing discourse, 3) force of agency, and 4) force of geographical location. We argue that an accurate understanding of these forces is necessary to predict future trajectories in volatile high-tech industries, such as nanotechnology or biotechnology.

### **HD-08.3 [R] An Exploratory Study on the Intra-Organizational Network during Restructuring: An Email Network Analysis**

*Antonio Lau; Kyung Hee University, Korea, South*

*Hisato Tashiro; University of Tokyo, Japan*

*Yuya Kajikawa; Tokyo Institute of Technology, Japan*

Organizational restructuring is a disruptive process that damages the communication patterns of surviving employees, in which the organizational networks could significantly affect a company performance, in particular its total quality management (TQM) performance. However, existing studies on how the employees of a TQM organization cope with lost communication linkages, and form new linkages, are unclear. The study is designed to test the relationships of multiple network attributes of employees before and after the organizational restructuring due to the 2008 global financial crisis between 2008 (T1), 2009 (T2), and 2010 (T3). It utilized internal company e-mail log data to detect the network attributes of over 2,468 employees in a major TQM manufacturer through PLS analysis. The results show that during the organizational restructuring, the employee's closeness decreased, but the degree and the betweenness recovered. The degree in 2008 is positively related to that in 2009-2010 as well as and the closeness in the year 2010. The betweenness in 2008 is positively related to that in 2010. The closeness in 2008 is positively related to that in 2009. The paper explores how an organizational internal network changes during the organizational restructuring through a set of longitudinal data using social network analysis.

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## **HD-09 Management of Communication Technologies-3**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Hibari 1**

**Chair(s) Antonie Jetter, Portland State University**

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## **HD-09.1 [R] The Localization of Praxis-Oriented Research: Creating Service Design Applications**

*Wei-Lin Chen; National Chengchi University, Taiwan*  
*Sheng-Chih Chen; National Chengchi University, Taiwan*  
*Cheng-Ming Huang; National Chengchi University, Taiwan*  
*Yi-Jia Huang; National Chengchi University, Taiwan*  
*Pei-Chun Tsai; National Chengchi University, Taiwan*  
*Wei-Chih Tseng; National Chengchi University, Taiwan*

In this study, a mobile application development course was implemented from the perspective of technology so that all of the inexperienced students who took the course were eventually able to independently develop a mobile application with their team to present their learning effects. The course structure was based on the service learning theory. The teacher led the students in performing field research and interacting with local residents, stores, and government agencies so that the students could design a localized mobile application service based on the background and problems that they encountered. The core value of the study is to reach the goal of "digital empowerment" of newer users, by training "digital natives" who will most likely in the future design applications for "digital immigrants." According to the result, users were more willing to use the mobile applications proposed in the course based on the service learning theory, and they found learning more enjoyable. The focus of this study was on a coherent teaching method incorporating both practical and theoretical aspects, to assist students in learning to create localized mobile application services of higher adhesion for every user.

## **HD-09.2 [R] Towards a Sustainable Volunteered Community: An Analysis of the OpenStreetMap Community in Japan and Its Activity after the 2011 Tohoku Earthquake**

*Tomomichi Hayakawa; Nagoya Institute of Technology, Japan*  
*Yuma Imi; Nagoya Institute of Technology, Japan*  
*Takayuki Ito; Nagoya Institute of Technology, Japan*

Artifacts and community activities of the OpenStreetMap (OSM) have been used for a variety of social activities. In recent years, in Japan, the Ministry of Economy, Trade and Industry has promoted open government as evidenced by its open government data strategy. It is expected that improving the quality of the OpenStreetMap will be one of its open data projects. There is a unique feature of the OpenStreetMap of early Japan in the background of the challenges. The two unique features of the OpenStreetMap of early Japan are summarized below: (1) Import of large-scale data, such as digital national land information data has been by small contributors. (2) At the time of crisis mapping of the 2011 Tohoku Earthquake, the basic data of the OpenStreetMap had not been maintained enough. The purpose of this study is to verify unique feature by data analysis. The two findings of this study are: (1) In Japan, the number of artifacts is very large with respect to the number of contributors. (2) An unusual number of artifacts were created by contributors immediately after the 2011 Tohoku Earthquake.

## **HD-09.3 [R] Does Personality Matter for Contributions to Online Communities?**

*Inthrayuth Mahaphol; Portland State University, United States*  
*Antonie J Jetter; Portland State University, United States*

Many high-technology business models would not be scalable and profitable without online communities that provide user support, foster technology adoption, offer product feedback, solve technical problems, and to co-develop products. However, only a relatively small number of all community members are actively contributing content and their attention is increasingly divided between a rapidly growing number of personal and professional online communities. Companies therefore strive to convert "lurkers," who observe the community, into active content providers. This paper investigates to what extent this is possible across different community members. Specifically, it asks how personality traits impact online behavior. To this end, the paper develops a research framework for online participation that is based on the Theory of Planned Behavior (TPB) and Big-Five personality factors and

outlines future research directions.

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## **HD-10 R&D Management-3**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Hibari 2**

**Chair(s) Simon P Philbin; Imperial College London**

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## **HD-10.1 [R] Managing Discrepancies in Evaluation Methods for Interdisciplinary Research Programme: The Case of WPI in Japan**

*Alfonso Avila Robinson; Kyoto University, Japan*  
*Naohiro Shichijo; NISTEP, Japan*  
*Shintaro Sengoku; Kyoto University, Japan*

Interdisciplinary research has recently been emphasised in science and technology policies throughout the world. Numerous organisational approaches are directed at accelerating interdisciplinary research; consequently, new research institutes have been established at the university level or as public institutions. However, principles of management regarding evaluation of interdisciplinary research have not been developed sufficiently in comparison to ordinary mono-disciplinary research. A practical approach is the use of the peer review by a small set of experts; however, the selection bias of peer reviewers, the lack of expertise in emerging disciplines, and a burden for evaluation tasks are currently pointed out as developmental needs. Alternatively, another approach that has been proposed is a more efficient and robust routine for applying scientometric intelligence with established bibliometric indicators and comprehensive publication databases. In this study, an empirical observation was conducted to examine six interdisciplinary research institutes operated for the last five years under an initiative of the Japanese government; results were expected to provide evidence regarding similarities of the two aforementioned approaches. Additionally, a discussion regarding the underlying reasons for possible discrepancies was initiated.

## **HD-10.2 [R] Inventive Productivity in Japanese Materials Sector**

*Hiroshi Oyamada; The University of Tokyo, Japan*  
*Toshiya Watanabe; The University of Tokyo, Japan*

Classical theory "Lotka's Law" has been proven in many fields that the number of persons who contribute  $n$  outputs is about  $1/n^a$  of those who contribute one output, where the exponent  $a$  is a parameter about 2 to 3 in most of the cases reported previously. Our analysis on patent productivity of inventors in Japan shows different characteristics from the results of previous studies on US and European firms. We have studied 17 Japanese firms of the materials sector and about 40,000 inventors of them who have contributed to more than 260,000 patent applications filed at the Japan Patent Office over the period 1992-2011. As a result, we find that a simple Lotka-like power law fitting is not applicable to patent distributions of the inventors in Japan. Each distribution has a turning point dividing into two domains: small patent counts with a gentle slope and large patent counts with a steep slope. This observation suggests that a typical inventor who is named as a first inventor more than once is the one who joined a firm in the R&D department and has remained there, keeping involving in the inventive activities for the long year of his/her employment.

## **HD-10.3 [A] Ranking of the Best Brazilian Universities and Professors in Information & Communication Technology: A Methodology for a R&D Lab of a Multinational Company in Brazilian Consumer Electronics' Industry**

*Marcus V Leite; Samsung R&D Institute Brazil, Brazil*  
*Luciana C Lenhari; Samsung R&D Institute Brazil, Brazil*  
*Miguel Lizarraga; Samsung R&D Institute Brazil, Brazil*

The objective of this paper is to present the methodology used for identifying the best Brazilian universities and professors in research topics of the information and communications technologies (ICT) sector. This analysis was part of the R&D lab planning activities in order to establish cooperative research projects with local universities. The motivation arises from the fact that the Brazilian research environment is not enough mapped/studied, especially for applications related to the company's demands. The country has just started to provide

# SESSIONS

competitive differentiation in R&D activities, and most universities are more concerned with teaching/researching than working with industry. The theoretical framework used is the innovation network management focused on the search for external partnership and the analysis of main universities ranking methodologies and bibliometrics indicators. Briefly, the methodology created can be separated into two phases: identification of top universities; and identification of top professors and research areas in ICT. From 10 universities and 150 professors, papers and thesis (master's/doctorate) were analyzed since 2009, summing up almost 4,000 documents. The result provided a Brazilian research map on ICT sector, and it can be used to start establishing partnerships with universities.

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## **HD-11 Technology Management Education-3**

**Thursday, 7/31/2014, 14:00 - 15:30**

**Room: Toki**

**Chair(s) Mary Mathew; Indian Institute of Science**

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### **HD-11.1 [A] The Similarities and Differences Between Entrepreneurship Education in Taiwan, Europe, and China: A Preliminary Study**

*Ming-Shun Tang; Feng Chia University, Taiwan*

*Wen-Hsiang Lai; Feng Chia University, Taiwan*

*Ying-Chyi Chou; Tunghai University, Taiwan*

*Chu-Sheng Chen; Huaqiao University, China*

This study investigates how entrepreneurship education affects national competitiveness by analyzing and comparing entrepreneurship education and investments in Taiwan, Europe, and China. The cross-national differences examined in this study were government or industry support and the entrepreneurial atmosphere. The research architecture was confirmed with the assistance of cross-national experts. In this study, a literature analysis was conducted using secondary data and, based on expert interviews, the dimensions of entrepreneurship education inputs and output were generalized. The input items comprised entrepreneurship curriculum design, mentors, entrepreneurship competitions, and entrepreneurship forums. The output items comprised the industrial pattern of student employment, enterprise popularity, salary standards, and promotion status. Entrepreneurs are rarely innately successful; most entrepreneurs mature gradually and harmoniously through education and training. The results of this study should serve as a reference to national education units when drafting directions for entrepreneurship education and resource distribution.

### **HD-11.2 [R] Conceptualization of a Behavior Modification Tool for University Systems and Doctoral Students**

*N. Kavita; Indian Institute of Science, India*

*Mary Mathew; Indian Institute of Science, India*

This paper describes a university based system relevant to doctoral students who have problems with themselves, their peers and research supervisors. Doctoral students have various challenges to solve and these challenges contribute to delays in their thesis submission. This tool aims at helping them think through their problem in a pre-counseling stage. The tool uses narratives and hypothetical stories to walk a doctoral student through options of responses he or she can make given the situation in the narrative. Narratives were developed after a preliminary survey (n=57) of doctoral students. The survey indicated that problems they experienced were: busy supervisors, negative competition from peers and laziness with self. The narrative scenarios in the tool prompt self-reflection and provide for options to choose from leading to the next scenario that will ensue. The different stages of the stimulus-response cycles are designed based on Thomas-Kilmann conflict resolution techniques (collaboration and avoidance). Each stimulus-response cycle has a score attached that reflects the student's ability to judge a collaborative approach. At the end of all the stages a scorecard is generated indicating either a progressive or regressive outcome of thesis submission.

### **HD-11.3 [R] The Influence of Co-Authorship Networks on the Performance of**

## **Graduate Programs in the Brazilian Evaluation System**

*Cibele B Martins; Federal University of Santa Catarina - UFSC, Brazil*

*Emerson A Maccari; Universidade Nove de Julho - UNINOVE, Brazil*

*Sergio B Martins; Universidade Nove de Julho - UNINOVE, Brazil*

*Fernando A Serra; Universidade Nove de Julho - UNINOVE, Brazil*

In Brazil, CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) regulates graduate programs at universities. This agency belongs to the Ministry of Education (MEC) and it is empowered to recommend or discredit graduate courses. Graduate programs are required to coordinate their strategies and actions to comply with the requisites of the evaluation system. This study investigated the influence of "co-authorship networks" on the performance of graduate programs in the CAPES evaluation system. We used a quantitative research method to assess the correlation between co-authorship networks and the evaluations of the programs in the fields of business management, accounting, and tourism from 2001 to 2009. The results show a positive relationship between the consolidation of co-authorship groups and the score obtained by the graduate programs in the CAPES evaluation system.

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## **HE-01 Innovation Management-10**

**Thursday, 7/31/2014, 16:00 - 17:30**

**Room: Ootori 1**

**Chair(s) Yuichi Washida; Hitotsubashi University**

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### **HE-01.1 [A] Scoring Methods for Prioritizing and Selecting Innovation Projects**

*Rick Mitchell; University of Cambridge, United Kingdom*

*Robert Phaal; University of Cambridge, United Kingdom*

*Nicky Athanassopoulou; University of Cambridge, United Kingdom*

An approach for designing multi-factor scoring systems for evaluating and selecting early stage innovation projects is presented. A project is a piece of work of finite duration with finite resources, aimed at defined outcome. Innovation projects have the extra complication that all of these aspects will be somewhat uncertain and knowledge of them is liable to change as the project proceeds. Clearly different assessment factors are required for different organizations, and for different types and stages of project. There is little guidance in the literature on how to choose the factors and how best to structure the scoring process. The approach is presented in the form of managerial guidelines, targeted at those who have to implement innovation project selection systems. Design aspects are discussed, including structure of the tool, choosing the factors, scaling statements, weightings, risk, uncertainty and confidence. Management aspects are considered, including preparation, scoring, decisions and outputs. The method is positioned in terms of theory and practice, with reference to both literature and industrial case studies. The paper concludes with a discussion of practical and theoretical contributions, and highlights areas that would benefit from further research.

### **HE-01.2 [R] A Literature Review with Citation Analysis of Technology Transfer**

*Chih-Hung Hsieh; Yuan-Ze University, Taiwan*

*Louis Y. Y. Lu; Yuan Ze University, Taiwan*

*John S. Liu; National Taiwan University, Taiwan*

*Alexander Kondrashov; Yuan Ze University, Russia*

In this study, we reviewed papers from the 1970s to the present on the theory development of technology transfer (TT). Using the Web of Science search engine, we extracted more than 6,000 papers from the Institute for Scientific Information database. Then, we selected 367 highly related journal papers and analyzed them with self-developed software. We found that the TT studies focused on international technology diffusion in the 1970s and 1980s. In particular, these studies used economic models to study TT activities and their impact on economic development at the global, national, and corporate levels. In the 1990s, with the emergence of technology management studies, research on TT em-

# SESSIONS

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phasized technological issues, such as knowledge management, science and technology (S&T) policy, intellectual property rights management, and TT agents. The TT model in the 2000s (networking type) was more complicated than that in the 1970s (linear type). We successfully analyzed two major research tracks in our study; namely, the “economic” and “management of technology” tracks. The findings from our study will help scholars continue their work in each track. Finally, we also present the notion that there is no “one size fits all” TT model. We believe this is an issue that will lead to further studies.

## **HE-01.3 [R] Exploring the Relationship between Service Innovation and New Product Performance: The Moderating Effect of Market Linking Capability and Market Turbulence**

*Ching-Hsing Chang; National Chiayi University, Taiwan*  
*Chun-Hsien Wang; National Chiayi University, Taiwan*  
*Huei-Mei Liang; National Sun Yat-sen University, Taiwan*  
*Pei-Yu Chien; National Sun Yat-sen University, Taiwan*

Service innovation is significant in maintaining a firm's competitive advantage in an increasingly service-centered economy. Although there is a rich body of research on the role of service innovation in value creation for firms, little attention has been devoted to its effect on new product development. This study advances research on service innovation and market fit capabilities by examining how the capability of a service-based firm's market linking and market turbulence shapes the relationship between service innovation and new product performance. This study offers a theoretical framework that integrates both the resource-based view and market orientation perspectives of service innovation to investigate innovative service practices and activities that occur in contemporary service-based firms. Using an original dataset of 170 service-based firms from a service-centered economy, this study demonstrates that the combination of high market linking capability and high market turbulence are likely to strengthen new product development performance. Finally, the empirical results find that new product performance is highest in situations with high levels of service innovation, market linking, and market turbulence; therefore, the findings could support the proposed three-way interaction. Overall, these findings contribute to a better understanding of contexts in which service innovation represents an invisible specific asset or resource for service-based firms.

## **HE-01.4 [R] An Analysis on Effects of Science Communication on Regional Technological Innovation in SECI Model**

*Huijun Zhang; China Research Inst for Science Popularization, China*  
*Nian Zheng; China Research Inst for Science Popularization, China*

From the perspective of knowledge, the foundation of technological innovation is knowledge-based innovation. Knowledge-based technological innovation is a dynamic process of creation, communication and application of new knowledge. Knowledge flow between technology innovators and technology followers within a region is an important factor of promoting regional innovation capability. This paper constructs a technological innovation cycle under the perspective of knowledge to study knowledge creation, flow and transformation in the technological innovation cycle and analyzes the effects of science communication in the process of knowledge transformation. Finally, the effects of science communication on regional technological innovation are gained under the perspective of knowledge.

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## **HE-02 Technology Management in the Health Sector-3**

**Thursday, 7/31/2014, 16:00 - 17:30**

**Room: Ootori 2**

**Chair(s) Kunio Shirahada; JAIST**

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### **HE-02.1 [R] Technology Challenges to Healthcare Service Innovation in Aging Asia: Case Study of Emergency Medical Service System**

*Sukkirat Vatcharapong; JAIST and SIIT Thammasat University, Thailand*  
*Kunio Shirahada; JAIST, Japan*

The trend of the aging populations in Asia countries will increase at an average of 10%

in 2009 to 30% in 2050. Healthcare service is a principal social right and an essential mechanism for the well-being of the elderly. The emergency medical support system is a critical process for providing healthcare service for physical conditions related to aging and for help in life threatening cases. There is a need to provide flexible applications that enable the elderly to communicate their desires with others in a reasonable amount of time. This research is aimed at identifying the technological challenges that face healthcare services in terms of the emergency medical service system created to support elderly patients' demands. We conduct a questionnaire survey for statistical analysis based on secondary data from the World Health Organization (WHO) and use systematic reviews to identify the needs of healthcare technology related to aging based on the service system. In addition, as a case study, we conducted a questionnaire survey given to healthcare service providers who work in hospitals in Thailand to identify current situation of EMSS and relative available technology for system improvement. The findings show that healthcare technology priorities and emergency service modeling are positively significant factors influencing healthcare service innovation for selected countries. This paper will increase the confidence of elderly people and their families through the preparation of alternative service systems with all service providers.

### **HE-02.2 [R] A Review of Multiple User Center Design Methods for New Product Development in Smart and Connected Health Applications**

*Noshad Rahimi; Portland State University, United States*  
*Maria Ibarra Prado; Portland State University, United States*

Evidence across industries including telecommunication, retail and trading, suggests many benefits are to be gained from automation. To obtain these benefits in the field of healthcare, there have been a vast amount of studies conducted on utilization of technological capabilities during the past few decades. From medical information systems to telemedicine to ubiquitous computing, smart and connected health applications are designed to have a positive impact on current and future health care practices. While there have been a lot of successful innovations in these applications, there have also been a lot of failures. Study of these applications highlights the importance of user involvement from the very early stage of new product development. This paper utilizes the categories identified in Smart and Connected Health (SCH) terminology recognized by the National Science Foundation (NSF) to conduct a holistic study of different technological applications developed for healthcare to identify major barriers inhibiting their diffusion. The User Centered Design (UCD) methodologies proven valuable in industrial contexts are reviewed to highlight their characteristics and capabilities to facilitate user involvement. It references cases where they have been valuable toolkits to address barriers recognized. Finally, the study categorizes the major barriers captured throughout the study and recommends best user centered design(s) approaches to be deployed for superior front-end management of healthcare solution innovation.

### **HE-02.3 [R] Assessing Technologies for Post Discharge Follow-up of Orthopedic Surgery**

*Noshad Rahimi; Portland State University, United States*  
*Parisa Ghafoori; Portland State University, United States*  
*Matt Nickeson; Portland State University, United States*

This study examines several developing technological alternatives, including computer vision, lab-on-chip blood monitors, and integrated servomotors to meet the needs of post-surgical patient follow-up. Multiple health care provider experts were surveyed using pairwise comparison in a hierarchical decision making model to determine their preferred criteria for addressing these tasks, revealing a preference for quality and protection at the expense of speed. Cost and ease of use were perceived as smaller factors with no strong differences noted between patient and provider effort. The high tech alternatives did not always outrank the current low tech state of the art, particularly for x-ray analysis, although integrated servomotors and lab-on-chip blood monitoring show promise for future development.

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## **HE-03 Enterprise Management-3**

# SESSIONS

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**Thursday, 7/31/2014, 16:00 - 17:30**

**Room: Ootori 3**

**Chair(s) Elma Van der Lingen; University of Pretoria**

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**HE-03.1 [R] Investigating the Relationship between Competency Development and Organizational Performance**

*Yu-Pin Chao; Feng Chia University, Taiwan*

*Wen-Hsiang Lai; Feng Chia University, Taiwan*

*Ying-Chyi Chou; Tunghai University, Taiwan*

Competency development and human resources are increasingly valued by organizations. Employees are confronted by the question of how to enhance their abilities to meet the needs of organizations. For organizations, talent is a crucial enterprise resource in the era of the knowledge economy. One of the key success factors in enterprise management is finding and developing the right talent for the organization. The competency of employees at every level must be established through recruitment, promotion, educational training, and employee career development methods to enhance talent quality and competitiveness, and ensure that enterprises achieve their performance goals. This study investigated (a) the current condition of competency implementation in enterprises; (b) the interconnectedness of competency and recruitment, training, and performance; and (c) the correlation and causality between competency and enterprise performance. Interviews were conducted with professionals and organizations awarded with Taiwan's National Training Quality Award to understand the implementation and application of competency in these organizations, which will serve as a reference for enterprises with the intention to advance in competency implementation.

**HE-03.2 [R] The Use of Self-Service Technologies for Trust Forming Behavior within the South African Fresh Produce Industry: A Case Study Approach**

*Justy Range; University of Pretoria, South Africa*

*Awie C Leonard; University of Pretoria, South Africa*

When using self-service solutions to deliver services the challenge is to retain the trust of the end user. This is specifically the case when dealing with end users in the fresh produce market environment. This sector has not seen the adoption of self-service technologies specifically in southern Africa. In this paper we propose a model to enhance our understanding of trust formation using self-service technologies. A qualitative research approach, based on a case study (and many years of experience in this field), was followed to create the model. This case study offers insight into how the dynamics of the product, supporting services and the technology shapes trust forming behavior.

**HE-03.3 [A] Case Study of Product Management of the Dense Medium Cyclone Range**

*Faan Bornman; University of Pretoria, South Africa*

*Elma Van der Lingen; University of Pretoria, South Africa*

The Cyclone division of the company in the case study has been plagued by maintaining sales growth, late delivery of products, a high turnover of staff and a lack of developing new products. The interrelationships among the aspects are complex and contribute towards substandard performance in the division. The investigation set out to determine how the sales function should be managed and how to improve on product delivery accuracy. Equally important is the aspect of retaining skills in the division, as well as the management actions required to develop new products. Managing a product line involves a number of factors to manage such as life cycle, on-time deliveries, cost quality, risks, development, human resources, operations, etc. The study focuses on four management aspects, namely sales, on-time delivery, skills retention and product development. The investigation reveals that there are shortcomings in the day-to-day operations, especially in terms of on-time deliveries. Based on the findings of the investigation, the gap is identified in the current management model, and it further explores how to influence the overall performance of the division. Practical recommendations are made accordingly to improve the approach towards the management principles.

**HE-03.4 [R] Application of Kano's Two-Dimensional Quality Model and QFD on a Gender-Friendly Environment of Hospital**

*Ying-Chyi Chou; Tunghai University, Taiwan*

*Pei-Chi Tsai; Tunghai University, Taiwan*

*Jar-Yuan Pai; Chung Shan Medical University, Taiwan*

*Hsin-Yi Yen; Tunghai University, Taiwan*

*Ching-Hua Lu; National Chiao Tung University, Taiwan*

With changes in economic development and market environment, people are paying more attention to service quality. Professional and medical conflicts are also increasing, and the quality of medical services has also come under increasing spotlight. Using the Kano two-dimensional quality model, this study proposed a priority list for constructing a gender-friendly environment. Combining the service experience engineering process, SERVQUAL scale and expert interviews, a questionnaire surveying the gender-friendliness of medical facilities is developed to determine patient needs. Research results showed that in terms of the gender-friendliness of medical facilities, patients are mostly aware of must-be qualities even if there was significant room for improvement in the existing health care environment, such as needing plenty of and clearly marked childcare areas. Using Quality Function Deployment and House of Quality, a priority list for facility improvements are made for the references for management.

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**HE-04 PANEL: PICMET 2015 Planning Session**

**Thursday, 7/31/2014, 16:00 - 17:30**

**Room: Zuiun 1**

**Panelist(s) Timothy R Anderson; Portland State University**

**Dilek Cetindamar; Sabanci University**

**Tugrul U Daim; Portland State University**

**Antonie J Jetter; Portland State University**

**Dundar F Kocaoglu; Portland State University**

**Kiyoshi Niwa; The University of Tokyo**

**Kenny Phan; Portland State University**

**Charles M Weber; Portland State University**

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This panel session will provide an opportunity to give feedback on PICMET '14 and to get involved in the planning for PICMET '15 and '16 conferences. PICMET '15 will be held in Portland, Oregon, USA.

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**HE-05 Technology Transfer-2**

**Thursday, 7/31/2014, 16:00 - 17:30**

**Room: Zuiun 2**

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

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**HE-05.1 [R] The Reason to Form a 'Keiretsu' in Terms of Technology Transfer**

*Atsushi Inuzuka; Nagoya University, Japan*

"Keiretsu" is a network of businesses that own stakes in each other as a means of mutual security and technology exchange, especially in Japan, and usually includes large manufacturers and their suppliers of raw materials and components. This study focuses on a large automobile company, Toyota Corporation, which is well known to have a large Keiretsu network, and investigates the contribution of having Keiretsu companies to the parent company in terms of technology transfer. The author collected patents with Toyota as an applicant during 1983-1999, and extracted the patent citations between the focal patents and the patents the focal patent cites (backward citations). Each paired patent between the focal patent and the backward patent was categorized into (a) a citation from parent company (self-citations), (b) a citation from a Keiretsu company (Keiretsu citations), or (c) a citation neither from a parent company nor from a Keiretsu company (external-citations). Then the author tested which category really contributes to the values of the focal patents in the parent company. The analysis showed that the Keiretsu citations have a moderate contribution to Toyota. A strong reason for the parent company to form the Keiretsu was not found in terms of technology transfer.



# SESSIONS

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## **HE-05.2 [R] The Role of 'Knowledge White Space' in Products for Value Co-Creation with Customers in Service Dominant Logic**

*Kazuhiro Oshio; Japan Advanced Institute of Science and Technology, Japan*

The selling price of commoditized products has recently been decreasing rapidly due to the commoditization of B to B products as well as B to C products. Manufacturers need to customize products to satisfy customers and earn higher profits rather than enhance product performance. Service dominant logic (SDL), which claims value co-creation with customers, is the most important concept for creating new products and services in these circumstances. The main purpose of this research was to propose a new concept of a "knowledge white space" in products for value co-creation with customers and verify its effectiveness through successful examples. Customers can express their needs for products in the knowledge white space, and manufacturers can understand real customer needs through the knowledge white space. Two case studies of a sales company were analyzed in this research and it was found that approximate designs contributed to the creation of new ideas. It is very effective for value co-creation with customers from the viewpoints of SDL to leave a knowledge white space in which customers can place new ideas.

## **HE-5.3 [R] How Sourcing Knowledge is Acquired in Companies**

*Keisuke Inoue; Japan Advanced Institute of Science and Technology, Japan*

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

As companies increasingly have more horizontal specialization in their business structures, the number of items procured and amounts of money spent have been increasing, resulting in a larger impact by the procurement on corporate earnings. In the electronics industry, more and more companies are moving to the horizontal specialization structure. Among them, Apple, which outsources not only its parts but also the production of its apparatus, appears to be making skillful use of sourcing, to the point that its sourcing capability has been serving as one of the main drivers of its high performance. Apple is known to employ people from the same industry it purchases parts from to acquire their highly sophisticated knowledge. On the other hand, there are companies such as Japanese car manufacturers that accumulate sourcing knowledge internally. Surveys using questionnaires and interviews were conducted and analysis was made on how the Japanese manufacturing companies are acquiring knowledge necessary to perform effective sourcing activity. As a result, it was found that the acquisition method of procurement knowledge differs depending on the product architecture type. Building on this finding, a method for enhancing organizational knowledge to improve procurement work is proposed.



# AUTHOR INDEX

---

## A

Abe, Hitoshi; MB-11.2  
Adebari, Adeola; TB-13.1  
Aguirre Albas, Rodrigo E.; MD-08.1  
Agwa-Ejon, John Francis J.; WB-12.1;  
WB-12  
Ahmad, Toufiq; TB-11.2  
Alahuhta, Pekka; TE-01.2  
Albors-Garrigos, Jose; MD-10.4  
Alp, Neslihan; MD-07; TD-11; WB-06.1  
Alvarez, Francisco; WB-06.3  
Alvarez, Jose C.; TB-05.1  
Amadi-Echendu, Joe; TB-13.1; HB-04;  
HB-04.1;  
Amemiya, Kenichi; TE-06.4  
Amitrano, Fernanda; MD-07.1  
Amodio Estorilio, Carla Cristina;  
MD-07.1  
Anderson, Timothy R.; MD-02; TD-05.2;  
WB-05; WD-00; HE-04  
Ando, Makoto; TE-05.3  
Ansal, Hacer; WB-11.1  
Anthanassopoulou, Nikoletta; HD-02.1  
Antony, Toby J.; ME-13.2  
Aoki, Youichi; WE-01.1  
Aoyama, Atsushi; MD-04.2  
Apfel, Katharina; MB-02.1; TB-05.2;  
TE-05.1  
Aronson, Zvi H.; HD-05.4  
Arunagiri, Srigowtham; MB-04.3;  
WB-03.2  
Asai, Masami; WE-07.1  
Asgari, Behrooz; HB-07.1  
Atalay, Bulent; HA-00.2  
Athanasopoulou, Nicky; HE-01.1  
Atoche-Kong, Carlos E.; HB-07; HD-07.2  
Avila-Robinson, Alfonso; ME-07.1;  
HD-10.1  
Ayabakan, Murat; MD-07.2

## B

Badir, Yuosre F.; HB-02.3  
Banihashemi, Seyed Yaser; HD-05.3  
Barczak, Gloria; MD-02; TD-02; WB-02;  
Basmer, Sissy-Ve; MB-06.1; ME-02.1  
Batnasan, Javkhuu; ME-04.3

Bekar, Ebru Turanoglu; TE-11.1  
Bell, Jef; MB-02.2  
Benade, Siebert; HD-04.1  
Berg, Pekka; TE-01.2  
Betancur, David; MD-01.2  
Betz, Frederick; ME-12.2  
Biegl, Matthias; MB-05.1  
Bocatto, Evandro; TB-08.3  
Boemo-Mokhawa, Nametsegang; MB-11.3  
Boglo, Ayodele P.; TB-13.1  
Bohliqa, Ahmed; WE-03.3  
Boppolige Anand, Archana; TB-13.2  
Bornman, Faan; HE-03.3  
Brakling, Andre; TE-05.1  
Brandon, Nigel P.; WB-07.1  
Brill, Eyal; MD-06  
Brown, Robert L.; MB-06.2  
Bruhns, Franz L.; MB-06.1; ME-02.1  
Buchanan, Walter W.; TE-11; TE-11.1  
Bullinger, Hans-Joerg; HA-00.1  
Buxbaum-Conradi, Sonja; MB-06.1;  
ME-02.1  
Buys, Andre J.; MB-01; WE-01; HD-01.2

## C

Callaway, Stephen K.; WB-08.2  
Camargo Jr., Alceu S.; MD-04.3; TE-08.3;  
HD-01.1  
Carrillo, Janice; MB-10; MB-10.2;  
WB-02.1;  
Castro Gama, Camilo Alberto; TE-08.1  
Cetindamar, Dilek; MD-12; TA-00;  
TB-08.1; WB-07; HE-04  
Chachondia, Sanjeev; MD-08.2; TB-12.4  
Chan, Te-Yi; WE-05.2  
Chang, Boyoung; TB-10.1  
Chang, Chia-Chi; WE-09.2  
Chang, Ching-Hsing; HE-01.3  
Chang, Ching-Hsun; TE-02.2  
Chang, Daniel; WE-08.1  
Chang, Ke-Chiun; HB-03.3; HB-03.2  
Chang, Pao-Long; TE-13.4; HB-07.2  
Chang, Ping-Chun; TB-09.3; TE-3.4  
Chang, Sandy W.C.; TD-03.1  
Chang, Shih-Chi; MB-12.2  
Chang, Tung-Lung Steven; MD-11.1

Chang, Yu-Ting; MB-09.3  
Chang, Yuan-Chieh; MD-03.1; TE-01.3  
Chang, Yu-Hsin; TB-09.3; TE-3.4  
Chang, Yu-Ying; MB-05.2  
Chang, Yu-Yu; WE-01.4  
Chao, Yu-Pin; HE-03.1  
Chao, Zhang; TE-11.2; WE-06.2  
Che, Joseph L.; MB-11.1  
Chen, Chihchang; HB-03.2; HB-03.3  
Chen, Chin-Yi; MB-05.2  
Chen, Chu-Sheng; HD-11.1  
Chen, Chu-Wen; HB-01.2  
Chen, Dar-Zen; TE-03.3  
Chen, Etta Y. I.; MD-11; TD-07.1;  
TD-07.2;  
Chen, Guangpu; TB-12.2  
Chen, Hui-Fen; WB-02.3  
Chen, James K.; MB-10.3; ME-04.3;  
TE-06.1; TE-06  
Chen, Jin; TD-04.3; HB-01.3; HD-01.3  
Chen, Keke; HD-06.1  
Chen, Ling; WE-06.1; HD-06.3  
Chen, Ming-Huei; TE-01.3; WE-01.4  
Chen, Po-Yu; WE-09.2  
Chen, Qiang; WB-03.3  
Chen, Shao-Huan; WB-02.3  
Chen, Sheng-Chih; HD-09.1  
Chen, Shu Jung; TB-09.3  
Chen, Shu-Hui; ME-02.2  
Chen, Song; MB-05.3  
Chen, Wan-Yu; TE-11.3  
Chen, Wei-Lin; HD-09.1  
Chen, Wei-Ying; TD-09.3; HB-07.3  
Chen, Xiangdong; MB-07; ME-05.3;  
WE-12  
Chen, Yi-chun; TE-07.3  
Chen, Yi-Ju; TE-13.3  
Chen, Yi-Wen; TB-06.3  
Chen, Yuanchin; WB-11.2  
Chen, Yu-Ching; TB-13.4  
Chen, Yufen; MB-07.3; MD-08; ME-08.3;  
ME-08  
Chen, Yu-Han; MD-11.3  
Chen, Yu-Shan; TE-02.2  
Cheng, Hsiang-Jui; ME-05.1  
Cheng, Hsiang-Lin; TE-07.1  
Cheng, Li-Hung; ME-01.3

# AUTHOR INDEX

---

Cheng, Meina; TD-05.4  
Cheng, Yijie; WB-09.2; WB-09.3;  
WB-09.4  
Cheng, Yu-Chao; ME-03.1  
Cheo, Harn Ying; TB-11.3  
Cheung, Benny Chi Fai; TD-05.4  
Chi, Hui-Ru; TE-01.3  
Chi, Kai-Lin; MB-03.2  
Chiang, Min-Chun; TD-09.4  
Chiang, Pei-Chia; TB-07.1  
Chien, Pei-Yu; MB-07.2; MD-01.1;  
TE-07.3; HB-01.4; HE-01.3  
Chiu, Chien-Che; TD-10.2  
Chiu, Po-Ning; WB-11.2  
Chiu, Shao-Chun; MB-10.3  
Cho, Daemyeong; MD-03; ME-05  
Cho, Hwang H.; WB-06.2  
Cho, Yonghee; TB-10.1  
Choi, Eugene K.; MD-11.2  
Choi, Gyunghyun; TB-02; TD-01.1  
Chou, Shin-Bin; TD-10.3  
Chou, Ying-Chyi; TD-06.4; HB-07.2;  
HD-11.1; HE-03.1; HE-03.4  
Choy, K.L.; TD-13.2  
Chu, Yen-Tzu; TB-03.1  
Chuang, Hao-Jun; TB-01.2  
Chumpoothepa, Supannikar; MB-10.3  
Chutivongse, Norawat; MB-01.1  
Cortes, Pedro L.; TD-12.2  
Cowan, Kelly R.; TB-10.3  
Cui, Zhijian; TD-04.2  
Cunningham, Scott; ME-12.1; TD-05.1;  
TE-05; WB-05

## D

da Cunha Menezes, Aleixo L.; TD-12.2  
Daim, Tugrul U.; MD-02; TB-10;  
TB-10.3; TB-10.4; TE-12; TE-12.2;  
WE-09.1; HA-00; HB-10.1; HE-04  
Damiani, Jose Henrique S.; ME-08.2;  
HD-08.1  
De Klerk, Antonie M.; MB-02; ME-13.2;  
ME-13  
de Mello, Adriana Marotti; WB-06.3  
de Oliveira, Rosicler B.; TB-08.3  
de Wit, Frederick; HB-04.1  
Dedehayir, Ozgur; MB-01.2

Dereli, Turkay; WB-01.2  
Dias, Frederico A.; MD-04.3  
Doblinger, Claudia; MD-10.1  
Dong, Huei-Ru; WB-07.4  
Drescher, Toni; TB-05.2  
Du, Jieli; TB-01.3  
Durmuglu, Alptekin; WB-01.2

## E

Edmondson, Joseph C.; WE-03.2;  
WE-03.3  
Eicker, Ursula O.; HB-09.2  
Eken, Ozgur; MD-07.2  
Engel, Markus; TB-05.2  
Erasmus, Louwrence D.; TE-09.4;  
WB-08.1; WE-02.1  
Ericsson, Evelina; TD-02.2; WE-02.2  
Estep, Judith; TB-10.4  
Evert, Grant; TE-09.4

## F

Facin, Ana Lucia F.; WE-09.4  
Fan, Wei; WB-09.2; WB-09.3  
Fang, Kwoting; WB-09.1  
Fang, Shih-Chieh; MB-09.1; TD-09.2;  
TD-09.3  
Fang, Xinghua; MB-07.4  
Farukh, Clare; TE-07.2; HD-02.1  
Fazekas, Balazs; HD-08.2  
Feldhaus, Charles; TB-12.1  
Feng, Kuo-Hao; MB-09.1  
Feng, Zhang; TE-11.2  
Filo, Peter; MB-05.1  
Flannery, William T.; TB-05; WB-01;  
HD-02.3  
Foehr, Matthias; MB-08.1  
Fong, Hoi Yan Anna; ME-03.1; TE-03.2  
Fonseca, Fernando; TB-04.1  
Fox, Pat; TB-12.1  
Frank, Moti; WB-01.3  
Franzosi, Ligia de Oliveira; MD-07.1  
Freiling, Mike; WB-09  
Fujiwara, Takao; MB-03; ME-06.1;  
WB-08.3; WE-08.2; TB-06.2  
Fujun, Ren; HB-06.2

Funashima, Hiroki; WB-07.2  
Fung, Sui Hei; TD-05.4  
Furkan, Lalu M.; ME-06.3  
Furue, Nanami; HD-01.4  
Furukawa, Takao; WE-05.3

## G

Gabriel Dias da Silva, Marcelo L.;  
TB-08.3  
Gaimon, Cheryl; WB-02.1  
Gao, Hongbin; HB-06.1  
Garnsey, Elizabeth; MD-10.3  
Gehani, Ray R.; MB-08.3; MD-08.3  
Gemba, Kiminori; WE-03.1  
Gemma, Nobuhiro; HB-04.2  
Gerbing, David; WB-01.1  
Gerdtsri, Nathasit; MB-01.1  
Ghafoori, Parisa; HE-02.3  
Giannini, Beau; MB-05.3  
Gibson, Elizabeth; ME-06.2  
Gingnell, Liv; WE-02.2  
Glazer, Peter; MB-10.1  
Goncalves, Leandro R.; TE-08.2; TE-08.3  
Gonen, Amnon; MB-08; MD-06  
Goto, Hiroaki; HB-04.2  
Goto, Norihiko; MB-11.2  
Goto, Yoshimasa; WE-03.1; WE-03  
Grobelaar, Sara S.; MB-11; TB-08;  
WE-11.2; HB-10.2  
Guemes-Castorena, David; MD-08.1;  
TB-12.3; TE-08.1  
Guo, Aifang; TB-12.2  
Guo, Ying; TB-09.1  
Gupta, Shreya; HD-04.4  
Gutierrez Rocha, Maks W.; ME-01.1  
Guzman, Alexander; HB-07.1  
Gwija, Khanyile; TB-09.2  
Gwynne-Evans, Nigel; WE-11.2

## H

H.M., Belal; TB-11.2; TE-06.4  
Hallam, Cory; HD-02.3  
Hang, Chang Chieh; MD-10.3  
Hao, Juan; HB-03.3; HB-03.2  
Hao, Yen-Seng; TB-05.4

# AUTHOR INDEX

---

Hara, Kozo; MB-11.2  
Harland, Peter E.; MB-01.2; TE-04.1  
Harmon, Robert R.; MB-06.2; MB-06;  
MD-02; TD-09  
Hasegawa, Koichi; WE-11.1  
Hasenauer, Rainer; MB-05.1; TD-07  
Hashimoto, Masahiro; WE-12.1  
Hata, Shigenori; TD-11.2  
Hatakeyama, Kazuo; MD-07.1; MD-07.3;  
TB-05.1; TD-13.1; TD-13; TE-09.2  
Hawkes, Adam D.; WB-07.1  
Hayakawa, Tomomichi; HD-09.2  
Hayase, Kana; TD-01.2  
Hayashi, Kauhiro; WE-05.3  
Hayashi, Nobuyuki; MB-12.3  
Hayashida, Hideki; WB-07.2  
He, Wei; ME-02.3  
He, Xi; ME-05.3  
Heetun, Shameem; WE-08.1  
Hervas-Oliver, Jose Luis; MD-10.4  
Hidaka, Kazuyoshi; TB-04.2  
Hillegas, James; TB-10.4  
Hirano, Makoto; TE-01.1  
Hirata, Naoaki; TE-06.4  
Ho, G.T.S.; TD-13.2  
Ho, Jonathan C.; ME-11.2; MD-12.1;  
TD-10.1  
Ho, Kung-Ling; TE-3.4  
Ho, Mei H.; TB-11.3; TB-11  
Ho, Tay-Yeu; ME-08.1  
Hogaboam, Liliya; HB-10.1  
Hong, Paul; WB-08.2; WB-08.4  
Horie, Nobuhiro; TB-02.1  
Hosoya, Yoshihiro; WB-02.2  
Hou, Yuanyuan; WB-09.4; WE-12.3  
Hsieh, Chih-Hung; MD-11.3; HB-04.3;  
HE-01.2  
Hsu, Che-Pei; HB-04.3  
Hsu, Chiung-Wen; TE-13.4  
Hsu, Mu-Yen; TB-01.2  
Hsu, Yi-Ping; WE-05.2  
Hsueh, Chao-Chih; WE-12.2  
Hu, Jing; TE-07; MB-07.4; ME-05.2;  
WB-08  
Hu, Ying; ME-05.3  
Hua, Xiaofang; MD-03.3  
Huang, Cheng-Ming; HD-09.1

Huang, Hung-Chun; MD-11.1  
Huang, I-Mei; WB-09.1  
Huang, Kuan-Wei; TD-13.3  
Huang, Lu; TB-09.1  
Huang, Lucheng; MD-11.4; TB-05.3;  
HD-03.3  
Huang, Min; ME-05.3  
Huang, Mu-Hsuan; WB-07.4  
Huang, Ping-Lun; TE-13.3  
Huang, Shu Yuan; MB 03.3  
Huang, Tsung Chi; TE-07.3  
Huang, Wensheng; WE-07.3  
Huang, Yi-Jia; HD-09.1  
Huang, Yu-Hua S.; ME-11.2  
Huesig, Stefan; MD-10.1; MD-10.2  
Hundley, Stephen; TB-12.1; TB-12  
Hung, Ava; WE-01.4  
Hung, Shih-Chang; ME-08.1  
Hung, Shu-Hui; HB-10.3  
Hung, Yu-Shan; HB-01.4  
Hwang, Reakook; MB-12.3

## I

Iamratanakul, Supachart; TB-02.2;  
TE-02; HB-02  
Ibarra Prado, Maria; WE-03.3; HE-02.2  
Ikawa, Yasuo; MB-06.4; ME-10; TB-02.1;  
TE-10; WA-00; WE-10; HE-05.3  
Ikeda, Yasushi; TE-06.4  
Imai, Thiago H.; HD-01.1  
Imi, Yuma; HD-09.2  
Inoue, Keisuke; HE-05.3  
Inuzuka, Atsushi; HE-05.1  
Ioku, Akira; MD-04.1  
Ishimatsu, Hirokazu; TB-01.1  
Ishiwatari, Norio; MB-12.3  
Iskin, Ibrahim; TE-12.2  
Islam, Nazrul; TB-10.4  
Itaya, Kazuhiko; ME-04.2  
Ito, Takayuki; HD-09.2  
Ito, Yasunobu; WB-10.3  
Ito, Yuko; TD-11.1  
Iwamoto, Takashi; ME-04.1  
Iwata, Shinjiro; TA-00.1  
Izumi, Toshiyuki; TB-04.4

## J

Jetter, Antonie J.; ME-06.2; TB-02.3;  
HD-09; HD-09.3; HE-04  
Jhan, Yong-Chun; WB-11.2  
Jiang, Dongdong; HB-05.2; HB-05  
Jiang, Jing; ME-07.3  
Jiang, Syuan-Yi; TB-03.2  
Jones, David; WB-07.1  
Ju, Jiali; ME-12.3  
Juhola, Tomi; TD-02.3  
Jung, Euy-Young; HD-02.2  
Jung, Taehyun; MB-07.1; ME-03; TE-09

## K

Kageyama, Yoshiyuki; TB-01.1  
Kajikawa, Yuya; TD-08.2; TE-05.3;  
HD-08.3; HD-08  
Kakihara, Hiroaki; MB-04.2  
Kakutani, Yuji; TB-01.1  
Kamijo, Yukiko; HD-03.1, HD-03  
Kang, Ching-Wen; TE-03.1  
Kano, Shingo; WB-10.2  
Kanto, Laura; TE-01.2  
Kao, Hung-Hsiang; TD-09.2  
Kao, Rui-Hsin; MD-01.1; HB-01.4  
Karvonen, Matti; TE-05.2  
Kassi, Tuomo; TE-05.2  
Kataoka, Rieko; MB-06.4  
Katayama-Yoshida, Hiroshi; MB-12.3;  
WB-07.2  
Kato, Hiroshi; HD-03.2  
Kato, Seiichi; HB-01.1  
Katz, Bernhard R.; MD-03.1; WB-03  
Kavita, N.; HD-11.2  
Kawahara, Katsumi; HB-08  
Kay, Luciano; WB-09.3  
Kayukawa, Keiko; WE-12.1  
Ke, Tsung-Han; MD-11.1  
Kebede, Kassahun Y.; MD-11.2  
Kehinde, Lawrence O.; ME-07.4  
Keke, Chen; WE-06; HB-06.2  
Ken, Yun; TE-04.4  
Kennedy, Donald; ME-09; TD-06.1;  
TD-06  
Kerr, Clive; TE-07.2; HD-02.1



# AUTHOR INDEX

---

Kholopane, Pule A.; HD-04.3; HD-04  
Kim, Brian; WE-08.1  
Kim, Chaiho; TE-09.1; WB-11  
Kim, Jieun; MD-01; TE-01  
Kim, Jooyoung; TD-01.1  
Kim, Karp-Soo; TB-10.1  
Kim, Minje; TD-01.1  
Kim, Myeonggyu; HD-02.2  
Kim, Seong-Jin; HD-02.2  
Kissimoto, Kumiko O.; WE-08.3  
Kobako, Masahiko; HB-02.1  
Kobayashi, Toshiya; WE-11.1  
Kocaoglu, Dundar F.; MB-11.3; ME-12.3;  
TE-13.1; WE-01.3; HE-04  
Kodes, Rudolf; MB-08.1  
Kohtsuki, Shotaro; TB-04.4  
Komorek, Nicolas J.; WB-04.1  
Kondo, Akira; HD-04.2  
Kondo, Masayuki; WB-07.3  
Kondo, Naoko; HD-04.2  
Kondou, Shuuji; ME-10; TE-10; WE-10;  
Kondrashov, Alexander; HE-01.2  
Kono, Tomoki; MD-04.2  
Koral Kordova, Sigal; WB-01.3  
Kosaka, Michitaka; MB-02.3; TE-02.3;  
WB-12.3; WE-04.2; HB-05.3; HD-04.2  
Kozanoglu, Hayri; TB-08.1  
Kozanoglu, Orkun; TE-11.1  
Krenz, Pascal; MB-06.1; ME-02.1  
Kruger, David; MB-12.1; ME-13.1;  
WB-04; HB-10  
Kuan, Chung-Huei; ME-05.1; TE-03.3;  
Kubo, Hiroshi; TE-12.1  
Kubo, Tomoaki; MB-09.2  
Kukko, Kirsi; TE-01.2  
Kume, Katsunori; WB-08.3  
Kuo, Beryl Z.; TD-04.4; TE-04  
Kuo, Che Jung; WB-11.2  
Kuo, Chien-Liang; TB-06.3  
Kuriyama, Yasutaka; WE-11.1  
Kwakkel, Jan H.; ME-12.1; TD-05.1

## L

Lai, Hsien-Che; TE-07.1  
Lai, Kuei Kuei; TB-09.3  
Lai, Wen-Hsiang; TD-06.4; HD-11.1;

HE-03.1  
Lai, Wen-Shan; MB-09.1  
Lalitnorasate, Paveena; MB-01.3  
Lam, H.Y.; TD-13.2  
Lamarca, Katia; WB-06.3  
Lan, Yuhong; TE-03.2; ME-03.1  
Laraia, Lilian R.; MD-04.3  
Lau, Antonio; HD-08.3  
Laurindo, Fernando; WE-08.3; WE-09.4  
Lee, Albert C. T.; TE-13.3  
Lee, Chia-Ko; TD-07.3  
Lee, Ching-Fang; TD-09.2  
Lee, Ho-Joong; WE-08.1  
Lee, Hsing-fen; TE-01.3  
Lee, Jeong-Dong; HD-02.2  
Lee, Jong M.; WB-06.2  
Lee, Michael; MB-03.1  
Lee, Yi-Chih; TD-07.3; TE-04.3  
Lee, Yih-Jiun; TB-13.4  
Lee, Yu-I; TB-06.3; TE-02.2  
Lei, Ren; WE-06.2  
Leite, Marcus V.; WE-07.2; HD-10.3  
Lemberger, Ian; WB-08.1  
Lenhari, Luciana C.; WE-07.2; HD-10.3  
Leonard, Awie C.; TD-04; WE-04.1;  
HD-02; HE-03.2  
Li, Chih Chun; TE-06.3  
Li, Chi-Jen; TD-07.2  
Li, Feng; TB-12.1  
Li, Jizhen; ME-13.3  
Li, Junping; HD-06.3  
Li, Xianjun; ME-11.3  
Li, Xiaoming; ME-13.3  
Li, Xin; HD-03.3  
Li, Xiujun; WE-11.3  
Li, Yawen; ME-13.3  
Li, Zhaohui; HD-06.1  
Liang, Huei-Mei; MD-01.1; HB-01.4;  
HE-01.3  
Lihui, Wang; WE-06.3  
Lillieskold, Joakim; WE-02.2  
Lim, Dong-Joon; TD-05.2; WB-05  
Limarta, Standley; ME-07.3  
Lin, Canhong; TD-13.2  
Lin, Cheng Pa; MD-09.2  
Lin, Cheng-Ta; ME-02.2

Lin, Chien-Chiang; TB-06.3; TE-06.3  
Lin, Ching-Wei; TD-13.3  
Lin, Hai-Chen; TE-13.3; WE-05.2  
Lin, Hsin-Hung; HB-10.3  
Lin, Jei-Heng; TD-09.4  
Lin, Jia-Yun; MD-03.2  
Lin, Lan-Hui; TE-07.3  
Lin, Ya-Ti; MB-09.3; ME-01.2  
Lin, Yang-Chih; MB-05.2  
Lin, Yang-Chu; TD-07.3  
Lin, Yu-Wen; TD-07.1  
Little-Wiles, Julie; TB-12.1  
Liu, Chun-Yi; MB-12.2  
Liu, Guangbin; WE-09.3; HD-06.2  
Liu, John S.; ME-03.2; HE-01.2  
Liu, Li; HD-05.3  
Liu, Shang-Jyh; ME-03.1; TE-03.2  
Liu, Xuan; HB-06.3  
Liu, Xuefeng; TD-01.3  
Liu, Yun; WB-09.2; WB-09.3; WB-09.4;  
WE-12.3  
Liu, Zhidong; TE-12.3  
Lizarraga, Miguel G.; WE-07.2; HD-10.3  
Lkhagvajav, Amarbayasgalan; TE-06.1  
Lo, Chih-cheng; MB-07.2; TE-07.3  
Lo, Liang-Huey; TE-13.3  
Lo, Shihmin; MB-11.1; MD-09.3;  
HB-01.2  
Loch, Christoph; TD-04.2  
Loewen, Ulrich; TB-11.1  
Lu, Ching-Hua; HE-03.4  
Lu, Louis Y.; ME-03.2; HE-01.2  
Lucas, Jessica; WE-03.3  
Luder, Arndt; MB-08.1

## M

Maccari, Emerson A.; HD-11.3  
Machado, Marcelo A.; ME-01; TD-02.2;  
TE-04.2; HD-01  
Magnanti, Thomas L.; WA-00.2  
Mahaphol, Inthrayuth; HD-09.3  
Makinen, Saku J.; WE-02.3  
Makutsoane, Mpho P.; WE-04.1  
Mammen, Anju A.; WB-10.1  
Mann, Hans-Georg; MD-10.2  
Mannen, Hideyuki; HB-04.2

# AUTHOR INDEX

---

Manning, Chase; WB-06.1  
Marcal, Rui F.; MD-07.3; TD-13.1  
Martins, Cibele B.; HD-11.3  
Martins, Sergio B.; HD-11.3  
Masuda, Hisashi; TB-04.3  
Masuya, Hitoshi; HB-01.1  
Mathew, Mary; MB-04; MB-04.3;  
TB-13.2; WB-03.1; WB-03.2; HB-03;  
HD-11; HD-11.2  
Matsumoto, Chugo; MD-04.2  
Matsumoto, Kaname; HB-02.2  
Matsumoto, Takayuki; TB-04.2  
Matsuoka, Yasutomo; HB-09.3  
Mattos, Claudia A.; WE-08.3  
Mayer, Jonas; TD-02.1  
Mbohwa, C.; WB-12.1  
McKinney, Laura; MB-02.2; ME-06;  
TE-03  
McPherson, Jacqueline; ME-07.3  
Mehta, Merwan; WB-01.1  
Mei, Hsiao-Chen; MD-09.3; HB-01.2  
Mei, Liang; HB-01.3  
Mello, Adriana M.; TB-04.1; TE-08.2  
Meng, Donghui; ME-11.3  
Merritt, Humberto; TD-06.3  
Milanzi, Ditshegofatso D.; HD-02.4  
Milford, Kim; TB-12.1  
Mitchell, Rick; HE-01.1  
Mitsufuji, Toshio; MD-11.2  
Mitsumori, Yaeko; TB-08.2; TD-03.4;  
Miyazaki, Kumiko; MB-01.3; MD-09;  
MD-09.1; TD-10.1  
Miyazawa, Takashi; HB-03.1  
Mizushima, Kazunori; TB-01.1  
Momaya, Kirankumar; MD-08.2;  
TB-12.4  
Mori, Miki; MB-09.2  
Morioka, Makoto; WE-01.1  
Moroga, Kana; WE-11.1  
Mortara, Letizia; TE-07.2  
Motohashi, Kazuyuki; TD-08.3; TD-08  
Mountford, Gregory A.; WE-02.1  
Mulder, Herman L.; HD-01.2  
Muller-Martin, Andreas; MB-08.1  
Munisi, Hawa I.; MB-04.2  
Munkongsujarit, Songphon; TD-04.1

Munson, J. Michael; TD-09.1  
Murata, Koichi; HB-02.2

## N

Naga Rekha, G; MB-04.3  
Nagata, Akiya; WE-11.1  
Nakahara, Itaru; ME-11.1  
Nakajima, Ryuji; HB-04.2  
Nakamura, Kenta; TD-08.1  
Nakamura, Kotaro; ME-04; TB-04.3;  
WE-01.1  
Nakata, Yukihiro; WB-12.2  
Nakayama, Yasuo; TD-08.1  
Namba, Masanori; TB-01  
Namba, Yu; MB-11.2  
Naruse, Hiroshi; TB-01.1  
Nascimento, Paulo T.; MD-04.3;  
ME-01.1; TB-04; TB-04.1; TE-08.3;  
TE-08.2; WB-06.3; HD-01.1  
Ng, Tsz Wing; TD-13.2  
Nhlengethwa, Ntokozo; HB-05.1  
Ni, Shih Yu; TE-06.3  
Nickeson, Matt; HE-02.3  
Nienaber, Ann-Marie; TE-04.1  
Niwa, Kiyoshi; MA-00; ME-02; TB-07;  
WE-07; HE-04  
Nomoto, Shinichiro; TD-06.2

## O

Odake, Nobutaka; ME-06.3; TD-01.2  
Ogano, Noah O.; MD-05.1  
Ogata, Masaki; MA-00.1  
Ohashi, Tetsuji; MA-00.2  
Ohnishi, Toshinobu; MB-02.3  
Ohno, Tadahisa; WE-11.1  
Okuyama, Ryo; MB-04.1  
Olivares-Olivares, Silvia L.; MD-08.1  
Oliveira, Joao Paulo L.; ME-08.2;  
HD-08.1  
Olorunniwo, Moses A.; ME-07.4  
Olorunniwo, Oludare; ME-07.4  
Onodera, Natsuo; TD-08.1  
Orgonas, Jozef; MB-05.1  
Osada, Hiroshi; MB-04.1; HB-03.1

Oshio, Kazuhiro; HE-05.2  
Osunyomi, Babasile D.; HB-10.2  
Otieno, Francis; TB-13.3  
Oyamada, Hiroshi; HD-10.2  
Ozcan, Sercan; TB-10.4

## P

Paholkova, Barbora; MB-05.1  
Pai, Jar-Yuan; HE-03.4  
Pan, Lee-Yun; MB-12.2  
Paramonov, Pavel; MB-05.3  
Park, Sehee; WE-08.1  
Park, Young-Jun; TE-13.1  
Park, Youngwon; WB-08.2; WB-08.4  
Partanen, Jouni; TE-01.2  
Peltola, Tero; TE-04.2; WB-06; WE-02.3  
Pessey, Julien; ME-07.3  
Phaal, Robert; TB-10.2; TE-07.2;  
WB-04.2; HD-02.1; HE-01.1  
Pham, Nhivuong; TB-03.3  
Pham, Thanh-Thao T.; MD-12.1  
Phan, Kenny; WE-01.3; HE-04  
Philbin, Simon P.; ME-09; WB-07.1;  
HD-10  
Phillips, Fred Y.; MD-02; ME-12.2;  
TD-05; WE-08.1  
Pihlajamaa, Jussi; TE-01.2  
Pitsch, Martin; WB-04.1; WE-05.1  
Porter, Alan L.; TB-09.1  
Potente, Till; TD-02.1  
Prabhu, Ganesh N.; MB-08.2; HB-02.4;  
HD-04.4  
Pretorius, Jan-Harm C.; MB-12.1; MB-12  
Pretorius, Leon; HB-05.2; MD-05.1;  
TB-06; TB-06.1; TD-05.3; HD-05  
Pretorius, Marthinus W.; TD-05.3  
Probert, David; TE-07.2; WB-04.2  
Pruyt, Erik; ME-12.1  
Pur, Sabine; MD-10.2  
Putri, Anjani; ME-06.1

## Q

Qi, YanRu; WE-12.3  
Qiao, Zheng; MD-11.4; TB-05.3

# AUTHOR INDEX

---

## R

Raffo, David; MD-04; WB-01.1; WE-09.1  
Ragel, Brian; HB-10.1  
Rahimi, Noshad; HE-02.2; HE-02.3  
Ranaei, Samira; TE-05.2  
Range, Justy; HE-03.2  
Redlich, Tobias; MB-06.1; ME-02.1  
Reis, Rubens A.; MD-07.3  
Ren, Fujun; WE-09.3; HB-06; HB-06.3  
Ren, Jie; HB-06.1  
Ren, Lei; ME-02.3  
Ren, Weihong; WE-09.3; HD-06.2  
Routley, Michele; HD-02.1  
Ruan, Yi; MD-10.3; MD-10  
Ruiz, Mauro S.; TB-08.3; TD-12.2

## S

Sadeh, Arik; TD-12.1  
Sadia, Rina; TB-07.2  
Saenz, Santos; HD-07.2  
Saiki, Tomoko; ME-03.3; TB-09; TD-03  
Sakano, Hiroyuki; TE-02.3  
Sakata, Ichiro; ME-07.2; TE-12.3;  
WE-12.1  
Sakurai, Mitsuya; MB-04.2  
Sakurai, Shigeaki; TB-01.1  
Salman, Rosine H.; WE-09.1  
Sasakawa, Takashi; HB-02.2  
Sasaki, Hajime; ME-07.2; TE-12.3;  
WE-12.1  
Sato, Carlos E.; TE-09.2  
Sawa, Kenta; MB-12.3  
Sawaguchi, Manabu; ME-11.1  
Sawatani, Yuriko; WE-04.3  
Schaeffler, Thomas; MB-08.1; MD-05.3;  
TB-11.1  
Schmidhammer, Christoph; MD-10.2  
Schmitz, Stephan; TD-02.1  
Schuh, Guenther; MB-02.1; TB-05.2;  
TD-02.1; TE-05.1; WB-04.1; WE-05.1  
Seboni, Lone; MD-05.2  
Seino, Takehisa; MB-09.2; MB-09  
Sengoku, Shintaro; MB-04.2; ME-07.1;  
ME-07; HD-10.1

Serra, Fernando A.; HD-11.3  
Shang, Lining; TB-09.1  
Shannon, Randall M.; TE-13.2  
Sheikh, Nasir; ME-12; TE-13; TE-13.1;  
WE-09  
Shen, Qiutan; HB-06.1  
Sher, Peter J.; MB-11.1; MD-09.3;  
TD-04.4; WE-04; HB-01.2  
Shibata, Tomoatsu; WB-04.3  
Shichijo, Naohiro; HD-10.1  
Shih, Hsin-Yu; MD-11.1; TB-05.4;  
TD-04.4  
Shirahada, Kunio; TB-11.2; TD-12;  
TD-12.3; TD-12.4; TE-06.2; TE-06.4;  
WE-04.2; HB-05.3; HE-02.1; HE-02  
Shirakawa, Nobuyuki; WE-05.3  
Shiu, Shian-Hung; TE-04.4  
Silberbauer, Lukas; MB-05.1  
Silva Leme, Patricia C.; TD-12.2  
Siripitakchai, Naparat; TD-10.1  
Sokmen, Nermin; MD-05.4  
Song, Yu; WB-04.3  
Spinola, Mauro M.; WE-09.4  
Spivey, W. Austin; MB-05; TD-09.1;  
HE-05  
Srihari, M; WB-03.1  
Staphorst, Leon; TD-05.3  
Steinmann, Florian; MB-08.1; MD-05.3;  
TB-11.1  
Steyn, Jasper L.; ME-11; TB-09.2; TE-08  
Straus, Jonathan R.; MB-10.1  
Struffaldi, Aldo; TB-08.3  
Su, Fang-Pei; TB-09.3  
Su, Hsing-Ning; MB-03.1; MD-03.2;  
TB-03.1; TB-03.2; TD-10.2; TE-03.1  
Su, Wen-Jywan G.; HB-09.1  
Su, Yu-Shan; TD-10.4  
Sugie, Ryosuke; WB-08.2  
Sugimitsu, Kazunari; HD-03.1  
Sugimoto, Manabu; TD-03.3  
Sugiyama, Daisuke; WE-04.2  
Sukholthaman, Pitchayanin; TD-12.3;  
TD-12.4  
Sun, Hengyu; ME-08.3  
Sun, Peng; ME-08.3  
Sunasaki, Tomohiro; TE-02.1  
Suominen, Arho; TE-05.2

## T

Ta, Thi Dao; TE-09.3  
Tabira, Yoshihiro; TB-13.3  
Tai, Shih Chin; MB-09.1  
Takahashi, Kohei; MD-04.2  
Takahashi, Masayoshi; HB-04.2  
Takahashi, Naoki; TE-06.4  
Takahira, Ricardo Y.; MD-04.3  
Takano, Yasutomo; TE-05.3  
Takekura, Toru; TE-01.1  
Takeo, Eriko; MD-04.2  
Tamamura, Masatoshi; WE-05.3  
Tan, Yinliang (Ricky); MB-10.2  
Tanaka, Yoshitoshi; TB-03.3; TD-03.2;  
TD-03.3  
Tang, Ming-Shun; HD-11.1  
Tashiro, Hisato; HD-08.3  
Tashiro, Koichi; MB-11.2  
Tashiro, Yoichiro; WB-12.3  
Teng, MC; TE-13.3  
Thamhain, Hans J.; MD-05; WD-00.1;  
HD-05.1  
Thanasrivanitchai, Jul; TE-13.2  
Thomas, Christina; TD-02.1  
Thu Ha, Nguyen; WE-08.2  
Tian, Juan Juan; TB-01.3  
Timar, Katalin; MD-10.1  
Tippayasawate, Pongchalerm; ME-07.3  
Toga, Gulhan; WB-01.2  
Tomizawa, Hiroyuki; TD-08.1  
Trappey, Amy J.C.; TD-03.1  
Trappey, Charles V.; TD-03.1  
Tsai, Bi-Huei; TD-10.3; TD-10  
Tsai, Cheng-An; ME-01.3  
Tsai, Mavis; MD-12.3  
Tsai, Ming-Kwen; MB-03.2  
Tsai, Pei-Chi; HE-03.4  
Tsai, Pei-Chun; HD-09.1  
Tsai, Wan-Hsu; WE-05.2  
Tsai-Lin, Tung-Fei; MD-03.1  
Tsang, Kwok King; TD-05.4  
Tseng, Fang-Mei; MB-09.3; ME-01.2  
Tseng, Wei-Chih; HD-09.1

# AUTHOR INDEX

---

Tseng, Yung-Ching; ME-08.1  
Tsutani, Nobuko; TD-03.2  
Tubtiang, Arnon; WB-11.3  
Tutesigensi, Apollo; MD-05.2  
Tzeng, Gwo-Hshiung; TD-13.3

## U

Uchihira, Naoshi; MB-06.4; TB-01.1  
Umeda, Kentaro; TE-06.2  
Uscanga Castillo, Gonzalo I.; TB-12.3

## V

van Blommestein, Kevin; TB-10.4  
Van der Lingen, Elma; WE-02; HB-05.1;  
HE-03.3; HE-03  
Vandayar, Candice; HD-04.3  
Vartiainen, Matti; TE-01.2  
Vatcharapong, Sukkird; HE-02.1  
Verghese, George; TD-02.2; TE-04.2  
Vermeulen, Andre; MB-12.1  
Vianna, Regina Helena P.; TB-04.1  
Vieira Martins da Cunha Menezes,  
Cassia M.; TD-12.2  
Visessonchok, Tanunya; ME-07.2  
Voigt, Kai-Ingo; TB-11.1; MD-05.3  
Vollmar, Jan; MD-05.3

## W

Wagner, Martin J.; TB-12.1  
Wakabayashi, Naoki; HD-08.2  
Walsh, Steven; MD-02; TB-10.3  
Wang, C. H.; TE-07.3  
Wang, Bing; WE-03.2  
Wang, Chia Ying; WB-02.3  
Wang, Chih-Yuan; TD-10.4  
Wang, Chin-Hsien; HB-10.3  
Wang, Chun-Chieh; WB-07.4; WE-12.2  
Wang, Chun-Hsien; MB-07.2; HE-01.3  
Wang, Hong-Yan; WE-01.4  
Wang, Jian-Hang; HD-07.1  
Wang, Kun; HD-01.3  
Wang, LiYing; TB-01.3  
Wang, Ming-Yeu; TD-09.3; TD-09.4

Wang, Tien-Hao; ME-07.3  
Wang, Wayne; WB-09.1  
Wang, Xiaojiong; HB-06.3  
Wang, Xiaowen; WE-03.3  
Wang, Xiaoyan; TB-01.3  
Wang, Yue; TB-09.1  
Wang, Zhifang; HD-06.3;  
Washida, Yuichi; HB-04.2; HD-01.4;  
HE-01  
Watanabe, Seiichi; HB-01.1  
Watanabe, Toshiya; HD-10.2  
Weber, Charles M.; MB-05.1; TB-03;  
WE-05; HD-07; HE-04  
Weeks, Richard; WB-10; WB-10.1;  
WE-02.1; HB-09; HB-09.2; HD-02.4;  
HD-04.1  
Wei, He; TE-11.2; WE-06.2  
Weng, Calvin S.; TE-07.1  
Winzker, Dietmar H.; TB-06.1; TD-01;  
HB-01  
Wittman, Alexis; ME-07.3  
Wu, Bei; TB-01.3  
Wu, Chien-Hsin; MD-12.2  
Wu, Chien-Huei; HB-07.3  
Wu, Chorng-Guang; HB-04.3  
Wu, Dan; MD-11.4; HD-06.4; HD-06  
Wu, Feifei; MD-11.4; TB-05.3  
Wu, Feng-Shang; MD-12.2; TD-09.3;  
HB-07.3  
Wu, Seh-Wa; TB-07.3  
Wu, Squall ChunYi; TD-03.1  
Wu, Wei-Li; TD-07.3; TE-04.3  
Wu, Yann-Ling; TD-06.4  
Wu, Ying Yu; MB-05.3  
Wu, Yueh; TE-13.3  
Wu, Yung-Chin; MD-11.3  
Wuest, Sabine; MB-01.2  
Wulfsberg, Jens; MB-06.1; ME-02.1  
Wurth, Bernd; HD-02.3

## X

Xiang, Yangxue; HB-01.3  
Xiao, Wenli; WB-02.1  
Xiaoyan, Guo; WE-06.2  
Xie, Yuying; TD-01.3  
Xu, Ke; ME-11.3

Xu, Yusen; MD-03.3  
Xue, Lan; HD-03.3

## Y

Yamaguchi, Hiromi; WB-10.3  
Yamaguchi, Yasuhisa; MB-02.4  
Yamakawa, Daisuke; TD-01.2  
Yamamoto, Masato; TE-06.4  
Yamashita, Tomonori; HB-05.3  
Yamazaki, Nobuo; TE-12.1  
Yang, Chia-Han; TB-07.1; TB-07.4;  
TE-09.3  
Yang, Chun-Chieh; MD-01.1  
Yang, Ming Chung; TE-03.4  
Yang, Phil Y.; HD-07.1  
Yang, Sangoon; MB-07.1  
Yang, Yi-Chang; HD-07.1  
Yang, Yinjuan; TD-04.3  
Yang, Zi; TB-05.3  
Yasunaga, Yuko; WA-00.1  
Yeh, Bi-Ling; TB-07.3  
Yen, Hsin-Yi; HE-03.4  
Yen, Yung-Shen; MD-12.2  
Yildirim, Hakan; TD-11.3  
Yildirim, Nihan; TB-13; TD-11.3;  
WB-11.1; WE-11  
Yim, Deok S.; WB-06.2; WE-08  
Yin, Lin; HB-06.3  
Yip, Man Hang; TD-02.3; WB-04.2  
Yoneda, Susumu; TB-01.1  
Yoneda, Takahiro; TE-06.4  
Yoon, Byung Sung; TB-02.3  
Yoon, Jungsub; HD-02.2  
Yoon, Seong-Pil; TB-10.1  
Yoshida, Mayumi; HB-02.2  
Yoshida, Satoshi; TB-10.2  
Yu, Abraham S.; MD-04.3; ME-01.1  
Yu, Ching-Ying; MB-09.3  
Yu, Ming-Jen; TB-01.2  
Yu, Oliver; TA-00.2  
Yu, Sheng-Tsai; HB-07.2  
Yu, Ya-Wen; MB-10.3; ME-04.3  
Yuan, Benjamin J. C.; TD-13.3  
Yuan, Chien-Chung; HB-03.2; HB-03.3  
Yuan, Fei; MD-09.1



# AUTHOR INDEX

---

Yurtseven, Murat Kudret; TE-11.1

## Z

Zartha Sossa, Jhon Wilder W.; MD-01.2

Zeitouni, Naomi; TD-12.1

Zhang, Chao; ME-02.3

Zhang, Fang H.; WB-03.3

Zhang, Hui; MD-11.4

Zhang, Huijun; HE-01.4

Zhang, Huiliang; WE-06.1

Zhang, Yong; ME-05.2

Zhang, Yueyi; MB-07.4

Zheng, Nian; HE-01.4

Zheng, Zongxi; HD-01.3

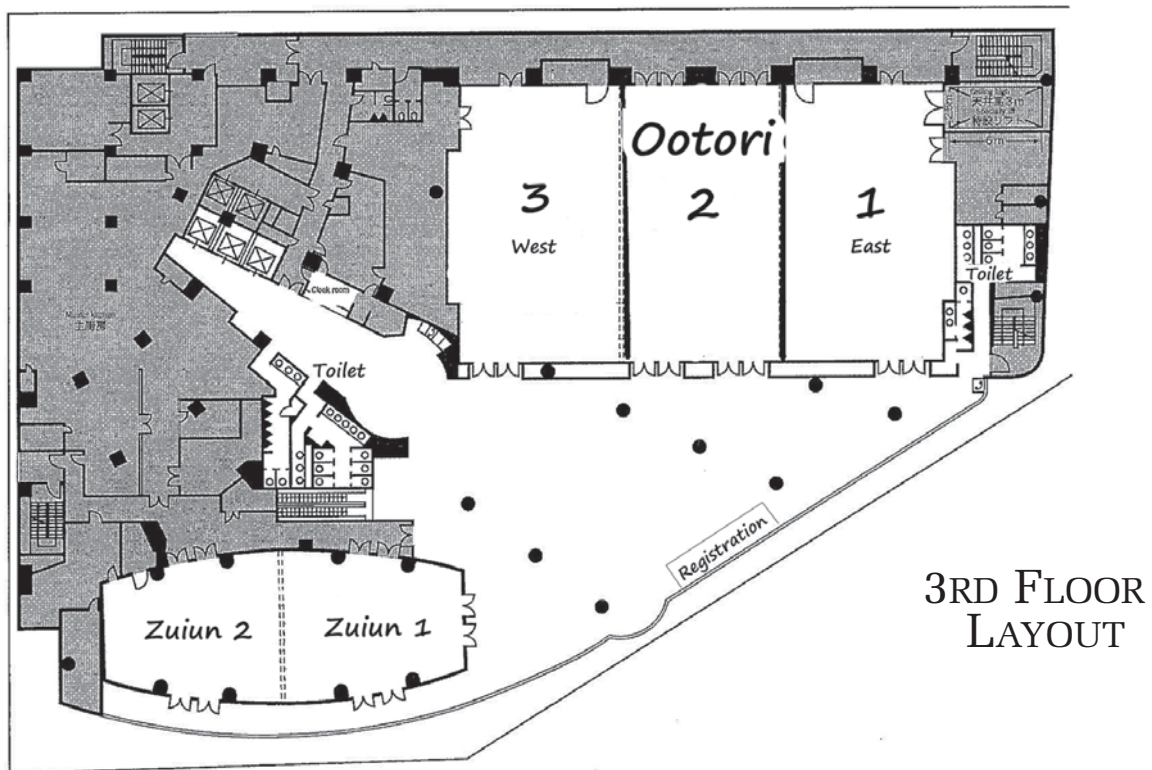
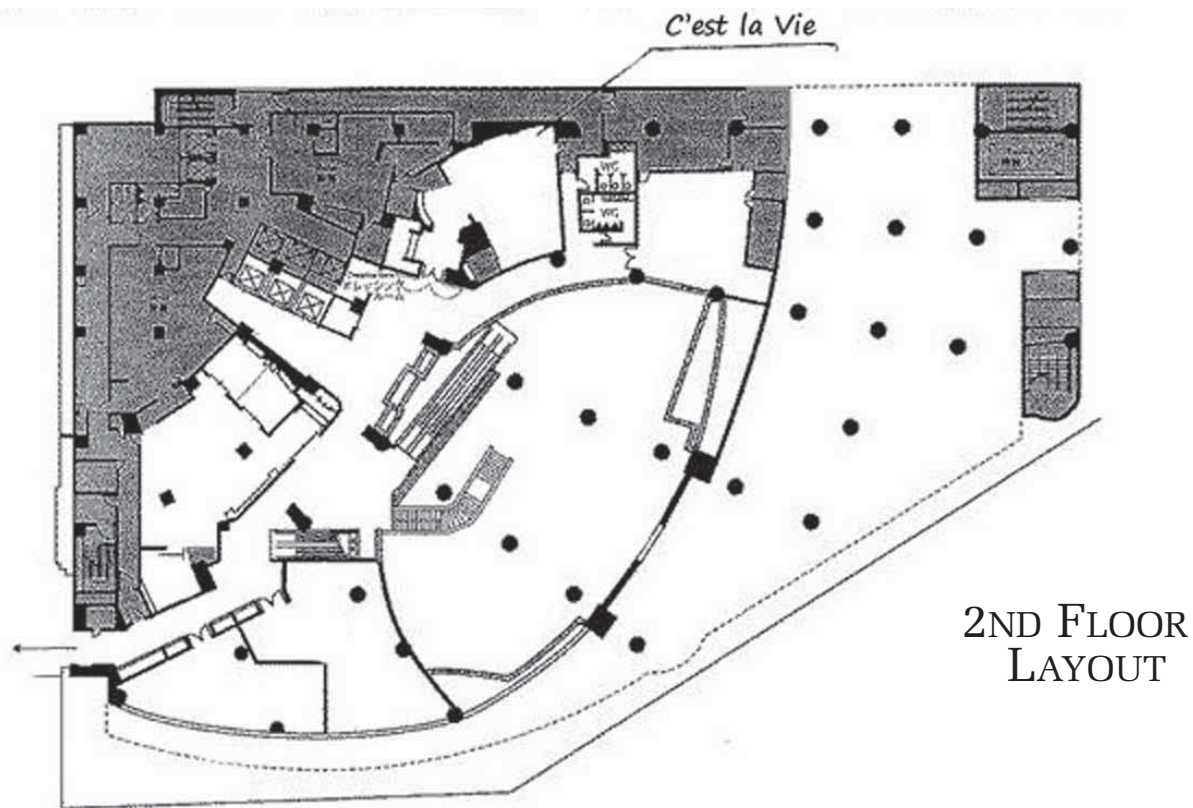
Zhou, Yuan; HD-03.3

Zhu, Zhaohui; WE-07.3

Zuo, Ze; TB-12.2

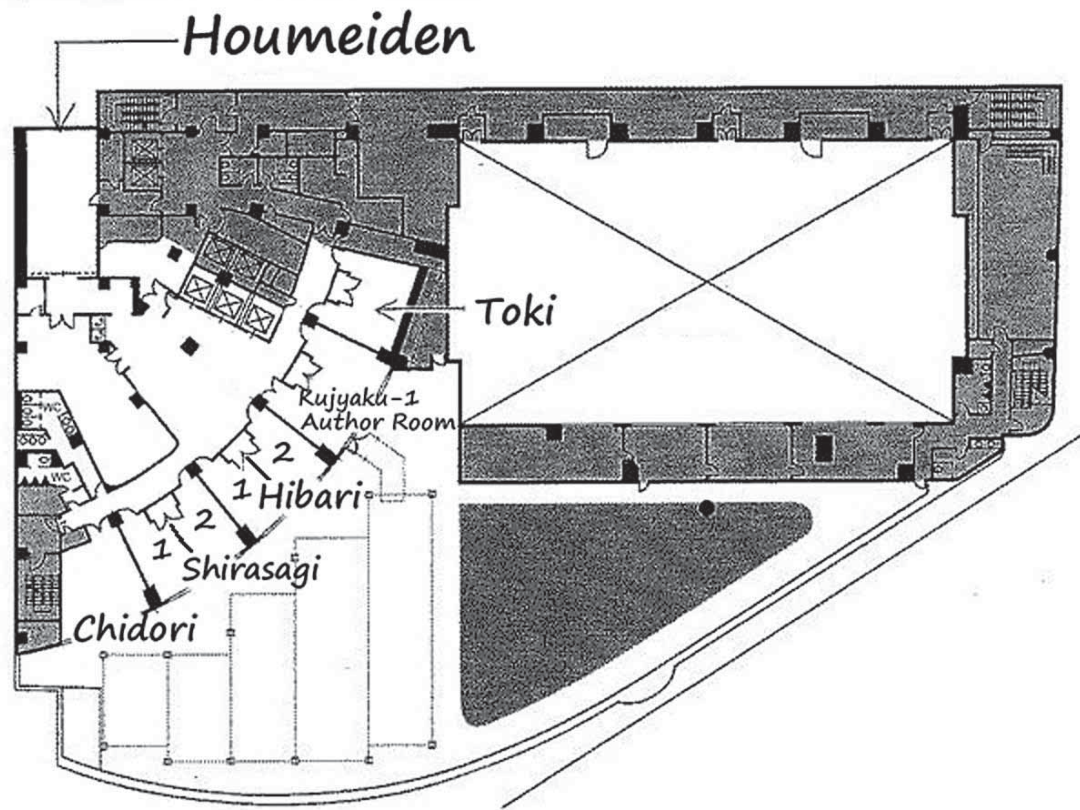


# ANA CROWNE PLAZA FLOOR PLAN



# ANA CROWNE PLAZA FLOOR PLAN

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4TH FLOOR  
LAYOUT

19TH FLOOR  
LAYOUT

