

TABLE OF CONTENTS

Message from the President and CEO of PICMET	2-3	
PICMET '16		
Executive Committee	4	
Acknowledgments.....	5	
Advisory Council	5	
Panel of Reviewers.....	6	
Past LTM Award Recipients	7-8	
Past Medal of Excellence Award Recipients	8-9	
Past PICMET Fellow Award Recipients.....	9-10	
PICMET '16 AWARDS		
Student Paper Award.....	11-13	
Medal of Excellence	14	
LTM Award	15	
GENERAL INFORMATION		
Conference Focus	16	
Who Should Attend.....	16	
Program.....	16	
Publications.....	17	
Registration Policy	17	
Session and Paper Designations.....	17	
Presentation Guidelines.....	17	
Audio/Visual Equipment.....	18	
Wireless Access.....	18	
PICMET Volunteers.....	18	
HAWAII		
Airport Transportation.....	19	
Weather.....	19	
Climate.....	19	
Attire.....	19	
Rainfall	19	
Water and Surf	20	
Mountains and Volcanoes	20	
Oahu	20	
Windward Coast.....	21	
Leeward Coast.....	21	
North Shore.....	21	
Central	21	
Honolulu	21-22	
OPTIONAL TOURS		
Pearl Harbor, AZ Memorial and Punchbowl	23	
Pearl Harbor Circle Island Adventure.....	23	
Mini-Circle Island with Scenic Shores Tour	23	
Manoa Waterfall Adventure Hike	23	
Helicopter Tour	24	
Ko'olina Dolphin and Snorkeling Cruise.....	24	
IEEE HAWAII SECTION DISTINGUISHED LECTURE SEMINAR		25
SOCIAL EVENTS		
Reception / Buffet	26	
Hawaiian Luau Dinner.....	26	
Awards Banquet	26	
SITE VISIT		
Oceanic Institute Site Visit.....	27	
TECHNICAL PROGRAM		
Program Overview	28	
The Papers.....	28	
The Schedule	28	
Monday Schedule	29	
Tuesday Schedule	30	
Wednesday Schedule.....	31	
Thursday Schedule	32	
Schedule of Sessions by Date.....	33-35	
Schedule of Sessions by Room.....	36-38	
Personal Schedule.....	39	
SPECIAL SESSIONS		
Country Representatives Meeting	40	
Picmet '17 and '18 Planning Session.....	40	
PLENARY SESSIONS		41-46
PHD COLLOQUIUM.....		47
PANELS		48
SESSIONS.....		50-113
AUTHOR INDEX.....		114-120
FLOOR LAYOUT OF THE MARRIOT HOTEL		121

PICMET '16



PICMET

Dear PICMET Guests:

We are pleased to welcome you to the PICMET '16 Conference.



The general theme of PICMET '16, "Technology Management for Social Innovation," brings attention to technological innovations that meet social goals by providing effective, efficient and sustainable solutions to social problems and creating value to society as a whole. It is woven into the keynote speeches and the papers, but the Conference is not limited to the theme. Every aspect of technology management is addressed in the presentations.

We are honored that President John Gotanda of Hawaii Pacific University (HPU) and CIO of the State of Hawaii, Todd Nacapy, will welcome PICMET guests to Hawaii on Tuesday.

There are seven keynote speeches:

Monday:

Mr. Shinjiro Iwata, Representative Executive Officer, Executive Vice President and Executive Officer, Hitachi Ltd. Japan; "Social Innovation – Delivering New Value Through Collaborative Creation"

Dr. Hans-Joerg Bullinger, Senator of the Fraunhofer-Gesellschaft, Germany; "Innovation Management 2030: Integrating Social Aspects in Technology & Innovation Management"

Tuesday:

*Dr. Bulent Atalay, University of Mary Washington and the University of Virginia; Member, Institute for Advanced Study, Princeton, USA; "Creativity and Genius: Inside the Minds of Leonardo, Shakespeare, Newton, Beethoven and Einstein," followed by a book signing ceremony for Dr. Atalay's book, *Math and the Mona Lisa**

Wednesday:

Dr. Jay Lee, Ohio Eminent Scholar, L.W. Scott Alter Chair, and Distinguished University Professor, University of Cincinnati, USA; "Recent Advances of Predictive Big Data Analytics and Industry 4.0 for Future Manufacturing and Service Innovation"

Dr. Alan L. Porter, Professor Emeritus, Georgia Institute of Technology, USA; "Forecasting Innovation Pathways: The Case of Big Data"

Thursday:

Dr. Nam P. Suh, Ralph E. & Eloise F. Cross Professor, Emeritus, Massachusetts Institute of Technology (MIT), USA; "Challenges in Designing and Implementing Large Systems"

Dr. Adnan Akay, Provost, Bilkent University, Ankara, Turkey; "External Technology Advisory Boards"

PICMET '16 received 779 submissions. After a double-blind refereeing process, 331 papers were included in the conference. The referees were from around the world. The authors represent more than 300 academic institutions, industrial corporations and government agencies in 37 countries.

In addition to the technical program, a very interesting site visit is offered to the Oceanic Institute, affiliated with Hawaii Pacific University. Reservations can be made for the site visit at http://www.picmet.org/new/Conferences/16/site_visits.aspx.

Ground transportation between the airport and the hotel by taxi is about \$50 plus tip one way. The shuttle is \$16 per person one way, but there is usually a long wait at the airport. To avoid the wait, PICMET has arranged for our guests to make advance reservations at: <http://www.robertshawaii.com/picmet>.

With the "paradise" location of PICMET '16 in Hawaii, our guests can arrange for numerous tours before, during and after the Conference at http://www.alohaholidayshawaii.com/tours_oahu.htm.

The PICMET '16 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 41 sections, listed below, each containing several papers on the topic.

- **Collaborations for Technology Management**
- **Commercialization of Technology**
- **Competitiveness in Technology Management**
- **Convergence of Technologies**
- **Decision Making**
- **E-Business**
- **Educational Issues**
- **Emerging Technologies**
- **Enterprise Management**
- **Entrepreneurship/Intrapreneurship**
- **Environmental Issues**
- **Global Issues in Technology Management**

PICMET '16

- Information & Knowledge Management
- Information/Communication Technologies
- Infrastructure Management
- Innovation Management
- Intellectual Property
- Manufacturing Management
- New Product Development
- Productivity Management
- Project/Program Management
- Quality Management
- Science and Technology Communication
- Science and Technology Policy
- Social Innovation
- Software Process Management
- Strategic Management of Technology
- Supply Chain Management
- Sustainability Management
- Technical Workforce
- Technology & Knowledge Transfer
- Technology Adoption
- Technology Assessment and Evaluation
- Technology Diffusion
- Technology Forecasting
- Technology Management Framework
- Technology Management in the Energy Sector
- Technology Management in the Financial Sector
- Technology Management in the Health Sector
- Technology Management in the Service Sector
- Technology Roadmapping

Many colleagues, worldwide, contributed to the success of the PICMET '16 Conference.

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

Ann White, as the Executive Director Emeritus, edited the *Bulletin* and prepared the front-end materials; Liono Setiowijoso designed, maintained and managed the information systems, and formatted the papers for the Proceedings; Caroline Mudavadi, as the Executive Assistant, provided continuous support throughout the planning process and managed the registration process; Kenny Phan, as the Executive Director of PICMET, coordinated the overall planning for the conference. Tugrul Daim was the Director of Technical Activities and Director of Student Activities, Kiyoshi Niwa and Dilek Cetindamar Kozanoglu were the Co-Directors of International Activities, and Charles Weber was the Director of Awards. Songphon Munkongsujarit and Byung-Sung Yoon coordinated the on-site activities; Ibnu Wibowo Tandiono managed the documentation together with Pei Zhang; and Jeff Birndorf developed graphic arts for the conference.

Timothy Anderson, Tugrul Daim, Kiyoshi Niwa, Dilek Cetindamar Kozanoglu and Gary Perman conducted the review process for the papers as the Associate Editors; 155 colleagues from around the world constituted the Panel of Reviewers. They each reviewed up to 10 papers submitted to PICMET '16. Each paper was reviewed by two or more reviewers to assure high quality. Caroline Mudavadi and Kenny Phan did the scheduling of the accepted papers for presentation at the conference. Hamad Alanazi, Edwin Garces, Liliya Hogaboam, Jiali Ju, Rafea Khalifa, Joao Lavoie, Inthrayuth Mahaphol, Caroline Mudavadi, Byung-Sung Yoon, Chih-Jen Yu and Pei Zhang were the Editorial Assistants to check and verify that the finalized papers included all the revisions recommended by the reviewers.

Vince Reindl and Rob Bossingham 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 and supporters of PICMET '16 made this conference possible. We extend special thanks to all of them: Portland State University Department of Engineering and Technology Management, Maseeh College of Engineering and Computer Science, Portland State University Foundation, In-Focus Corporation, Hawaii Visitors and Convention Bureau, Hawaii Pacific University, and University of Hawaii.

We believe the PICMET '16 *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.

~ Dunder F. Kocaoglu, President and CEO



PICMET

PICMET '16

DEDICATION

PICMET '16 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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Hawaii Pacific University
University of Hawaii

COOPERATING SOCIETIES

IEEE - Technology Engineering Management Society
INFORMS – Technology, Innovation Management
and Entrepreneurship Section
IEEE Hawaii Section
IEEE Computer Society – Hawaii 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.

Dr. Adnan Akay, Provost, Bilkent University, Turkey
Mr. Hamid Reza Amirinia, Head, International Innovation and Technology Exhibition, Iran
Dr. Bulent Atalay, Professor, University of Mary Washington and the University of Virginia, USA
Dr. Daniel Berg, Professor, University of Miami, USA
Dr. Walter Buchanan, Professor, Texas A&M University, USA
Dr. Hans-Jeorg Bullinger, Senator, Fraunhofer-Gesellschaft, and Professor, University of Stuttgart, Germany
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Dr. Youngrak Choi, S&T Policy Adviser, Korea
Dr. Steven Eppinger, Professor, MIT, USA
Dr. Eliezer Geisler, Professor, Illinois Institute of Technology, USA
Dr. Hans G. Gemuenden, Professor, Berlin Technical University, Germany
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Mr. Roy Hemmingway, Energy Consultant, USA
Mr. Shinjiro Iwata, Advisor, Hitachi, Japan
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Dr. Nam P. Suh, Professor Emeritus, MIT, USA
Dr. James M. Utterback, Professor, MIT, USA
Dr. Yuko Yasunaga, Deputy Director General, Industrial Science and Technology, and Standards and Conformity Assessment, METI, Japan
Dr. Oliver Yu, Executive in Residence, College of Business, San Jose State University, USA



PICMET '16

PANEL OF REVIEWERS

Papers submitted to PICMET conferences are subjected to a double-blind review process. Each paper included in the PICMET '16 conference was reviewed by two or more members of the Panel of Reviewers to assure a very high quality. The panel had 155 members from around the world. They are listed below in alphabetical order by last name.

Hitoshi Abe
Mark Ahn
Jose Albors-Garrigos
Joe Amadi-Echendu
Muhammad Amer
Jean-Pierre Auffret
Alfonso Avila-Robinson
Elif Baktir
Bridget Barnes
Nuri Basoglu
Robert Bass
Pamela Becker
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Yufen Chen
Byung Chul Choi
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Toni Doolen
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Gita Mathur
Nitin Mayande
Paul Menig
Iffet Iyigun Meydanli
Yaeko Mitsumori
David Moore
Songphon
Munkongsujarit
Nazmun Nahar
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Toryos Pandejpong
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Marthinus Pretorius
Prattana
Punnakitikashem
T. Ramayah
Kem Ramdass
Bharat Rao
Tobias Redlich

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Frank Steiner
Jasper Steyn
Fang-Pei Su
Hsin-Ning Su
Yalcin Tanes
Thorsten Teichert
Alfred Thal, Jr.
Harald Throne-Holst
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Andreas Udbye
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Calvin Weng
Gerry Williams
Dietmar Winzker
Nihan Yildirim
Man Hang Yip

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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 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

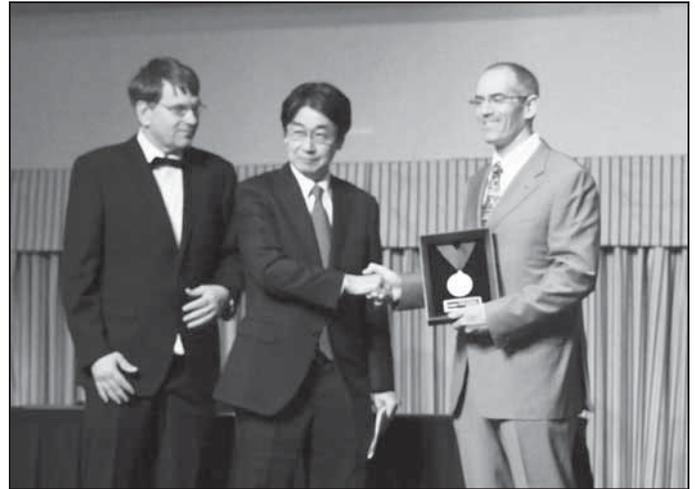
2004

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

Dr. Gunnar Hambraeus, member of the Swedish Royal Academy of Science and former President and Chairman, Royal Swedish Academy of Engineering Sciences, Sweden

2005

Dr. Morris Chang, Founding Chairman, Taiwan Semiconductor Manufacturing Company Ltd. (TSMC),



Taiwan

Dr. Pairash Thajchayapong, Permanent Secretary, Ministry of Science and Technology, Thailand

Dr. Eric von Hippel, Professor and Head of the Technological Innovation and Entrepreneurship Group, Sloan School of Management, Massachusetts Institute of Technology, USA

Prof. Dr.-Ing. Dr. Sc. h.c. Bacharuddin Jusuf Habibie, former President, Indonesia, and founder and chairman, The Habibie Center, Indonesia

2006

Dr. Youngrak Choi, Chairman, Korea Research Council of Public Science & Technology (KORP), Korea
Dr. Tsuneo Nakahara, Adviser to CEO (past Vice Chairman) of Sumitomo Electric Industries, Ltd., Japan

Dr. Mehmet Nimet Ozdas, Dept. of Mechanical and Control Engineering, Istanbul Technical University, Turkey
Dr. Edward B. Roberts, David Sarnoff Professor of the Management of Technology and Chair, Massachusetts

Institute of Technology (MIT) Entrepreneurship Center, USA

2007

Dr. Harold A. Linstone, Editor-in-chief, Technological Forecasting and Social Change, University Professor Emeritus, Systems Science, Portland State University, USA

Dr. Yoshio Nishi, Director of Research of the Stanford Center for Integrated Systems, Director of the Stanford



PICMET '16

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

2014

Dr. Hans-Joerg Bullinger, Senator of the Fraunhofer-Gesellschaft, Germany
Mr. Michael Joseph, Director of Mobile Money, Vodafone Group Services Limited, UK; and Fellow, the World Bank
Dr. 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
Mr. Takeshi Uchiyamada, Chairman of the Board, Toyota Motor Corporation, Japan

2015

Mr. John R. McDougall, President, National Research Council, Canada



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 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

PICMET '16

Dr. Fariborz Maseeh, Founder and President, The Massiah Foundation
Dr. T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami

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

2015

Dr. Steven Eppinger, Professor of Management Science and Innovation, Massachusetts Institute of Technology, USA
Dr. Alan L. Porter, Professor Emeritus, Georgia Institute of Technology; and Director of R&D for Search Technology, Inc., USA

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 with their affiliations and at the time of the award are listed below.

2011

Mr. Charles Allcock, PGE, USA
Dr. Daniel Berg, Rensselaer Polytechnic Institute (RPI), USA



PICMET '16

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

2013

Dr. Klaus Brockhoff, WHU – Otto Beisheim School of
Management, Germany
Dr. Antonie de Klerk, University of Pretoria, South
Africa
Dr. Norman G. Einspruch, University of Miami, USA
Dr. Joseph P. Martino, Yorktown University, USA
Mr. Terry Oliver, Bonneville Power Administration,
USA
Dr. Alan L. Porter, Search Technology, Inc., USA
Dr. Albert H. Rubenstein, Northwestern University, USA
Dr. James C. Spohrer, IBM, USA
Dr. David M. Steele, San Jose State University, USA

2014

Dr. Timothy R. Anderson, Portland State University,
USA
Dr. Tugrul U. Daim, Portland State University, USA
Dr. Fred Phillips, Stony Brook - State University of New
York, USA
Dr. David Probert, University of Cambridge, UK

2015

Dr. Oliver Yu, President and CEO, The STARS Group;
Executive in Residence, Lucas College of Business,
San Jose State University, California, USA



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, 2015. 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 certificate for the student, as well as a certificate 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

Ying Huang

ADVISOR & CO-AUTHOR

Dr. Alan L. Porter

UNIVERSITY

Beijing Institute of Technology,
China

PAPER TITLE

“Exploring Technology Evolution Pathways to Facilitate Technology Management: A Study of Dye-Sensitized Solar Cells”

ABSTRACT

Market competition drives attention to the prospects of new and emerging science & technologies (NESTs), which are fast changing and, so far, have relatively limited applications. Technology evolution pathways, as a powerful representation of the development of technology, have caught researchers' interest as a tool to trace historical progression, explore knowledge diffusion, and forecast future NEST trends. Citation analysis approaches are actively applied to structure a large number of patents, map patent distribution, and capture knowledge transfer and change in technologies or industries. This paper (1) introduces the indicator of connectivity and modularity in the interior citation network to identify the technology development stage; (2) takes family patent information into the process of building a comprehensive patent citation network; and (3) extracts technological trajectories by applying integrated approaches of main path analyses, namely global main path analysis and global key-route main analysis, among different technological stages. We illustrate this approach with dye-sensitized solar cells (DSSCs) as an example of a promising NEST, contributing to the remarkable growth in the renewable energy industry. The results show how our method can trace the main development trajectory of a research field and discern the

technology focus to help decision-makers facilitate technology management.

In addition, there were four Honorable Mentions.

BRAD W. HOSLER OUTSTANDING STUDENT PAPER HONORABLE MENTIONS

AUTHOR

Mustafa Abbas

ADVISOR & CO-AUTHOR

Dr. Dundar F. Kocaoglu

UNIVERSITY

Portland State University, USA

PAPER TITLE

“Consistency Thresholds for Hierarchical Decision Model”

ABSTRACT

The objective of this research is to establish consistency thresholds linked to alpha levels for hierarchical decision model's (HDM) judgment quantification method. Measuring consistency in order to control it is a crucial and inseparable part of any AHP/HDM experiment. The researchers on the subject recommend establishing thresholds that are statistically based on hypothesis testing and are linked to the number of decision variables and alpha level. Such thresholds provide the means with which to evaluate the soundness and validity of an AHP/HDM decision. The linkage of thresholds to alpha levels allows the decision makers to set an appropriate inconsistency tolerance compatible with the situation at hand. The measurements of judgments are unreliable in the absence of an inconsistency measure that includes acceptable limits. All of this is essential to the credibility of the entire decision-making process and hence is extremely useful for practitioners and researchers alike. This research includes distribution fitting for the inconsistencies. The superb fits obtained give confidence that all the statistical inferences based on the fitted distributions accurately reflect the HDM's inconsistency measure.

AUTHOR

You-Na Lee

ADVISOR & CO-AUTHOR

Dr. John Walsh

UNIVERSITY

Georgia Institute of Technology, USA

STUDENT PAPER AWARDS

PAPER TITLE

“Distributed Loci of Innovation in Firms: R&D and non-R&D Innovation”

ABSTRACT

Innovative ideas can be generated from knowledge built throughout a firm. However, the innovation management literature that is based on an economic perspective has emphasized R&D, i.e., intended and organized inventive activity, as an essential input for innovation, while often neglecting the importance of informal inventive activity outside R&D. In contrast, the learning by doing literature addresses innovation by outside-R&D activity, primarily focusing on process improvement, although it has the potential to provide additional insights for understanding significant product innovation generated outside R&D. Bridging the innovation management literature and organizational learning literature, and adopting a sociology of work perspective, we show that non-R&D work, by building on learning processes separate from R&D, can generate product innovation as well as process innovation. We also show rates of non-R&D invention are relatively higher in knowledge environments that are less general (i.e., lower mobility/transferability) and more visible (i.e., tighter links between actions and outcomes). The paper concludes with a discussion of the implications of these insights for innovation management.

AUTHOR

Anja Herrmann-Fankhänel

ADVISOR & CO-AUTHOR

Prof. Dr. Stefan Huesig

UNIVERSITY

Technische Universität Chemnitz, Germany

PAPER TITLE

“How Much Social Innovation is Behind the Online Platforms of the Sharing Economy?: An Exploratory Investigation and Educating of Clusters in the German Context”

ABSTRACT

The paper aims to generate insight about conceptualization of the sharing economy. With a field research of 76 online platforms associated with the German sharing economy (SE), a generalized conceptualization is formed. With the inferred attributes and developed categories, clusters are built. The German sharing economy is outlined as a conglomerate of business models that are affecting classical consumption by online platform-using business organizations, peer-to-peer consumption without business intermediates, and hybrid forms between

commercial and non-commercial users. Within these and their frequency, conclusions about possibilities for alternative consumption and social innovations are discussed. A minority can be directly linked to alternative consumption that acts without business intermediates or without monetary reward. Seldom can cases be interpreted as social innovations, because improvements in social concerns are enabled through online platform technology. The frame of the German economic system for the sharing economy is considered briefly to underpin assumed developments and effects, which led to the actual status and will influence the sharing economy's future. The study is theoretically based on the resource-dependence approach and on related fields. Concluding hypotheses are derived from our results for further research on SE.

AUTHOR

Rahul Z. More

ADVISOR & CO-AUTHOR

Dr. Karuna Jain

UNIVERSITY

Indian Institute of Technology Bombay, India

PAPER TITLE

“T-Shape Competence Model for Firms to Leverage Innovation Capabilities and Create Impact in a Cluster”

ABSTRACT

Automobile clusters, driven by innovation capabilities, have emerged as competence centers and engines of new economic growth in India. Identified as a high potential sector, the automobile industry has been targeted under the “Make in India” initiative to foster inclusive growth in the country. The dynamism within a cluster emerges from the interaction between innovation systems and global value chain systems, which contribute to developing a framework for evaluating the innovation performance and maintaining competitiveness of firms. While evaluating innovation performance, this research examined the innovation capabilities of auto component firms and analyzed how firms in the Pune automobile cluster integrate technology management and innovation strategies with their business strategy. A mixed research methodology was adopted for this study. Structured equation modeling (SEM) was used to test the hypotheses, and the results show how firms utilize innovation capabilities and leverage their innovations through emerging practice domains. A T-shape competence model is proposed to achieve global competitiveness and create sustainable impact through social innovations.

MEDAL OF EXCELLENCE

Initiated at PICMET '04 in Seoul, Korea, the Medal of Excellence award is given for extraordinary achievements of individuals in any discipline for their outstanding contributions to science, engineering and technology management.

PICMET '16 AWARDEES

Dr. Jay Lee

Ohio Eminent Scholar, L.W. Scott Alter Chair, and Distinguished University Professor, University of Cincinnati, USA



Dr. Jay Lee is Ohio Eminent Scholar, L.W. Scott Alter Chair Professor, and Distinguished University Professor at the University of Cincinnati, and he is the Founding Director of the National Science Foundation (NSF) Industry/University Cooperative Research Center (I/UCRC) on Intelligent Maintenance Systems (IMS www.imscenter.net), which is a multi-campus NSF

Industry/University Cooperative Research Center which consists of the University of Cincinnati (lead institution), the University of Michigan, Missouri University of S&T, and University of Texas-Austin. The Center has developed partnerships with over 85 companies from 15 countries since its inception in 2001. In addition, he has mentored his students and developed a spin-off company, Predictronic, with support from the NSF Innovation ICORPS Award in 2012. He also served as an invited committee member for White House Cyber Physical Systems (CPS) Advisory Group in 2013.

His current research focuses on Industrial Big Data Analytics, Cyber-Physical Systems, as well as Prognostics and Health Management (PHM). He led the IMS Team and developed the well-known Watchdog Agent[®] (a systematic platform for data analytics toolbox used by over 80 global companies) as well as the Dominant Innovation[™] (a methodology for product and service innovation design that has been used by many Fortune 500 companies).

Currently, Dr. Lee also serves as advisor to a number of global organizations: he is a member of the Manufacturing Executive Leadership Council; member of International S&T Committee of Alstom Transport, France; Scientific

Advisory Board of Flanders' MECHATRONICS Technology Centre (FMTC) in Leuven, Belgium; Scientific Advisor Board of SIMTech, Singapore; and member of the Advisory Committee of MIRDC Taiwan. In addition, he serves as editor and associate editor for a number of journals including *IEEE Transactions on Industrial Informatics and International Journal on Prognostics & Health Management* (IJPHM). In addition, he is also a De Tao Master in Innovation (http://www.detaoma.com/Jay_Lee/).

Previously, he served as Director for Product Development and Manufacturing at United Technologies Research Center (UTRC), E. Hartford, CT, as well as program director for a number of programs at NSF during 1991-1998, including the Engineering Research Centers (ERCs) Program, the Industry/University Cooperative Research Centers (I/UCRCs) Program, and the Materials Processing and Manufacturing Program. He also served as advisor to a number of universities including Cambridge University and Johns Hopkins University.

Dr. Lee is a Fellow of ASME, SME, as well as a founding fellow of the International Society of Engineering Asset Management (ISEAM). He is a frequently invited speaker and has delivered over 200 invited keynote speeches at major international conferences and has over 20 patents and two trademarks. He received a number of awards, including the most recent NSF Alex Schwarzkopf Technological Innovation Prize in Jan. 2014, MFPT (Machinery Failure Prevention Technology Society) Jack Frearey Award in 2014, and the Prognostics Innovation Award from National Instruments in 2012. He mentored his students to participate in PHM Data Challenge Competition and won the 1st prize five times since 2008. He is also an honorary advisor to Heifer International, a charity organization working to end hunger and poverty around the world by providing livestock and training to struggling communities.



PICMET

LTM AWARD

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 '16 AWARDEE

Mr. Shinjiro Iwata

Advisor to Hitachi Ltd., Japan



Mr. Shinjiro Iwata is Advisor to Hitachi Ltd. He retired in April after serving as the Representative Executive Officer, Executive Vice President, Executive Officer and Chief Transformation Officer. Mr. Iwata began his career with Hitachi Ltd. in 1972, when he joined the Overseas Business Department. Working his way up through various positions, in

1996 he became manager of the Business Planning Department for the Information Systems Group. He joined Hitachi Data Systems (HDS) in 1997 as Executive Vice President. After improving the performance of HDS, he became CEO of the company in 2001. In 2006 he became

CMO of the newly established Hitachi Global Storage Technologies (HGST), where he oversaw everything from manufacturing to front-line sales. Later, acting as EVP, he implemented sweeping management reforms, putting HGST's business firmly back on track. In 2009, he returned to Hitachi Ltd. as Vice President and Executive Officer, CEO of Service & Global Business, Information & Telecommunication Systems. In the following years, Mr. Iwata strengthened the overseas divisions of ICT, later becoming Senior Vice President, and further contributing to the expansion of business. In 2013 he became Representative Executive Officer and worked on management reform of the entire Hitachi Group. Mr. Iwata firmly believes in nimble management making use of data, and efficient waste-free management. In order to implement this policy, Mr. Iwata also acted as CIO for integration of Hitachi's internal ICT systems and a leader of the End-to-End Supply Chain Project. Most recently, Mr. Iwata served as Director of the Hitachi Smart Transformation Project Initiatives Division, which is reforming the structures of the entire Hitachi Group. Since 2012, he has also been a visiting professor at Tsukuba University.



GENERAL INFORMATION

CONFERENCE FOCUS

The Technology Age is upon us. It is a challenge to think of any activity in any part of our lives that is not affected or driven by technology. PICMET '16 emphasizes the role of technology management for social innovation that meets social goals by providing effective, efficient and sustainable solutions to social problems and creates value to society as a whole. It includes both for-profit and non-profit innovation by the public sector, private sector and NGOs.

Some examples of technology management for social innovation are:

- Partnerships among industry, government, NGOs and the public for collaborative creation of value for growth through technology
- Managing technology for micro-credits institutions
- Managing health technologies to eradicate HIV, TB, malaria and other diseases
- Managing transportation technologies to meet safe and effective transport needs
- Managing energy technologies to provide uninterrupted energy
- Providing technological solutions to address global warming issues
- Developing and managing technologies to eliminate water shortages
- Managing information technology to bring education to remote areas of the world
- Elimination of the digital divide in societies
- Managing the convergence of biotechnology, nanotechnology and information technology for early detection of chronic diseases
- Managing genetic engineering to boost crop yield
- Managing nanotechnology for improvements in agricultural products and their distribution
- Managing technology for improved infrastructure and services
- Managing technology for pollution control

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 to meet the world's needs.

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.

It is our expectation that, by focusing on the role of

technology management in social innovation, the PICMET '16 Conference will encourage researchers to engage in significant scholarly work in the areas listed above in the years to come.

WHO SHOULD ATTEND

Following the PICMET tradition, this high-impact conference 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 '16 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 '16 program consists of

- Ph.D. Colloquium, "Getting Your PhD....and Beyond," Sunday, September 4, 13:00 - 17:00, Waikiki Ballroom, Salon 2 (3rd floor of the Paoakalani Tower near the swimming pool)
- Plenary sessions by global leaders from industrial corporations, academic institutions and government agencies in the Kona Moku Ballroom (3rd floor of the Paoakalani Tower)
- Two special meetings:
 1. Country Representatives Lunch Meeting for the current PICMET Country Representatives and

GENERAL INFORMATION

those who are interested in becoming Country Representatives, Wednesday, September 7, 12:00-14:00, Kaimuki-1 Room (2nd floor of Kealohilani Tower).

2. PICMET '16 & '17 Planning Session for everybody who would like to discuss strategies for future PICMET conferences, Thursday, September 8, 14:00-15:30, Kona Moku Ballroom, Salon A (3rd floor of Paoakalani Tower).

- Research papers by cutting-edge researchers
- Applications papers by researchers and practitioners working on industry applications
- A panel discussion with interactions between panelists and the audience

PUBLICATIONS

There will be two publications at PICMET '16:

- 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 '16 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 sessions and social events.*

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

**The one-day registration fee does not include the Sunday, Monday, and Tuesday evening social events. The student fee does not include the Monday and Tuesday social events. The PhD Colloquium and site visit 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:

First digit shows the day	M: Monday
	T: Tuesday
	W: Wednesday
	H: Thursday

Second digit shows the time

A: 08:30-10:00
B: 10:30-12:00
C: 12:00-14:00
D: 14:00-15:30
E: 16:00-17:30

Third and fourth digits show the room

00: Kona Moku Ballroom
01: Kona Moku Salon A
02: Kona Moku Salon B
03: Kona Moku Salon C
04: Honolulu
05: Waikiki Salon 1
06: Waikiki Salon 2
07: Waikiki Salon 3
08: Milo I
09: Milo II
10: Milo III
11: Milo IV
12: Milo V

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 Waikiki Salon 1.

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

GENERAL INFORMATION

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

Kaimuki 2 on the 2nd floor of Kealohilani Tower is designated as the Authors' Room. The authors can work there with their laptops anytime they wish to do so.

There will be a computer, a projector and a screen in every break-out room. You can bring your presentation slides on a USB drive and use the computer provided. If you would like to use your own laptop, please be advised that you will need to bring the adapters that will fit into the VGA standard connection as all of our projectors will have the standard VGA port. Also, please make sure that you have an adapter to connect to USA electric port if your connection port is different. You can get more information and tips at <http://www.usatourist.com/english/traveltips/electric-power-tips.html>.

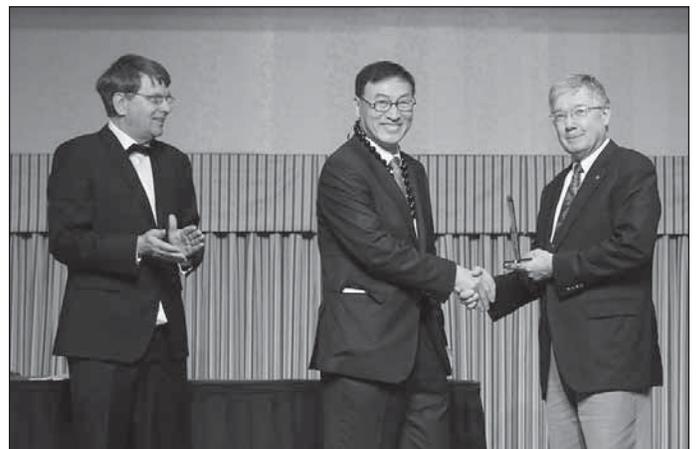
If you need information about anything else concerning the conference, volunteers in the registration area will try to help you.

WIRELESS ACCESS

Wireless access will be available in designated areas.

PICMET VOLUNTEERS

PICMET Volunteers wearing Aloha shirts with PICMET logo buttons 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.



HAWAII

GROUND TRANSPORTATION BETWEEN HONOLULU AIRPORT AND THE HOTEL

Because of safety measures, vehicles are not allowed to park and wait outside the Honolulu airport. Vehicles wait in a parking area across the street.

There are several options for transportation between Honolulu airport and the Waikiki Marriott Resort where PICMET '16 is held.

- Taxis cost about \$50 plus tip one way.
- Shuttle bus is \$16 per person one way, but if advance reservation is not made, a long wait (up to half an hour, sometimes more) can be expected before boarding it at the airport.
- PICMET has made an arrangement with Roberts Hawaii Express Shuttle Service. PICMET guests can make advanced reservations at <http://www.robertshawaii.com/picmet/>.

One-way transportation is \$16 per person; round trip is \$30. This reduces the wait time at the airport significantly.

HAWAII

The following is from the Hawaii Tourism Authority (<http://www.gohawaii.com/>).

Hawaii is like no other place on earth. Home to one of the world's most active volcanoes and the world's tallest sea mountain. Birthplace of modern surfing, the hula and Hawaii Regional Cuisine.

Former seat of a royal kingdom and home to the only royal palace on US soil, Hawaii is one of the youngest geological formations in the world and the youngest state of the union. But perhaps Hawaii's most unique feature is its aloha spirit: the warmth of Hawaii's people that wonderfully complements the Islands' perfect temperatures.

There are six major islands to visit in Hawaii: Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii Island. You'll find each island has its own distinct personality and offers its own adventures, activities and sights. We invite you to explore the Islands of Aloha to find your own heavenly Hawaii experiences.

Hawaii Weather

Weather in Hawaii is very consistent, with only minor changes in temperature throughout the year. There are re-



ally only two seasons in Hawaii: summer (called Kau in Hawaiian) from May to October, and winter (Hooilo) from November to April. The average daytime summer temperature at sea level is 85° F (29.4 C), while the average daytime winter temperature is 78° F (25.6° C). Temperatures at night are approximately 10° F. lower.

Temperature and Climate Zones

The islands are an incredible collection of diverse micro-environments, each with its own unique weather, plants, and animals. As a result of the shielding effect of volcanic mountains and the differences in weather found at various elevations, you can find tropical rain forests, cool alpine regions, arid deserts, and sunny beaches - all within the span of just a few miles.

What Should I Pack on My Trip to Hawaii?

It is warm in Hawaii, so pack your summer attire. You may want to bring a jacket or sweater for the evenings. Suits and ties are very rarely worn here. Bring some casual dress clothes or resort wear if you plan on experiencing Hawaii's nightlife. You can buy an aloha shirt and flip-flops (or slippers, as the locals call them) when you get here.

Rainfall and Trade Winds

Through most of the year, Hawaiian weather patterns are affected primarily by high-pressure zones in the north Pacific that pump cool, moist trade winds down onto the island's northeastern slopes. These winds are forced up-slope by the mountain heights where their moisture condenses into clouds that produce rain. Most of the rain falls in the mountains and valleys on the windward (northeastern) side of the islands. It is this weather phenomenon that creates Hawaii's rich, green, tropical environment.

HAWAII

The wettest months are from November to March, but winter rains do not generally disrupt vacation plans, since the weather is very localized. This means that if it is raining where you are, there is almost always a sunny spot to be found around the coast.

Hawaii's trade winds mean there is almost always a cooling breeze here. Several times during the year the trade winds will stop completely and the wind will switch around to come out of the south or west, bringing stormy or hot sticky weather. Islanders sometimes call this "Kona" weather, because kona means leeward or south, and this points to the direction from which these weather systems arrive.

Water and Surf Conditions

Hawaii's near-shore water temperatures remain comfortable throughout the year. The average water temperature is 74° F. (23.3 C), with a summer high of 80° F. (26.7° C). Wave action varies dramatically between island coasts and



seasons. Summer waters are typically gentle on all beaches. During the winter on many north shore beaches, Pacific storms drive ocean swells towards the islands, creating Hawaii's legendary big waves.

Wave conditions are often very localized, so if the waves are too big on your beach, you can usually find calmer water at a more sheltered beach. Strong currents can make any beach unsafe at any time during the year, particularly in the winter. Ask your hotel staff or a lifeguard about ocean currents or look for warning flags and posted beach conditions.

Hawaii's Mountains and Volcanoes

Many visitors are drawn to the natural beauty found in



higher elevations such as Kokee on Kauai, Haleakala on Maui, or Kilauea on the Big Island. Temperatures in these higher locations drop 3.5 degrees for every 1,000 feet above sea level that you climb, so dress appropriately with pants and several layers of clothing. At an elevation of 10,023 feet, the summit of Haleakala can be as much as 30° F. cooler than resort areas on the coast. Also note that because of these high elevations, there is less protection from the sun's powerful UV rays, so come prepared with sun block and sunglasses.

ABOUT OAHU

Sometimes called "The Gathering Place," Oahu certainly lives up to its name. The third largest Hawaiian island is home to the majority of Hawaii's diverse population, a fusion of east and west cultures rooted in the values and traditions of the Native Hawaiian people. It is this fundamental contrast between the ancient and the modern that makes discovering Oahu so enjoyable.

Whether you are hiking atop iconic Leahi (Diamond Head), enjoying some of Hawaii's best shopping, or simply unwinding on the sands of the island's beautiful beaches, you'll find variety at every turn on Oahu.

HAWAII

Oahu Regions

Home to the majority of Hawaii's population and a wealth of activities and attractions, Oahu is separated into five distinct regions: Honolulu, the Windward Coast, Central Oahu, the Leeward Coast and the North Shore. World famous Waikiki is located on the south shore of Honolulu.

WINDWARD COAST, OAHU

Kailua Beach Park

Kailua Beach Park overlooks Kaneohe Bay and the Mokulua Islands and is a great spot for kayaking, windsurfing and other water sports.



Makapuu Point Lighthouse

Hike to this scenic point on Oahu's eastern most tip for incredible views and whale watching during the winter.

Nuuanu Pali Lookout

Nuuanu Pali Lookout is one of Oahu's most popular scenic spots with panoramic views of Windward Oahu and the Koolau mountain range.

Valley of the Temples

Valley of the Temples Memorial Park houses Byodo-in, a replica of a Japanese Buddhist Temple.

Kailua

Kailua Town is a buzzing beach community on the Windward Coast of Oahu, Hawaii, and is known for its turquoise water, crescent beach, unique shopping and dining.

LEEWARD COAST, OAHU

Kaena Point

Kaena Point is a sacred spot at the western most tip of Oahu accessible only by hike.

NORTH SHORE, OAHU

Haleiwa

This historic surf town is the gateway to the legendary North Shore.

Waimea Bay

Waimea Bay is a legendary surf spot influential in the birth of big wave surfing.

CENTRAL OAHU

Pearl Harbor

Five Pearl Harbor Historic Sites honor this National Historic Landmark where World War II both began and ended.

HONOLULU, OAHU

Waikiki

Once a playground for Hawaiian royalty, Waikiki is now a vibrant gathering place for visitors from around the world.

Leahi (Diamond Head)

Hike to the top of the iconic Diamond Head State Monument for panoramic views of Waikiki and Honolulu.

Aloha Tower

Aloha Tower is a historic Honolulu landmark and home to an outdoor shopping and dining marketplace.

Bishop Museum

Bishop Museum houses the largest collection of Hawaiian artifacts in the state and is a popular destination for the whole family.

Downtown Honolulu and Chinatown

Downtown Honolulu and Chinatown are Oahu's historic centers for government, business and the arts.

HAWAII



Duke Kahanamoku Statue

This iconic statue of “The father of modern surfing” welcomes visitors to Waikiki with open arms.

Hanauma Bay Nature Preserve

This Marine Life Conservation District is one of Oahu’s most popular snorkeling destinations.

Honolulu Museum of Art and Shangri La

The Honolulu Museum of Art is Hawaii’s largest fine-arts museum. Shangri La is one of Hawaii’s most architecturally significant homes.

Iolani Palace

The only official state residence of royalty in the U.S., Iolani Palace’s grounds and galleries are now open to the public as a museum.

Kapahulu

Kapahulu is a small neighborhood right next to Waikiki where you can find unique shops and some of Honolulu’s best local food.

Kawaiahao Church

The historic Kawaiahao Church was the first Christian Church built on Oahu in 1842.

King Kamehameha Statue

The most famous Kamehameha Statue stands in front of Aliiolani Hale in Downtown Honolulu.

National Memorial Cemetery of the Pacific

One of the nation’s prominent national cemeteries, the National Memorial of the Pacific honors the sacrifices of America’s Armed Forces.

Queen Emma Summer Palace

The summer retreat of Queen Emma and King Kamehameha IV.

Washington Place

Visit Washington Place in Downtown Honolulu, the residence of Queen Liliuokalani, Hawaii’s last reigning monarch. It is located in Hawaii’s Capital Historic District and is open for private tours.



OPTIONAL TOURS

Several optional tours have been arranged for PICMET guests. To reserve a tour, please visit www.picmet.org and click on "Optional Tours and Activities."

PEARL HARBOR, ARIZONA MEMORIAL AND PUNCHBOWL

Visit Pearl Harbor and the Arizona Memorial Visitors Center VIA AIR-CONDITIONED fully narrated coach tour. View a 20-minute film of the history of the famous battleship and board a Navy launch to visit the Memorial. Ride through the National Cemetery of the Pacific at beautiful Punchbowl Crater; the most dramatically located site of its kind in the world. Descend past the Governor's Mansion, the State Capitol Building, the Royal Palace, and the historic Kawaiahao Church, King Kamehameha Statue and finally on to Honolulu's Chinatown.



DATE: Daily
TIME: 9:00am - 3:00pm
COST: \$44.50 Adult
\$17.00 Child (Ages 3-11)

PEARL HARBOR CIRCLE ISLAND ADVENTURE

Tour through the Arizona Memorial then continue your trip to Dole Plantation and learn the history of pineapple in Hawaii, drive through the surfing town of Haleiwa, view surfing beaches of the North Shore, visit Byodo Inn Temple, stop for a breath taking view of the Windward side from the Pali Lookout. A no-host lunch stop is made (lunch location subject to change).



DATE: Monday - Friday
TIME: 7:00am - 5:00pm
COST: \$88.50 Adult
\$22.50 Child (Ages 3-11)

MINI-CIRCLE ISLAND WITH SCENIC SHORES TOUR

A half-day tour departing daily on a fully narrated motorcoach tour. You will drive by President Obama's birth place, his first home, and school. Drive by Diamond Head Crater, Nuuanu Valley, Mt. Tantalus for a spectacular view of Honolulu, the Pali Lookout and Oahu's most scenic shoreline with great ocean views. See most beautiful shoreline + Molokai island in the distance.



DATE: Monday/Wednesday/Friday
TIME: 1:00pm - 5:00pm
COST: \$43.00 Adult
\$15.50 Child (Ages 3-11)

MANOA WATERFALL ADVENTURE HIKE

This adventure will fulfill all your fantasies about Hawaii's lush rainforests, giant ferns, cascading tropical waterfalls, picturesque streams and unique species that can be found nowhere else on Earth. This trail, a hidden treasure that was used by Spielberg while filming "Jurassic Park," leads to the tallest accessible waterfall on Oahu, deep within a prehistoric landscape.



4 hour tour. Walking time of 2-2.5 hours. Operates twice on every weekday (Mon thru Fri).

AM tour depart hotel at 8am and return at 12:30 pm. PM tour departs hotel at 2pm and returns at 6-6:30pm.

DATE: Monday/Wednesday/Friday
TIME: Morning Tour: 8:00am - 12:30pm
Afternoon Tour: 2:00pm - 6:30pm
COST: \$52.50 Adult

OPTIONAL TOURS

HELICOPTER TOUR

Pali Makani Tour

Soar over Ocean and mountains, past diamond Head, Honolulu, Waikiki, Hanauma Bay, Punchbowl

DATE: Daily
TIME: 30 minute tour
COST: \$171 open seating
\$191 first class seating



Sacred Falls Tour

Sacred Falls, North Shore, Sunset Beach, Pupukea, Pipeline, Waimea Bay + Falls, sugar cane, pineapple, Pearl Harbor.

DATE: Daily
TIME: 60 minute tour
COST: \$303 open seating
\$343 first class seating

KO'OLINA DOLPHIN AND SNORKELING CRUISE - DELUXE MID-DAY

After an exciting ride up the coast to Ko Olina on the West side of the island, you'll Experience a snorkel adventure of a lifetime with three different stops. The leeward shore is home to the Hawaiian Spinner dolphins year round and this area offers the best snorkeling on the island! Check in snacks include assorted pastries, coffee, tea and sodas.

The first stop is a snorkel teeming with tropical fish. Our next stop is a viewing encounter with the wild dolphins



and the third stop is an incredible snorkel with sea turtles. After 3.5 hours on the water, return to shore for a grilled lunch including Teri chicken, hamburger, hot dog or veggie burgers; French fries,

coffee, tea, soda and bottled water.

Included are round trip transportation, high quality snorkel gear, snorkel safety vests, instruction, fresh water showers.

DATE: Daily
TIME: Pickup from hotel 10:30am
Return approximately 5:15pm
COST: \$146.00 Adult
\$114.50 Child (Ages 3-12)



IEEE SEMINAR

IEEE HAWAII SECTION DISTINGUISHED LECTURE SEMINAR

Sponsored by the Hawaii Computer Society Chapter

DATE: WEDNESDAY, SEPTEMBER 7
TIME: 18:00 - 19:30
LOCATION: WAIKIKI BALLROOM, SALON 2
(3RD FLOOR OF PAOKALANI TOWER NEAR THE SWIMMING POOL)
SPEAKER: DR. SHINTARO SENGOKU,
ASSOCIATE PROFESSOR,
TOKYO INSTITUTE OF TECHNOLOGY
TOPIC: MOBILE HEALTH TECHNOLOGIES

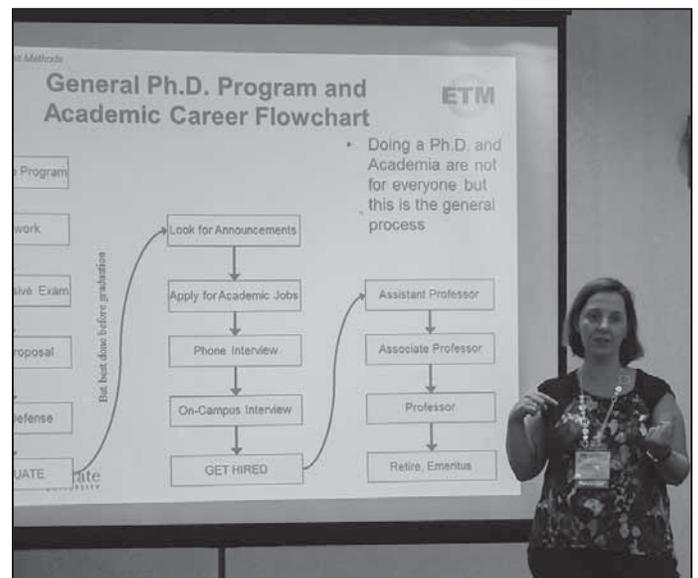


Shintaro Sengoku earned his PhD in science at the University of Tokyo in 2001. He has professional experience in advisory services at McKinsey&Company (2001-05); Fast Track Initiative, Inc. (a venture capital focusing on biotechnology and healthcare industries, 2005-07); and research and education experience in the field of management of technology at the University of Tokyo (2005-07) and International Collaborative Center, Kyoto University (2008-09) and the Institute for Integrated Cell-Material Sciences (WPI-iCeMS, 2009-14). He is currently a member of Department of Innovation

Science and Department of Technology and Innovation Management of School of Environment and Society; appointed to Advanced Computational Drug Discovery Unit (ACDD) of Institute for Innovative Research. His research and education covers the management of technology, innovation science, and the theory or bio-healthcare industries.

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There is no fee for this event. It is open to all PICMET attendees.



SOCIAL EVENTS



To facilitate the informal interaction of the participants, several social events have been scheduled during PICMET '16.

RECEPTION/BUFFET

DATE: SUNDAY, SEPTEMBER 4
TIME: 19:00—22:00
LOCATION: PUALEILANI TERRACE
(3RD FLOOR OF KEALOHILANI TOWER)
DRESS: INFORMAL

Meet other conference attendees, renew old acquaintances, and begin new friendships and collaborations at this poolside opening reception/buffet at the Marriott's Waikiki Terrace. Included in the regular registration fee.*



HAWAIIAN LUAU DINNER

DATE: MONDAY, SEPTEMBER 5
TIME: 19:00-22:00
LOCATION: PUALEILANI TERRACE
(3RD FLOOR OF KEALOHILANI TOWER)
DRESS: INFORMAL

Enjoy the bounty of Hawaii at this buffet of delectable local dishes while you mingle and network with colleagues. A Hawaiian trio and two Hawaiian dancers will present a performance of local music and entertainment. Included in the regular registration fee.*



AWARDS BANQUET

DATE: TUESDAY, SEPTEMBER 6
CASH BAR: 18:30—19:00
(IN THE PLAZA FOYER)
BANQUET: 19:00—22:00
LOCATION: (IN THE KONA MOKU BALLROOM LANAI)
DRESS: BUSINESS ATTIRE**

This is the premier social event of the conference. The PICMET '16 Leadership in Technology Management, Medal of Excellence, and Outstanding Student Paper awards will be presented at the banquet. Included in the registration fee.*

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

***“Business attire” in Hawaii is defined as either Aloha shirt or regular shirt with or without coat and tie.*

SITE VISIT

The following site visit is offered during PICMET '16. Seating is limited, so sign up early. The registration fee is \$75 for the tour.

The time below includes travel time. The return time is approximate and will depend on traffic.

Attendees will meet on Tuesday at 14:00 in Tour Lobby on the first floor of Paoakalani Tower by Seattle's Best Coffee, where a PICMET volunteer will guide you to the bus.

OCEANIC INSTITUTE SITE VISIT

TUESDAY, SEPTEMBER 6, 14:00 - 17:30

Oceanic Institute (OI), an affiliate of Hawaii Pacific University, is a not-for-profit research and development organization dedicated to marine aquaculture, biotechnology, and coastal resource management. Founded in 1960, the research facility is located on a 56-acre site at Makapuu Point on the windward coast of Oahu, Hawaii, with facilities on the Big Island of Hawaii as well. A year-round tropical climate provides ideal working conditions and



allows for uninterrupted research.

OI's mission is to develop and transfer economically responsible technologies to increase aquatic food production while promoting the sustainable use of ocean resources. OI works with community, industry, government and academic partners, and non-governmental organizations to benefit the state, the nation, and the world.



The site visit will begin at the OI administration building followed by a walking tour to seven stations. Each station focuses on a different aspect of OI's research (shrimp aquaculture, aquaculture of fish for food, fish for the ornamental industry, sea urchins, aquatic animal feed, etc.).

Since the group will be walking outside most the time, visitors are asked to wear casual attire and shoes that can get dirty; we suggest that women avoid wearing high heels. For biosecurity reasons, visitors are asked not to visit another aquaculture facility within 72 hours prior to coming to OI for the tour. In addition, visitors must have showered and changed clothes after coming in contact with ocean water and after handling uncooked crustaceans or other seafood prior to visiting OI. These policies are in place to protect the valuable research and breeding animals maintained by the OI. More will be explained about why these stringent policies are in place during the tour.

For more information about the Oceanic Institute, please visit www.oceanicinstitute.org.



TECHNICAL PROGRAM

PROGRAM OVERVIEW

The PICMET '16 technical program consists of 110 sessions including 4 plenaries, 2 special sessions, 1 panel discussion, and 103 paper sessions.

The plenaries are scheduled from 08:30 to 10:00 every morning, Monday, September 5, through Thursday, September 8, in the Kona Moku Ballroom on the 3rd floor of Paoakalani Tower. They are described in the “Plenaries” section of this Bulletin.

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 '16 are listed with an [R] in front of their titles on the following pages; and the “Industry Applications” papers are shown with an [A] in front of their titles. Roughly 79 percent are in the [R] category, and the rest are in the [A] category.

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

THE SCHEDULE

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

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

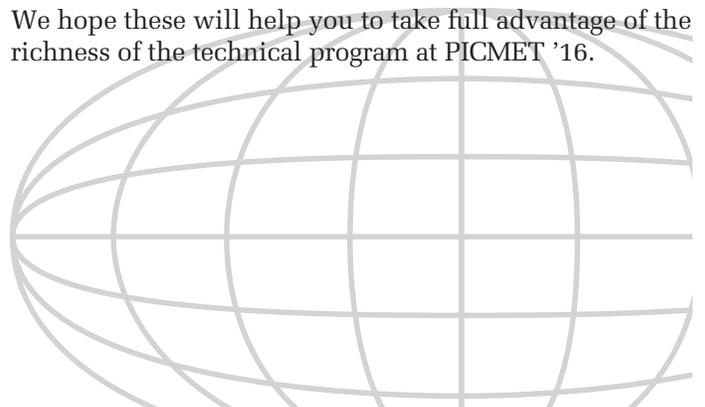
First, you will find a pictorial display of the sessions for each day. The four pages (one for each day) should help you visualize what session is scheduled in what time slot and in which room each day.

In the second set of schedules, the sessions are listed in chronological 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 '16.



DAILY SCHEDULE

MONDAY, SEPTEMBER 5, 2016

	01 Kona Moku Salon A	02 Kona Moku Salon B	03 Kona Moku Salon C	04 Honolulu	05 Waikiki Salon 1	06 Waikiki Salon 2	07 Waikiki Salon 3	08 Milo I	09 Milo II	10 Milo III	11 Milo IV	12 Milo V
MA 08:30-10:00	Plenary - 1											
MB 10:30-12:00	Meet the Editors	Environmental Issues 1	S & T Policy 1	Collaborations for TM 1	Decision Making 1	Strategic Management of Tech 1	Innovation Management 1	Knowledge Management 1	Entrepreneurship/ Intrapreneurship 1	Intellectual Property 1	Supply Chain Management 1	NPD 1
MC 12:00-14:00	LUNCH											
MD 14:00-15:30	Technology Diffusion	Social Innovation 1	S & T Policy 2	Technical Workforce	Infrastructure Management	Strategic Management of Tech 2	Innovation Management 2	Commercial- ization of Tech 1	Emerging Tech 1	Intellectual Property 2	Environmental Issues 2	NPD 2
ME 16:00-17:30	Competitiveness in TM	Social Innovation 2	S & T Policy 3	Collaborations for TM 2	Educational Issues 1	TM in Finance	Innovation Management 3		Entrepreneurship/ Intrapreneurship 2	Intellectual Property 3	ICT Mgmt 3	NPD 3

DAILY SCHEDULE

TUESDAY, SEPTEMBER 6, 2016

	01 Kona Moku Salon A	02 Kona Moku Salon B	03 Kona Moku Salon C	04 Honolulu	05 Waikiki Salon 1	06 Waikiki Salon 2	07 Waikiki Salon 3	08 Milo I	09 Milo II	10 Milo III	11 Milo IV
TA 08:30-10:00		Plenary - 2									
TB 10:30-12:00	TM in Health 1	Social Innovation 3	Project Management 1	Collaborations for TM 3	Decision Making 2	Global Issues in TM	Innovation Management 4	Commercial- ization of Tech 2	Emerging Tech 2	Intellectual Property 4	Manufacturing Management
TC 12:00-14:00	LUNCH										
TD 14:00-15:30	TM in Health 2	Social Innovation 4	Project Management 2	E-Business	Decision Making 3	Sustainability Management 1	Innovation Management 5	TM in Service	Emerging Tech 3	S & T Communication	Software Process Management
TE 16:00-17:30	TM in Health 3	TM Framework	Project Management 3	Collaborations for TM 4	Educational Issues 2	Sustainability Management 2	Innovation Management 6	Knowledge Management 2	Entrepreneurship/ Intrapreneurship 3	Intellectual Property 5	Technology Assessment & Eval. 1

DAILY SCHEDULE

WEDNESDAY, SEPTEMBER 7, 2016

	01 Kona Moku Salon A	02 Kona Moku Salon B	03 Kona Moku Salon C	04 Honolulu	05 Waikiki Salon 1	06 Waikiki Salon 2	07 Waikiki Salon 3	08 Milo I	09 Milo II	10 Milo III	11 Milo IV
WA 08:30-10:00		Plenary - 3									
WB 10:30-12:00	TM in Health 4		S & T Policy 4	Collaborations for TM 5	ICT Management 1	Productivity Management	Innovation Management 7	Knowledge Management 3	Emerging Tech 4	Intellectual Property 6	Supply Chain Management 2
WC 12:00-14:00	LUNCH										
WD 14:00-15:30	Technology Roadmapping 1	Enterprise Management 1	Project Management 4	TM in Energy 1	ICT Management 2	Technology & Knowledge Transfer 1	Innovation Management 8	Knowledge Management 4	Emerging Tech 5	Intellectual Property 7	Technology Assessment & Eval. 2
WE 16:00-17:30	TM in Health 5	Enterprise Management 2	Project Management 5		Technology Adoption		Innovation Management 9	Knowledge Management 5	Entrepreneurship/ Intrapreneurship 4	Intellectual Property 8	Technology Assessment & Eval. 3

DAILY SCHEDULE

THURSDAY, SEPTEMBER 8, 2016

	01 Kona Moku Salon A	02 Kona Moku Salon B	03 Kona Moku Salon C	05 Waikiki Salon 1	06 Waikiki Salon 2	07 Waikiki Salon 3	10 Milo III
HA 08:30-10:00	Plenary - 4						
HB 10:30-12:00	Technology Roadmapping 2	Technology Forecasting 1		Quality Management	Innovation Management 10	Innovation Management 11	Innovation Management 11
HC 12:00-14:00	LUNCH						
HD 14:00-15:30	PICMET '17 Debriefing/ Planning Session						
HE 16:00-17:30							

SCHEDULE OF SESSIONS

SCHEDULE OF SESSIONS BY DATE

MONDAY, SEPTEMBER 5, 2016

Session Number	Day	Time	Room	Session Title
MA 00	Monday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: "Plenary - 1"
MB 01	Monday	10:30 - 12:00	Kona Moku Salon A	PANEL: "Meet the Editors"
MB 02	Monday	10:30 - 12:00	Kona Moku Salon B	"Environmental Issues 1"
MB 03	Monday	10:30 - 12:00	Kona Moku Salon C	"S & T Policy 1"
MB 04	Monday	10:30 - 12:00	Honolulu	"Collaborations for TM 1"
MB 05	Monday	10:30 - 12:00	Waikiki Salon 1	"Decision Making 1"
MB 06	Monday	10:30 - 12:00	Waikiki Salon 2	"Strategic Management of Tech 1"
MB 07	Monday	10:30 - 12:00	Waikiki Salon 3	"Innovation Management 1"
MB 08	Monday	10:30 - 12:00	Milo I	"Knowledge Management 1"
MB 09	Monday	10:30 - 12:00	Milo II	"Entrepreneurship/Intrapreneurship 1"
MB 10	Monday	10:30 - 12:00	Milo III	"Intellectual Property 1"
MB 11	Monday	10:30 - 12:00	Milo IV	"Supply Chain Management 1"
MB 12	Monday	10:30 - 12:00	Milo V	"NPD 1"
MD 01	Monday	14:00 - 15:30	Kona Moku Salon A	"Technology Diffusion"
MD 02	Monday	14:00 - 15:30	Kona Moku Salon B	"Social Innovation 1"
MD 03	Monday	14:00 - 15:30	Kona Moku Salon C	"S & T Policy 2"
MD 04	Monday	14:00 - 15:30	Honolulu	"Technical Workforce"
MD 05	Monday	14:00 - 15:30	Waikiki Salon 1	"Infrastructure Management"
MD 06	Monday	14:00 - 15:30	Waikiki Salon 2	"Strategic Management of Tech 2"
MD 07	Monday	14:00 - 15:30	Waikiki Salon 3	"Innovation Management 2"
MD 08	Monday	14:00 - 15:30	Milo I	"Commercialization of Tech 1"
MD 09	Monday	14:00 - 15:30	Milo II	"Emerging Tech 1"
MD 10	Monday	14:00 - 15:30	Milo III	"Intellectual Property 2"
MD 11	Monday	14:00 - 15:30	Milo IV	"Environmental Issues 2"
MD 12	Monday	14:00 - 15:30	Milo V	"NPD 2"
ME 01	Monday	16:00 - 17:30	Kona Moku Salon A	"Competitiveness in TM "
ME 02	Monday	16:00 - 17:30	Kona Moku Salon B	"Social Innovation 2"
ME 03	Monday	16:00 - 17:30	Kona Moku Salon C	"S & T Policy 3"
ME 04	Monday	16:00 - 17:30	Honolulu	"Collaborations for TM 2"
ME 05	Monday	16:00 - 17:30	Waikiki Salon 1	"Educational Issues 1"
ME 06	Monday	16:00 - 17:30	Waikiki Salon 2	"TM in Finance"
ME 07	Monday	16:00 - 17:30	Waikiki Salon 3	"Innovation Management 3"
ME 09	Monday	16:00 - 17:30	Milo II	"Entrepreneurship/Intrapreneurship 2"
ME 10	Monday	16:00 - 17:30	Milo III	"Intellectual Property 3"
ME 11	Monday	16:00 - 17:30	Milo IV	"Environmental Issues 3"

SCHEDULE OF SESSIONS

ME	12	Monday	16:00 - 17:30	Milo V	“NPD 3”
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TUESDAY, SEPTEMBER 6, 2016

TA	00	Tuesday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: “Plenary - 2”
TB	01	Tuesday	10:30 - 12:00	Kona Moku Salon A	“TM in Health 1”
TB	02	Tuesday	10:30 - 12:00	Kona Moku Salon B	“Social Innovation 3”
TB	03	Tuesday	10:30 - 12:00	Kona Moku Salon C	“Project Management 1”
TB	04	Tuesday	10:30 - 12:00	Honolulu	“Collaborations for TM 3”
TB	05	Tuesday	10:30 - 12:00	Waikiki Salon 1	“Decision Making 2”
TB	06	Tuesday	10:30 - 12:00	Waikiki Salon 2	“Global Issues in TM”
TB	07	Tuesday	10:30 - 12:00	Waikiki Salon 3	“Innovation Management 4”
TB	08	Tuesday	10:30 - 12:00	Milo I	“Commercialization of Tech 2”
TB	09	Tuesday	10:30 - 12:00	Milo II	“Emerging Tech 2”
TB	10	Tuesday	10:30 - 12:00	Milo III	“Intellectual Property 4”
TB	11	Tuesday	10:30 - 12:00	Milo IV	“Manufacturing Management”
TD	01	Tuesday	14:00 - 15:30	Kona Moku Salon A	“TM in Health 2”
TD	02	Tuesday	14:00 - 15:30	Kona Moku Salon B	“Social Innovation 4”
TD	03	Tuesday	14:00 - 15:30	Kona Moku Salon C	“Project Management 2”
TD	04	Tuesday	14:00 - 15:30	Honolulu	“E-Business”
TD	05	Tuesday	14:00 - 15:30	Waikiki Salon 1	“Decision Making 3”
TD	06	Tuesday	14:00 - 15:30	Waikiki Salon 2	“Sustainability Management 1”
TD	07	Tuesday	14:00 - 15:30	Waikiki Salon 3	“Innovation Management 5”
TD	08	Tuesday	14:00 - 15:30	Milo I	“TM in Service”
TD	09	Tuesday	14:00 - 15:30	Milo II	“Emerging Tech 3”
TD	10	Tuesday	14:00 - 15:30	Milo III	“S & T Communication”
TD	11	Tuesday	14:00 - 15:30	Milo IV	“Software Process Management”
TE	01	Tuesday	16:00 - 17:30	Kona Moku Salon A	“TM in Health 3”
TE	02	Tuesday	16:00 - 17:30	Kona Moku Salon B	“TM Framework”
TE	03	Tuesday	16:00 - 17:30	Kona Moku Salon C	“Project Management 3”
TE	04	Tuesday	16:00 - 17:30	Honolulu	“Collaborations for TM 4”
TE	05	Tuesday	16:00 - 17:30	Waikiki Salon 1	“Educational Issues 2”
TE	06	Tuesday	16:00 - 17:30	Waikiki Salon 2	“Sustainability Management 2”
TE	07	Tuesday	16:00 - 17:30	Waikiki Salon 3	“Innovation Management 6”
TE	08	Tuesday	16:00 - 17:30	Milo I	“Knowledge Management 2”
TE	09	Tuesday	16:00 - 17:30	Milo II	“Entrepreneurship/Intrapreneurship 3”
TE	10	Tuesday	16:00 - 17:30	Milo III	“Intellectual Property 5”
TE	11	Tuesday	16:00 - 17:30	Milo IV	“Technology Assessment & Eval. 1”

WEDNESDAY, SEPTEMBER 7, 2016

WA	00	Wednesday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: “Plenary - 3”
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SCHEDULE OF SESSIONS

WB	01	Wednesday	10:30 - 12:00	Kona Moku Salon A	“TM in Health 4”
WB	03	Wednesday	10:30 - 12:00	Kona Moku Salon C	“S & T Policy 4”
WB	04	Wednesday	10:30 - 12:00	Honolulu	“Collaborations for TM 5”
WB	05	Wednesday	10:30 - 12:00	Waikiki Salon 1	“ICT Management 1”
WB	06	Wednesday	10:30 - 12:00	Waikiki Salon 2	“Productivity Management”
WB	07	Wednesday	10:30 - 12:00	Waikiki Salon 3	“Innovation Management 7”
WB	08	Wednesday	10:30 - 12:00	Milo I	“Knowledge Management 3”
WB	09	Wednesday	10:30 - 12:00	Milo II	“Emerging Tech 4”
WB	10	Wednesday	10:30 - 12:00	Milo III	“Intellectual Property 6”
WB	11	Wednesday	10:30 - 12:00	Milo IV	“Supply Chain Management 2”
WD	01	Wednesday	14:00 - 15:30	Kona Moku Salon A	“Technology Roadmapping 1”
WD	02	Wednesday	14:00 - 15:30	Kona Moku Salon B	“Enterprise Management 1”
WD	03	Wednesday	14:00 - 15:30	Kona Moku Salon C	“Project Management 4”
WD	04	Wednesday	14:00 - 15:30	Honolulu	“TM in Energy 1”
WD	05	Wednesday	14:00 - 15:30	Waikiki Salon 1	“ICT Management 2”
WD	06	Wednesday	14:00 - 15:30	Waikiki Salon 2	“Technology & Knowledge Transfer 1”
WD	07	Wednesday	14:00 - 15:30	Waikiki Salon 3	“Innovation Management 8”
WD	08	Wednesday	14:00 - 15:30	Milo I	“Knowledge Management 4”
WD	09	Wednesday	14:00 - 15:30	Milo II	“Emerging Tech 5”
WD	10	Wednesday	14:00 - 15:30	Milo III	“Intellectual Property 7”
WD	11	Wednesday	14:00 - 15:30	Milo IV	“Technology Assessment & Eval. 2”
WE	01	Wednesday	16:00 - 17:30	Kona Moku Salon A	“TM in Health 5”
WE	02	Wednesday	16:00 - 17:30	Kona Moku Salon B	“Enterprise Management 2”
WE	03	Wednesday	16:00 - 17:30	Kona Moku Salon C	“Project Management 5”
WE	05	Wednesday	16:00 - 17:30	Waikiki Salon 1	“Technology Adoption”
WE	07	Wednesday	16:00 - 17:30	Waikiki Salon 3	“Innovation Management 9”
WE	08	Wednesday	16:00 - 17:30	Milo I	“Knowledge Management 5”
WE	09	Wednesday	16:00 - 17:30	Milo II	“Entrepreneurship/Intrapreneurship 4”
WE	10	Wednesday	16:00 - 17:30	Milo III	“Intellectual Property 8”
WE	11	Wednesday	16:00 - 17:30	Milo IV	“Technology Assessment & Eval. 3”

THURSDAY, SEPTEMBER 8, 2016

HA	00	Thursday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: “Plenary - 4”
HB	01	Thursday	10:30 - 12:00	Kona Moku Salon A	“Technology Roadmapping 2”
HB	02	Thursday	10:30 - 12:00	Kona Moku Salon B	“Technology Forecasting 1”
HB	05	Thursday	10:30 - 12:00	Waikiki Salon 1	“Quality Management”
HB	06	Thursday	10:30 - 12:00	Waikiki Salon 2	“Innovation Management 10”
HB	07	Thursday	10:30 - 12:00	Waikiki Salon 3	“Innovation Management 11”
HB	10	Thursday	10:30 - 12:00	Milo III	“Intellectual Property 9”
HD	01	Thursday	14:00 - 15:30	Kona Moku Salon A	“PICMET ‘17 Debriefing/Planning Session”

SCHEDULE OF SESSIONS

SCHEDULE OF SESSIONS BY ROOM

Session Number	Day	Time	Room	Session Title
MA 00	Monday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: "Plenary - 1"
TA 00	Tuesday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: "Plenary - 2"
WA 00	Wednesday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: "Plenary - 3"
HA 00	Thursday	08:30 - 10:00	Kona Moku Ballroom	PLENARY: "Plenary - 4"
MB 01	Monday	10:30 - 12:00	Kona Moku Salon A	PANEL: "Meet the Editors"
MD 01	Monday	14:00 - 15:30	Kona Moku Salon A	"Technology Diffusion"
ME 01	Monday	16:00 - 17:30	Kona Moku Salon A	"Competitiveness in TM "
TB 01	Tuesday	10:30 - 12:00	Kona Moku Salon A	"TM in Health 1"
TD 01	Tuesday	14:00 - 15:30	Kona Moku Salon A	"TM in Health 2"
TE 01	Tuesday	16:00 - 17:30	Kona Moku Salon A	"TM in Health 3"
WB 01	Wednesday	10:30 - 12:00	Kona Moku Salon A	"TM in Health 4"
WD 01	Wednesday	14:00 - 15:30	Kona Moku Salon A	"Technology Roadmapping 1"
WE 01	Wednesday	16:00 - 17:30	Kona Moku Salon A	"TM in Health 5"
HB 01	Thursday	10:30 - 12:00	Kona Moku Salon A	"Technology Roadmapping 2"
HD 01	Thursday	14:00 - 15:30	Kona Moku Salon A	"PICMET '17 Debriefing/Planning Session"
MB 02	Monday	10:30 - 12:00	Kona Moku Salon B	"Environmental Issues 1"
MD 02	Monday	14:00 - 15:30	Kona Moku Salon B	"Social Innovation 1"
ME 02	Monday	16:00 - 17:30	Kona Moku Salon B	"Social Innovation 2"
TB 02	Tuesday	10:30 - 12:00	Kona Moku Salon B	"Social Innovation 3"
TD 02	Tuesday	14:00 - 15:30	Kona Moku Salon B	"Social Innovation 4"
TE 02	Tuesday	16:00 - 17:30	Kona Moku Salon B	"TM Framework"
WD 02	Wednesday	14:00 - 15:30	Kona Moku Salon B	"Enterprise Management 1"
WE 02	Wednesday	16:00 - 17:30	Kona Moku Salon B	"Enterprise Management 2"
HB 02	Thursday	10:30 - 12:00	Kona Moku Salon B	"Technology Forecasting 1"
MB 03	Monday	10:30 - 12:00	Kona Moku Salon C	"S & T Policy 1"
MD 03	Monday	14:00 - 15:30	Kona Moku Salon C	"S & T Policy 2"
ME 03	Monday	16:00 - 17:30	Kona Moku Salon C	"S & T Policy 3"
TB 03	Tuesday	10:30 - 12:00	Kona Moku Salon C	"Project Management 1"
TD 03	Tuesday	14:00 - 15:30	Kona Moku Salon C	"Project Management 2"
TE 03	Tuesday	16:00 - 17:30	Kona Moku Salon C	"Project Management 3"
WB 03	Wednesday	10:30 - 12:00	Kona Moku Salon C	"S & T Policy 4"
WD 03	Wednesday	14:00 - 15:30	Kona Moku Salon C	"Project Management 4"
WE 03	Wednesday	16:00 - 17:30	Kona Moku Salon C	"Project Management 5"
MB 04	Monday	10:30 - 12:00	Honolulu	"Collaborations for TM 1"
MD 04	Monday	14:00 - 15:30	Honolulu	"Technical Workforce"

SCHEDULE OF SESSIONS

ME	04	Monday	16:00 - 17:30	Honolulu	“Collaborations for TM 2”
TB	04	Tuesday	10:30 - 12:00	Honolulu	“Collaborations for TM 3”
TD	04	Tuesday	14:00 - 15:30	Honolulu	“E-Business”
TE	04	Tuesday	16:00 - 17:30	Honolulu	“Collaborations for TM 4”
WB	04	Wednesday	10:30 - 12:00	Honolulu	“Collaborations for TM 5”
WD	04	Wednesday	14:00 - 15:30	Honolulu	“TM in Energy 1”
MB	05	Monday	10:30 - 12:00	Waikiki Salon 1	“Decision Making 1”
MD	05	Monday	14:00 - 15:30	Waikiki Salon 1	“Infrastructure Management”
ME	05	Monday	16:00 - 17:30	Waikiki Salon 1	“Educational Issues 1”
TB	05	Tuesday	10:30 - 12:00	Waikiki Salon 1	“Decision Making 2”
TD	05	Tuesday	14:00 - 15:30	Waikiki Salon 1	“Decision Making 3”
TE	05	Tuesday	16:00 - 17:30	Waikiki Salon 1	“Educational Issues 2”
WB	05	Wednesday	10:30 - 12:00	Waikiki Salon 1	“ICT Management 1”
WD	05	Wednesday	14:00 - 15:30	Waikiki Salon 1	“ICT Management 2”
WE	05	Wednesday	16:00 - 17:30	Waikiki Salon 1	“Technology Adoption”
HB	05	Thursday	10:30 - 12:00	Waikiki Salon 1	“Quality Management”
MB	06	Monday	10:30 - 12:00	Waikiki Salon 2	“Strategic Management of Tech 1”
MD	06	Monday	14:00 - 15:30	Waikiki Salon 2	“Strategic Management of Tech 2”
ME	06	Monday	16:00 - 17:30	Waikiki Salon 2	“TM in Finance”
TB	06	Tuesday	10:30 - 12:00	Waikiki Salon 2	“Global Issues in TM”
TD	06	Tuesday	14:00 - 15:30	Waikiki Salon 2	“Sustainability Management 1”
TE	06	Tuesday	16:00 - 17:30	Waikiki Salon 2	“Sustainability Management 2”
WB	06	Wednesday	10:30 - 12:00	Waikiki Salon 2	“Productivity Management”
WD	06	Wednesday	14:00 - 15:30	Waikiki Salon 2	“Technology & Knowledge Transfer 1”
HB	06	Thursday	10:30 - 12:00	Waikiki Salon 2	“Innovation Management 10”
MB	07	Monday	10:30 - 12:00	Waikiki Salon 3	“Innovation Management 1”
MD	07	Monday	14:00 - 15:30	Waikiki Salon 3	“Innovation Management 2”
ME	07	Monday	16:00 - 17:30	Waikiki Salon 3	“Innovation Management 3”
TB	07	Tuesday	10:30 - 12:00	Waikiki Salon 3	“Innovation Management 4”
TD	07	Tuesday	14:00 - 15:30	Waikiki Salon 3	“Innovation Management 5”
TE	07	Tuesday	16:00 - 17:30	Waikiki Salon 3	“Innovation Management 6”
WB	07	Wednesday	10:30 - 12:00	Waikiki Salon 3	“Innovation Management 7”
WD	07	Wednesday	14:00 - 15:30	Waikiki Salon 3	“Innovation Management 8”
WE	07	Wednesday	16:00 - 17:30	Waikiki Salon 3	“Innovation Management 9”
HB	07	Thursday	10:30 - 12:00	Waikiki Salon 3	“Innovation Management 11”
MB	08	Monday	10:30 - 12:00	Milo I	“Knowledge Management 1”
MD	08	Monday	14:00 - 15:30	Milo I	“Commercialization of Tech 1”
TB	08	Tuesday	10:30 - 12:00	Milo I	“Commercialization of Tech 2”

SCHEDULE OF SESSIONS

TD	08	Tuesday	14:00 - 15:30	Milo I	“TM in Service”
TE	08	Tuesday	16:00 - 17:30	Milo I	“Knowledge Management 2”
WB	08	Wednesday	10:30 - 12:00	Milo I	“Knowledge Management 3”
WD	08	Wednesday	14:00 - 15:30	Milo I	“Knowledge Management 4”
WE	08	Wednesday	16:00 - 17:30	Milo I	“Knowledge Management 5”
MB	09	Monday	10:30 - 12:00	Milo II	“Entrepreneurship/Intrapreneurship 1”
MD	09	Monday	14:00 - 15:30	Milo II	“Emerging Tech 1”
ME	09	Monday	16:00 - 17:30	Milo II	“Entrepreneurship/Intrapreneurship 2”
TB	09	Tuesday	10:30 - 12:00	Milo II	“Emerging Tech 2”
TD	09	Tuesday	14:00 - 15:30	Milo II	“Emerging Tech 3”
TE	09	Tuesday	16:00 - 17:30	Milo II	“Entrepreneurship/Intrapreneurship 3”
WB	09	Wednesday	10:30 - 12:00	Milo II	“Emerging Tech 4”
WD	09	Wednesday	14:00 - 15:30	Milo II	“Emerging Tech 5”
WE	09	Wednesday	16:00 - 17:30	Milo II	“Entrepreneurship/Intrapreneurship 4”
MB	10	Monday	10:30 - 12:00	Milo III	“Intellectual Property 1”
MD	10	Monday	14:00 - 15:30	Milo III	“Intellectual Property 2”
ME	10	Monday	16:00 - 17:30	Milo III	“Intellectual Property 3”
TB	10	Tuesday	10:30 - 12:00	Milo III	“Intellectual Property 4”
TD	10	Tuesday	14:00 - 15:30	Milo III	“S & T Communication”
TE	10	Tuesday	16:00 - 17:30	Milo III	“Intellectual Property 5”
WB	10	Wednesday	10:30 - 12:00	Milo III	“Intellectual Property 6”
WD	10	Wednesday	14:00 - 15:30	Milo III	“Intellectual Property 7”
WE	10	Wednesday	16:00 - 17:30	Milo III	“Intellectual Property 8”
HB	10	Thursday	10:30 - 12:00	Milo III	“Intellectual Property 9”
MB	11	Monday	10:30 - 12:00	Milo IV	“Supply Chain Management 1”
MD	11	Monday	14:00 - 15:30	Milo IV	“Environmental Issues 2”
ME	11	Monday	16:00 - 17:30	Milo IV	“Environmental Issues 3”
TB	11	Tuesday	10:30 - 12:00	Milo IV	“Manufacturing Management”
TD	11	Tuesday	14:00 - 15:30	Milo IV	“Software Process Management”
TE	11	Tuesday	16:00 - 17:30	Milo IV	“Technology Assessment & Eval. 1”
WB	11	Wednesday	10:30 - 12:00	Milo IV	“Supply Chain Management 2”
WD	11	Wednesday	14:00 - 15:30	Milo IV	“Technology Assessment & Eval. 2”
WE	11	Wednesday	16:00 - 17:30	Milo IV	“Technology Assessment & Eval. 3”
MB	12	Monday	10:30 - 12:00	Milo V	“NPD 1”
MD	12	Monday	14:00 - 15:30	Milo V	“NPD 2”
ME	12	Monday	16:00 - 17:30	Milo V	“NPD 3”

PERSONAL SCHEDULE

	Sunday September 4, 2016	Monday September 5, 2016	Tuesday September 6, 2016	Wednesday September 7, 2016	Thursday September 8, 2016
08:00 – 08:30 Bright Start (Breakfast)					
08:30 – 10:00 (A)		Plenary - 1 (Kona Moku)	Plenary - 2 (Kona Moku)	Plenary - 3 (Kona Moku)	Plenary - 4 (Kona Moku)
10:00 – 10:30 Coffee Break					
10:30 – 12:00 (B)					
12:00 – 14:00 Lunch Break					
14:00 – 15:30 (D)					PICMET '17 Planning Session (Kona Moku Salon A)
15:30 – 16:00 Coffee Break					
16:00 – 17:30 (E)					
19:00 – 22:00	Welcome Reception (Pualeilani Terrace)	Monday Dinner (Pualeilani Terrace)	Awards Banquet (Kona Moku)		



PICMET

SPECIAL SESSIONS

COUNTRY REPRESENTATIVES MEETING

DATE: WEDNESDAY, SEPTEMBER 7
TIME: 12:00-14:00
ROOM: KAIMUKI-1 (2ND FLOOR OF KEALOHILANI TOWER)

PICMET has 126 Country Representatives in 58 countries. They provide the linkage between PICMET Headquarters and the different parts of the world by disseminating PICMET information in their regions, proposing locations for future PICMET conferences, and starting PICMET chapters in their countries. Three such chapters, PICMET - Japan, PICMET - Korea, and PICMET - Turkey, are already in operation.



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

Lunch will be provided.



PICMET '17 AND '18 PLANNING SESSION

DATE: THURSDAY, SEPTEMBER 8
TIME: 14:00-15:30
ROOM: KONA MOKU, SALON A (3RD FLOOR OF PAOAKALANI TOWER)

This session will provide an opportunity to give feedback on PICMET '16 and to get involved in the planning for PICMET '17 and '18 conferences. PICMET '17 will be held July 9-13, 2017, at the Portland Marriott Downtown Waterfront, Portland, Oregon, USA.



PLENARIES

PLENARY SESSION—1

DATE: MONDAY, SEPTEMBER 5
TIME: 08:30-10:00
ROOM: KONA MOKU BALLROOM

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

KEYNOTE-1

Mr. Shinjiro Iwata, Advisor to Hitachi Ltd. Japan

“Social Innovation – Delivering New Value through ‘Collaborative Creation’”

The advent of the Internet of Things (IoT) is changing the way we live and do business, forming new connections and relationships among people, systems and things. In order to receive the maximum benefit of IoT, it is essential that we perform “open innovation,” that is, perform innovative creation that goes well beyond the scope of what is possible within a single company or single industry. Hitachi Group is a pioneer in open innovation, long active in collaborative creation ventures with a wide range of partners. Through our collaborative creation, we aim to bring about both economic value and social benefits, while working to realize a safe, comfortable and sustainable society and a better future for our children.



Mr. Shinjiro Iwata is Advisor to Hitachi Ltd. He retired in April after serving as the Representative Executive Officer, Executive Vice President, Executive Officer and Chief Transformation Officer. Mr. Iwata began his career with Hitachi Ltd. in 1972, when he joined the Overseas Business Department. Working his way up through various positions, in 1996 he became manager

of the Business Planning Department for the Information Systems Group. He joined Hitachi Data Systems (HDS) in 1997 as Executive Vice President. After improving the performance of HDS, he became CEO of the company in 2001. In 2006 he became CMO of the newly established Hitachi Global Storage Technologies (HGST), where he oversaw everything from manufacturing to front-line sales. Later, acting as EVP, he implemented sweeping management reforms, putting HGST’s business firmly back on track. In 2009, he returned to Hitachi Ltd. as Vice President and Executive Officer, CEO of Service & Global Business, Information & Telecommunication Systems. In the following years,

Mr. Iwata strengthened the overseas divisions of ICT, later becoming Senior Vice President, and further contributing to the expansion of business. In 2013 he became Representative Executive Officer and worked on management reform of the entire Hitachi Group. Mr. Iwata firmly believes in nimble management making use of data, and efficient waste-free management. In order to implement this policy, Mr. Iwata also acted as CIO for integration of Hitachi’s internal ICT systems and a leader of the End-to-End Supply Chain Project. Most recently, Mr. Iwata served as Director of the Hitachi Smart Transformation Project Initiatives Division, which is reforming the structures of the entire Hitachi Group. Since 2012, he has also been a visiting professor at Tsukuba University.

KEYNOTE-2

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

“Innovation Management 2030: Integrating Social Aspects in Technology & Innovation Management”

The world is becoming increasingly complex. Globalization and sustainability, flexibility and decentralization, diversity and new lifestyles bring markets and systems to their limits. The way we have so far organized the advance of knowledge as well as the research and innovation system have to adapt to those challenges. Yet the driving force of any innovation is the interplay between “technology push” and “market pull,” and both mechanisms have to face challenges which are based on the fact that any information in a knowledge society will be easily available and exchangeable. Therefore, technology and innovation management have to change in a way that they empower and integrate more and more stakeholders in the development of new technologies and innovations. How to handle this change will be one of the biggest challenges in the years to come. The keynote will give insights about how Fraunhofer is facing this challenge with innovative ideas, processes and some first examples.



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

PLENARIES

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 has received several honorary doctorates and awards, including 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. He 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 (ERLAB) 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.

PLENARY SESSION—2

DATE: TUESDAY, SEPTEMBER 6
TIME: 08:30-10:00
ROOM: KONA MOKU BALLROOM

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

WELCOME



Mr. Todd Nacapuy, Chief Information Officer, State of Hawaii, will welcome the PICMET guests to Hawaii.

Appointed by Governor David Y. Ige in April 2015, Todd Nacapuy formally stepped into the role of the State of

Hawaii's Chief Information Officer on May 4, 2015. Shortly after taking the technological helm for the state, Mr. Nacapuy announced the initiation of efforts to consolidate the Information and Communication Services Division (of the Department of Accounting and General Services) and the Office of Information Management and Technology to form a unified and cohesive Office of Enterprise Technology Services (ETS). Priorities for his technology team include IT workforce development; IT governance; enterprise shared services, projects and programs; open government; and cyber security, ensuring that the right systems and processes are in place to facilitate an effective, efficient and transparent government. Nacapuy brings to the task a breadth and depth of experience in application development, vendor selection and management, and infrastructure acquisition, as well as project management, reengineering, enterprise-wide implementation IT strategy and systems planning, and corporate strategy.

Before joining the Ige Administration, Nacapuy was the senior technical account manager responsible for all Premier Commercial services for Microsoft in Hawaii. Prior to that, as a senior infrastructure specialist for EDS, he led efforts to monitor and optimize all Web services within the Navy and Marine Corps network for the Pacific.



John Y. Gotanda, J.D., President of Hawaii Pacific University, will welcome the PICMET guests to Hawaii. He will be introduced by Prof. Dr. Harm-Jan Steenhuis, Professor of Management, International Business MBA Program Chair, College of Business, Hawaii Pacific University, Honolulu, Hawaii.

John Y. Gotanda, J.D., became the President of Hawaii Pacific University, the largest private university in the State of Hawaii, on July 1, 2016. Born and raised in Hawaii, President Gotanda is a graduate of Roosevelt High School, the University of Hawaii at Manoa (BBA, 1984) and the William S. Richardson School of Law (J.D., 1987), where he was Editor-in-Chief of the University of Hawaii Law Review.

Following law school, he was a staff attorney with the United States Court of Appeals for the District of Columbia Circuit. He then worked as an associate attorney with Covington & Burling in Washington, D.C., and later with Goodwin, Procter & Hoar in Boston. In 1994 he joined the faculty at Villanova University Charles Widger School of Law in Philadelphia, Pennsylvania, where he served as Professor of Law, Associate Dean for Academic Affairs, Associate Dean for Faculty Research, and Director of the J.D./M.B.A. Program; from 2011-2016 he served as Dean of

PLENARIES

the Law School.

Under his leadership, the Villanova Law School developed and implemented a strategic plan that radically reformed the school's curriculum, reducing the time and cost of the program, eliminating barriers to entry, and establishing increased international opportunities for its students.

President Gotanda is recognized as one of the world's leading authorities on damages in international law, and has been cited by courts, tribunals and commentators, including by the U.S. Supreme Court. He has spoken widely on the subjects of damages, international arbitration, and international sales law, including at The Hague Academy of International Law. He has also served as an expert on damages and an arbitrator in international investment disputes.

KEYNOTE

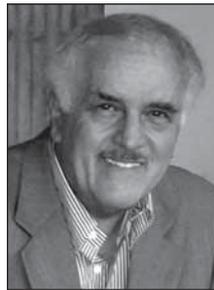
Dr. Bulent Atalay, University of Mary Washington and the University of Virginia; Member, Institute for Advanced Study, Princeton, USA

“Creativity and Genius: Inside the Minds of Leonardo, Shakespeare, Newton, Beethoven and Einstein”

What happens when the objective (scientific) part of the mind intersects with the subjective (artistic) part? Professor Atalay explores this fascinating question by probing the genius of Leonardo da Vinci, Shakespeare, Newton, Beethoven, and Einstein. Leonardo, the creator of the two most famous works in history, was a scientist doing art, and an artist doing science. Newton and Einstein were towering scientific figures. But Newton spent much of his time experimenting in a pair of distinctly non-scientific areas—in the mysterious precincts of alchemy and in scrutinizing the details of Biblical scripture. Einstein, the greatest scientist since Isaac Newton, was a gifted violinist who frequently found inspiration for his scientific endeavors while playing, especially the music of Mozart. And Beethoven was a pianist and composer, a pure musician, or so it seems. Finally, Shakespeare is without a peer in the history of literature.

Professor Atalay shows how they were able to weave their disparate passions, often with extraordinary results. Was this an anomaly or something that can be mapped onto the brain? Understanding the patterns of their creativity will provide an entirely new appreciation of their work and genius—and perhaps that of others, too.

Described by NPR, The Washington Post, and the National



*Geographic Society as a 21st Century Renaissance Man, Professor Bulent Atalay is a scientist, artist and author. In theoretical physics his undergraduate, graduate and post-doctoral training took place at Georgetown, CAL-Berkeley, Princeton, Oxford and the Institute for Advanced Study. The author of numerous papers in theoretical physics and two best-selling books about Leonardo da Vinci: *Math and the Mona Lisa* and *Leonardo's Universe*, he is currently working on a new book about the similarities and differences in the traits, and the modus operandi of Leonardo, Shakespeare, Newton, Beethoven and Einstein. His author website appears at www.bulentatalay.com.*

*Following his Keynote talk, “Creativity and Genius: Inside the Minds of Leonardo, Shakespeare, Newton, Beethoven and Einstein,” Prof. Bulent Atalay will be happy to sign copies of his book *Math and the Mona Lisa* (Smithsonian Books) available for purchase. This is a new paper edition of the bestselling book which has already appeared in 14 languages throughout the world. The price of the book is \$16.*

The book has been described as, “A book by a modern Renaissance man about the paragon Renaissance man. In a masterfully crafted approach, the author seeks the consilience of science and art — painting, architecture, sculpture, music, mathematics, physics, biology, astronomy, and engineering — employing “Leonardo’s mode,” a scheme he identifies as the modus operandi of Leonardo.”

PLENARY SESSION—3

DATE: WEDNESDAY, SEPTEMBER 7

TIME: 08:30—10:00

ROOM: KONA MOKU BALLROOM

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

KEYNOTE-1

Dr. Jay Lee, Ohio Eminent Scholar, L.W. Scott Alter Chair, and Distinguished University Professor, University of Cincinnati, USA

“Recent Advances of Predictive Big Data Analytics and Industry 4.0 for Future Manufacturing and Service Innovation”

PLENARIES

In today's competitive business environment, companies are facing challenges in dealing with big data issues for rapid decision making for improved productivity. Many manufacturing systems are not ready to manage big data due to the lack of smart analytics tools. The U.S. has been driving the Cyber Physical Systems (CPS), Industrial Internet, and Advanced Manufacturing Partnership (AMP) Program to advance future manufacturing. Germany is leading a transformation toward the 4th Generation Industrial Revolution (Industry 4.0) based on the Cyber-Physical Production System (CPPS). China has just launched 2025 Plan and Internet Plus to focus on strengthening manufacturing and accelerate service innovation. It is clear that as more predictive analytics software and embedded IoT are integrated in industrial products and systems, predictive technologies can further intertwine intelligent algorithms with electronics and tether-free intelligence to predict product performance degradation and autonomously manage and optimize product service needs.

The presentation will address the trends of predictive big data analytics and industrial 4.0 as well as the readiness of smart predictive tools to manage industrial big data to achieve productivity and resilient product life cycle management with improved service value. First, industrial competitiveness among the U.S., Germany, China, and Japan are examined. Second, Cyber-Physical System (CPS) enabled product manufacturing and services will be introduced. Third, advanced predictive analytics technologies for smart maintenance and manufacturing systems with case studies will be presented. Finally, Dominant Innovation[®] for smart service design will be introduced with case studies.



Dr. Jay Lee is Ohio Eminent Scholar, L.W. Scott Alter Chair Professor, and Distinguished University Professor at the University of Cincinnati, and he is the Founding Director of the National Science Foundation (NSF) Industry/University Cooperative Research Center (I/UCRC) on Intelligent Maintenance Systems (IMS www.ims-center.net), which is a multi-campus

NSF Industry/University Cooperative Research Center which consists of the University of Cincinnati (lead institution), the University of Michigan, Missouri University of S&T, and University of Texas-Austin. The Center has developed partnerships with over 85 companies from 15 countries since its inception in 2001. In addition, he has mentored his students and developed a spin-off company, Predictronics, with support from the NSF Innovation ICorps Award in 2012. He also served as an invited committee member for White House Cyber Physical Systems

(CPS) Advisory Group in 2013.

His current research focuses on Industrial Big Data Analytics, Cyber-Physical Systems, as well as Prognostics and Health Management (PHM). He led the IMS Team and developed the well-known Watchdog Agent[®] (a systematic platform for data analytics toolbox used by over 80 global companies) as well as the Dominant Innovation[™] (a methodology for product and service innovation design that has been used by many Fortune 500 companies).

Currently, Dr. Lee also serves as advisor to a number of global organizations: he is a member of the Manufacturing Executive Leadership Council; member of International S&T Committee of Alstom Transport, France; Scientific Advisory Board of Flanders' MECHATRONICS Technology Centre (FMTC) in Leuven, Belgium; Scientific Advisor Board of SIMTech, Singapore; and member of the Advisory Committee of MIRDC Taiwan. In addition, he serves as editor and associate editor for a number of journals including IEEE Transactions on Industrial Informatics and International Journal on Prognostics & Health Management (IJPHM). In addition, he is also a De Tao Master in Innovation (http://www.detaoma.com/Jay_Lee/).

Previously, he served as Director for Product Development and Manufacturing at United Technologies Research Center (UTRC), E. Hartford, CT, as well as program director for a number of programs at NSF during 1991-1998, including the Engineering Research Centers (ERCs) Program, the Industry/University Cooperative Research Centers (I/UCRCs) Program, and the Materials Processing and Manufacturing Program. He also served as advisor to a number of universities including Cambridge University and Johns Hopkins University.

Dr. Lee is a Fellow of ASME, SME, as well as a founding fellow of the International Society of Engineering Asset Management (ISEAM). He is a frequently invited speaker and has delivered over 200 invited keynote speeches at major international conferences and has over 20 patents and two trademarks. He received a number of awards, including the most recent NSF Alex Schwarzkopf Technological Innovation Prize in Jan. 2014, MFPT (Machinery Failure Prevention Technology Society) Jack Freary Award in 2014, and the Prognostics Innovation Award from National Instruments in 2012. He mentored his students to participate in PHM Data Challenge Competition and won the 1st prize five times since 2008. He is also an honorary advisor to Heifer International, a charity organization working to end hunger and poverty around the world by providing livestock and training to struggling communities.

PLENARIES

KEYNOTE-2

Dr. Alan L. Porter, Professor Emeritus, Georgia Institute of Technology, USA

“Forecasting Innovation Pathways: The Case of Big Data”

PICMET’s primary mission is to advance analyses of changing technologies to inform technology management. That reflects balancing expert and empirical components to provide effective intelligence. Are managers ready for that? Doubts remain.

Dr. Porter will share an example of his group’s efforts to “Forecast Innovation Pathways” (FIP) for the case of “Big Data.” In tackling such a challenge, we strive to understand the target technology and its attendant “technology delivery system” (i.e., contextual factors affecting development of novel applications). We then perform “tech mining” – text analyses of research publication, patent, and contextual abstract records on the topic, retrieved from databases. One aspect of special interest is detecting “emergence.”

Our process engages various experts and stakeholders to interpret the story of technology development to date. We then work to anticipate promising paths to diverse applications, and attendant issues, potential impacts, and policy/management leverage points.

“Big Data” offers an intriguing case. The explosive growth in R&D, business, and diverse popular interests, concurrently, fuels generation of challenging scenarios for technology managers.

Dr. Alan Porter is Professor Emeritus of Industrial & Systems Engineering, and of Public Policy, at Georgia Tech, where he is Co-director of the Technology Policy and Assessment Center. He is also Director of R&D for Search Technology, Inc., Norcross, Georgia (producers of VantagePoint and Thomson Data Analyzer software). He is author or co-author of some 230 articles and books, including Tech Mining (Wiley, 2005) and Forecasting and Management of Technology (Wiley, 2011). Current research emphasizes “forecasting innovation pathways” for newly emerging technologies. This entails text mining of science, technology & innovation information resources to generate Competitive Technical Intelligence. Many publications are available at: http://www.researchgate.net/profile/Alan_Porter4.



PLENARY SESSION—4

DATE: THURSDAY, SEPTEMBER 8

TIME: 08:30-10:00

ROOM: KONA MOKU BALLROOM

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

KEYNOTE-1

Dr. Nam P. Suh, Ralph E. & Eloise F. Cross Professor, Emeritus, Massachusetts Institute of Technology (MIT), USA

“Challenges in Designing and Implementing Large Systems”

For centuries, people have developed innovative solutions to satisfy human and societal needs in such fields as energy, electric power generation, food, transportation, healthcare, education, information technology, banking, defense, environment, communications, and materials. Many of these innovations are in the form of systems that are designed to satisfy a specific set of functional requirements (FRs) and constraints (C).

We should be able to design all these systems using the same methodology rather than a variety of ad hoc approaches, although the specific nature of the problem, physical principles, data, and acceptable variations are field specific.

This presentation addresses the two challenging issues involved in designing and commissioning large systems: cost over-runs and missing the original schedule. Experience with large system design reinforces the view that the coupling of FRs, i.e., coupled designs, is primarily responsible for cost over-runs and missed schedules. It also increases “complexity” of systems. A solution is presented to preventing the creation of a coupled design: System Architect, whose job is to monitor the design process to be certain that it does not inadvertently create functionally coupled designs. An example is provided.

Dr. Nam Pyo Suh was the 13th and 14th President of the Korea Advanced Institute of Science and Technology (KAIST). He is also the Ralph E. & Eloise F. Cross Professor, Emeritus, M.I.T. During his tenure at KAIST (from July 2006 to March 2013), its worldwide reputation has increased from 198th to 63rd overall and to 24th in engineering and IT. He was the presidential appointee in charge of engineering at NSF. He received nine honorary

PLENARIES



doctoral degrees. He is the recipient of the 2009 ASME Medal, the 2006 General Pierre Nicolau Award, the National Science Foundation's Distinguished Service Award, and many other distinguished awards. He is the author of over 300 papers and seven books, and holds more than 70 patents, including those related to the on-line electric vehicle (OLEV) and the Mobile Harbor (MH). He is a member of the Board of Trustees of King Abdullah University of Science and Technology (KAUST) and a member of the International Advisory Board of the King Fahd University of Petroleum and Minerals (KFUPM), and the Khalifa University of Science, Technology and Research (KUSTAR). He is a member of the Board of Directors of Axiomatic Design Software, Inc., OLEV Technology, Inc., and Parker Vision, Inc.

KEYNOTE-2

Dr. Adnan Akay, Provost, Bilkent University, Ankara, Turkey

“External Technology Advisory Boards”

Increasingly, companies look for external advice and viewpoints from a diverse set of experts who may have different degrees of familiarity with the company but are experts in areas important to the company. There are different reasons for setting up such boards and, accordingly, they have different structures. Some boards are very involved

and meet frequently, others receive information and provide high-level feedback. The key points for a successful board, not surprisingly, rest on its membership, but also how the interactions take place and the recipients of the advice. This presentation will describe how to start up a technology advisory board and the means by which to receive the best input from such boards, with anonymous examples.



Dr. Adnan Akay is the Provost of Bilkent University, where he began on January 1, 2009, as Vice President, and the founding chair of the new Mechanical Engineering Department. Previously, Dr. Akay served at the U.S. National Science Foundation as the Director of Civil, Mechanical and Manufacturing Innovation Division. Prior to serving at NSF, Dr. Akay was a professor and the head of the Mechanical Engineering Department at Carnegie Mellon University, where he was awarded the endowed Lord Chair in Engineering. From 1978 to 1992, he was on the faculty at Wayne State University where he held the DeVlieg Chair in Engineering. Between 1976 and 1978, he was a visiting staff fellow at the National Institute of Environmental Health. He has held visiting appointments at MIT, the University of Rome “La Sapienza,” and at the Institut National des Sciences Appliquées de Lyon in France. Professor Akay is a fellow of the American Society of Mechanical Engineers and the Acoustical Society of America, and a member of several honor societies. Dr. Akay serves on advisory boards of several universities and regularly consults with international industries as a technical advisor.



PICMET

PHD COLLOQUIUM

GETTING YOUR PHD... AND BEYOND

Critical Stages and Career Paths for the PhD Student

DATE: SUNDAY, SEPTEMBER 4
TIME: 13:00—17:00
ROOM: WAIKIKI BALLROOM,
SALON 2 (3RD FLOOR OF THE
PAOKALANI TOWER NEAR
THE SWIMMING POOL)
REGIST: \$35

Through guest lectures by the editors and an interactive workshop, the session gives Ph.D. candidates an excellent opportunity to learn how to successfully defend their Ph.D. viva voce and how to become confident in searching for jobs in academia and industry after obtaining a Ph.D. degree. In addition, the Ph.D. candidates will be able to meet peers and colleagues, share experiences, and network with scholars from different continents.

The invited speakers and the participants will share experiences in the following areas:

- Critical stages in the Ph.D. process and how to successfully master them
- The Ph.D. process and career paths in different continents
- Coping with possible problems while pursuing a Ph.D.
- Entering the job market – academia or industry? (tips/tools for job searching)
- How to get your Ph.D. research published

SPEAKERS:

Professor Gloria Barczak, Northeastern University, USA; Editor-in-Chief, *Journal of Product Innovation Management*

Professor Tugrul U. Daim, Portland State University, USA; Director of Technology Management Doctoral Program, Portland State University, and Editor-in-Chief, *International Journal for Innovation and Technology Management*

Recent graduates and early career researchers working in academia and industry



The colloquium consists of two sessions. The editors and peers will share their experiences on the above topics in the first session. The second session will be an interactive follow-up workshop to tackle topics in which the participants are most interested.

We encourage research students in all stages of the Ph.D. process, as well as recent graduates, to join this colloquium. For more information, please contact:



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Editor-in-Chief, International Journal of Technology Intelligence and Planning; *Academic Editor*, British Journal of Applied Science and Technology

PANELS

MEET THE EDITORS

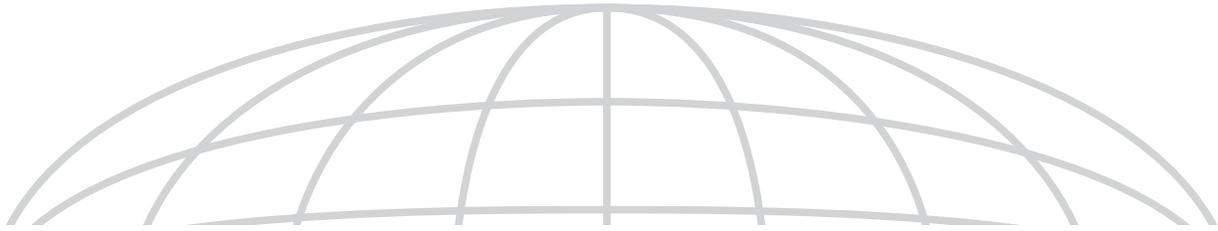
DATE: MONDAY, SEPTEMBER 5
TIME: 10:30-12:00
ROOM: KONA MOKU, SALON A

PANELISTS: Joe Amadi-Echendu, University of Pretoria; Gloria Barczak, Northeastern University; Dilek Cetindamar, Sabanci University; Marina Dabic, Nottingham Trent University; Tugrul Daim, Portland State University; Nazrul Islam, University of Exeter; Fred Phillips, Yuan Ze University; Marthinus Pretorius, University of Pretoria; Harm-Jan Steenhuis, Hawaii Pacific University; 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.



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THE PICMET EXPERIENCE

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



SESSIONS

MA-00 PLENARY - 1

DATE: MONDAY, 9/5/2016
TIME: 08:30 - 10:00
ROOM: KONA MOKU BALLROOM
CHAIR: KIYOSHI NIWA; THE UNIVERSITY OF TOKYO

MA-00.1 [K] Social Innovation-Delivering New Value Through Collaborative Creation

Shinjiro Iwata; Hitachi, Ltd., Japan

The advent of the Internet of Things (IoT) is changing the way we live and do business, forming new connections and relationships among people, systems and things. In order to receive the maximum benefit of IoT, it is essential that we perform "open innovation," that is, perform innovative creation that goes well beyond the scope of what is possible within a single company or single industry. Hitachi Group is a pioneer in open innovation, long active in collaborative creation ventures with a wide range of partners. Through our collaborative creation, we aim to bring about both economic value and social benefits, while working to realize a safe, comfortable and sustainable society and a better future for our children.

MA-00.2 [K] Innovation Management 2030: Integrating Social Aspects in Technology & Innovation Management

Hans-Joerg Bullinger; Senator of the Fraunhofer-Gesellschaft, Germany

The world is becoming increasingly complex. Globalization and sustainability, flexibility and decentralization, diversity and new lifestyles bring markets and systems to their limits. The way we have so far organized the advance of knowledge as well as the research and innovation system have to adapt to those challenges. Yet the driving force of any innovation is the interplay between "technology push" and "market pull," and both mechanisms have to face challenges which are based on the fact that any information in a knowledge society will be easily available and exchangeable. Therefore, technology and innovation management have to change in a way that they empower and integrate more and more stakeholders in the development of new technologies and innovations. How to handle this change will be one of the biggest challenges in the years to come. The keynote will give insights about how Fraunhofer is facing this challenge with innovative ideas, processes and some first examples.

MB-01 PANEL: Meet the Editors

Monday, 9/5/2016, 10:30 - 12:00

Room: Kona Moku Salon A

Panelist(s) Joe Amadi-Echendu; University of Pretoria

Gloria Barczak; Northeastern University

Dilek Cetindamar; Sabanci University

Marina Dabic; Nottingham Trent University

Tugrul U Daim; Portland State University

Nazrul Islam; University of Exeter

Fred Y Phillips; Yuan Ze University

Marthinus W Pretorius; University of Pretoria

Harm-Jan Steenhuis; Hawaii Pacific University

Steven T Walsh; University of New Mexico

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

MB-02 Environmental Issues 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Kona Moku Salon B

Chair(s) Yu-Shan Chen; National Taipei University

MB-02.1 [R] The Positive Impact of Environmental Friendliness on Green Purchase Intentions

Yu-Shan Chen; National Taipei University, Taiwan

Pi-Yu Lai; National Taipei University, Taiwan

Tai-Wei Chang; National Taipei University, Taiwan

Tsu-Ti Yen; National Taipei University, Taiwan

The major purpose of this paper is to explore the positive impact of environmental friendliness on green purchase intentions and also to discuss the mediation effects of green perceived value and green loyalty. This study undertakes an empirical study by means of questionnaire survey. The respondents are consumers who have purchase experience of green products. This study applies structural equation modeling (SEM) to test the hypotheses. The empirical results show that: (1) environmental friendliness has a significant positive impact on green perceived value, green loyalty, and green purchase intentions; (2) both green perceived value and green loyalty positively affect green purchase intentions; and (3) green perceived value and green loyalty partially mediate the positive relationship between environmental friendliness and green purchase intentions.

MB-02.2 [R] Green Patent 3.0: How to Promote Innovation for Environment beyond Green Channel

Mu-Yen Hsu; National Chengchi University, Taiwan

In the 2007 PICMET Conference, the author presented a paper called "Green Patent - Promoting Innovation for Environment by Patent System" to explore a kind of fundamental solution by refining the patent system. In order to alter the direction of the policy context of innovation, the author introduced a new examination criterion, greenness, into the patent system, and discussed its feasibility and possible impacts. In 2009, the UK announced the Green Channel to open a specific examination process for green patent and to quicken the examination speed of innovation for the environment. Following the step of the UK, Australia, South Korea, USA, Israel, Canada, Brazil, China and Taiwan opened various kinds of Green Channels for green patent application. However, the scheme is required to answer "What are green patents?" in advance. To solve this issue, the US EST Concordance was created to serve as a broad guide. EPO and WIPO announced the IPC Green Inventory. All of these institutional changes are in accord with the author's ideal of Green Patent. This research discusses the differences between the executed Green Channel (Green Patent 2.0) and the PICMET 2007 version of Green Patent 1.0, and finally proposes a more comprehensive scheme of Green Patent 3.0.

MB-02.3 [R] Applying Reverse Logistics and Cost Reducing in the Solid Residuals Management

Jose Manuel M Cardenas; Universidad Catolica San Pablo, Peru

Sergio Olivera; Universidad Catolica San Pablo, Peru

This work is based on reverse logistics processes from an entity whose core business is collecting and recycling products through the separation of useful materials for reuse, solid waste destruction, processing and selling of organic material useful inputs. So that reverse logistics and the models used to supply are important to the company. In this article the problem of reducing the cost of pickup truck in charge of recycling materials is introduced. This truck has a route that includes collection points, where it meets the bags of material collected in bags distributed to homes in a given district. The truck has space restrictions (volume of cargo), fuel and daily distance traveled. This way, the paper suggests using a routing model to decrease the distance between the Center and the collection points so that it can establish an optimal route to minimize fuel and tracking on the truck, aiming eventually to reduce transport costs and monitoring inputs. Thus, key concepts of reverse logistics models liable to be used for purposes of reverse logistics inventory are reviewed. And the "traveling salesman problem" as an alternative to optimize the routing of the truck is reviewed.

SESSIONS

MB-02.4 [R] Greenwash and Green Brand Equity

Yu-Shan Chen; National Taipei University, Taiwan

Wen-Pin Tien; National Kaohsiung First University, Taiwan

Yu-I Lee; Far East University, Taiwan

Ming-Lun Tsai; National Kaohsiung First University, Taiwan

The study investigates the impact of greenwash on green brand equity and discusses the mediation roles of green brand image and green satisfaction. The research object of this study focuses on Taiwanese consumers that have the experience to purchase information and electronics products in Taiwan. The results demonstrate that greenwash negatively influences green brand equity. In addition, this research verifies that greenwash is negatively related to both the green brand image and green satisfaction that would positively influence green brand equity. This paper also proves that green brand image and green satisfaction mediate the negative relationship between greenwash and green brand equity. Hence, this study suggests that companies should reduce their greenwash behaviors and raise their green brand image and green satisfaction to enhance their green brand equity.

MB-03 S & T Policy 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Kona Moku Salon C

Chair(s) Hsin-Ning Su; National Chung Hsing University

MB-03.1 [R] Analyzing Scientific Structure of Digital Humanity

Hsin-Ning Su; National Chung Hsing University, Taiwan

The integration of humanity and digital technology has been becoming a new approach for social science research or even gradually forming a new discipline in academia. To understand the currently developed knowledge structure of "Digital Humanity," this study utilized keyword analysis and social network analysis for investigating scientific papers published in the field of Digital Humanity. The methodology used in this study is capable of creating three-dimensional "research focus parallelship network" and "keyword co-occurrence network," together with a two-dimensional knowledge map. The networks and knowledge maps can be depicted differently by choosing different information as network actor, i.e., country, institute, paper and keyword, to reflect knowledge structures from macro, meso, to micro-levels. The quantitative exploration provides a way to visualize and assess the development of Digital Humanity to encourage the formation of this emerging research field.

MB-03.2 [R] Drivers to Enhance New Product Development Performance

Ching-Hsun Chang; Tamkang University, Taiwan

This study utilizes ordinary least squares (OLS) regression and verifies the framework in the Taiwanese manufacturing industry. The study employed questionnaire survey and collected data from 158 Taiwanese manufacturing companies. The purpose of this study develops an original framework to explore effects of both outward and inward capabilities on corporate competitive advantage through the mediator: new product development performance. Environmental scanning is regarded as the outward capability and locus of planning is regarded as the inward capability. If companies want to increase their new product development performance, they should enhance both environmental scanning and locus of planning capabilities.

MB-03.3 [R] Supporting Inclusive Innovation: Developing Improved Analytical Methods and STI Policy Instruments to Operationalise Inclusive Innovation

Sara S Grobbelaar; Stellenbosch University, South Africa

Edward van der Merwe; Stellenbosch University, South Africa

In this paper we consider the "inclusive innovation" concept and the growing interest among academics and practitioners in the role of innovation in socio-economic development. Inclusive innovation - i.e., the development of new products, services, processes and business models aimed at resource-poor individuals or groups - is considered to present a

positive contribution to better life conditions and upward mobility among low-income or resource-poor communities. The gap that was identified in the literature is that there remains a lack of analytical methods to analyze inclusive innovation opportunities from a system perspective. We argue that there is a need for developing a systems and network approach to understand systems that perpetuate inequalities and poverty based on the terms and conditions of inclusion and exclusion. To this end, the contribution made in this paper is to create a framework on which basis the innovation systems approach may be contrasted and compared with approaches of pro-poor value chain development. The aim here is to explore how the value chain approach may be used or integrated in the analysis of inclusive innovation systems. The methodological approach taken in this paper has its roots in the congruence analysis approach. Through this approach, we consider the explicit development of inclusive practices in innovation systems and value chains. We draw a number of general propositions towards conceptualizing and operationalizing inclusive innovation within the innovation system (IS) and (global) value chain (VC) frameworks. This is followed up with some proposals of how the IS and GVC approaches could be used in unison for the development of an analytical framework for operationalizing inclusive innovation.

MB-04 Collaborations for TM 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Honolulu

Chair(s) Joseph C Paradi; University of Toronto

MB-04.1 [R] Research on the Factors Affecting Synergy of Enterprise Innovation Network Based on ISM

Yunfeng Wei; Beijing University of Technology, China

Pingnan Ruan; Beijing University of Technology, China

The synergy of an enterprise innovation network will not only improve the performance of innovation, but also improve the stability of network organizations. So it is very important to study the influencing factors of synergy for the enterprise innovation network. The paper summarizes 11 influencing factors of innovation synergy from four dimensions based on the literature review. All 11 influencing factors are divided into four levels by the interpretation structure model, and the path of synergy influence factors are: the external environment of the enterprise innovation network; individual level factors; the internal environment of the enterprise innovation network; the relationship between nodes; and synergy. In all of the influencing factors, government is the core factor which affects the innovation synergy through the impact of market regulation and policy system on resource allocation and collaborative innovation policy support.

MB-04.2 [R] Untangling the Boundaries in Technology Collaborations: The Deviation Effects of 'Project Autonomy' on Innovations through Collaborations

Naoki Takada; Hitotsubashi University, Japan

In line with the rising number of collaborations among organizations, many researchers investigated the effects of relational factors (e.g., trust relationship) between parent firms. In contrast with this trend, this paper separately captures management-level (parent firms) and operational-level (projects) in collaborations, and investigates the effects of relationships between these two levels. In this setting, parent firms have responsibility for contract and conflict resolution, and project for R&D activities. The concept of "project autonomy," which means the extent of authority and freedom of a project to make its own decisions about purpose and procedure about R&D activities, is the indication of one of those relationships. The result of analysis using the patent-based measure suggests two points. First, high project autonomy promotes the technological outcome through integration inside projects. Because collaborative projects are composed of members from different organizations, autonomous decisions may set on integration of organizational routines. Second, low project autonomy promotes the integration between projects and own firm, which is needed to commercialize through linking technological outcome with complementary resources. Combining with these two points, it is suggested that these points are not accomplished

SESSIONS

simultaneously due to project autonomy. High failure rate of technology alliance may be explained from this aspect.

MB-04.3 [R] The Impact of Collaboration with Big Companies on Entrepreneurial Technology Innovation

Eva M Grochowski; Fraunhofer IAO, Germany
Joachim Warschat; Fraunhofer IAO, Germany
Richard Dasher; Stanford University, United States

Startups and small- and medium-sized companies are an important source for technology innovation. Cooperation with big companies reinforces technological innovation, but it can also hamper entrepreneurial undertakings. This research considers the impact of cooperative activities of startups or small- and medium-sized companies with big companies in regard to technology innovation in the automotive industry. The analysis of 16 cases gives a first overview about the particular characteristics of cooperative activities in an industry that suffers from disruptive innovation and new players. The analysis covers the reasons for cooperation, the desired partner characteristics, and the benefits and sacrifices caused by the cooperative activities. Risk and cost reduction are not seen as critical by big companies regarding the decision for or against the collaboration. Their focus is on knowledge gain and new ideas. Startups or small- and medium-sized companies, on the other hand, seek market entry and public relations. Cooperation is not primarily considered as a source for venture capital. Public funding as a financial source for innovative work is underestimated except for university cooperation. The study is based on eight expert interviews with CEOs, founders and technical directors with wide experience in R&D cooperation.

MB-05 Decision Making 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Waikiki Salon 1

Chair(s) Timothy R Anderson; Portland State University

MB-05.1 [R] Decision-Making Model on DSLR Camera Choosing for 18 ~ 30 Years Old College Students

Pei Zhang; Portland State University, United States
Chih-Jen Yu; Portland State University, United States
Jiabing Zhang; Portland State University, United States
Monticha Khammuang; Portland State University, United States
Dundar F. Kocaoglu; Portland State University, United States

A three-level hierarchical decision model (HDM) is established in this paper to help 18-30 year-old college students make decisions about choosing a desirable digital single-lens reflex camera (DSLR) from five famous DSLR camera manufacturers. The HDM has been utilized in this paper because it measures the relative contribution of each criterion to the final decision based on quantified judgments of the respondents. A group of experts consisting of 12 males and nine females provided their quantified judgements with different weighted value in each element at each level of the decision hierarchy. By applying desirable functions, there was one most desirable camera picked from each manufacturer of the five. Additionally, the research team also analyzed the judgments from experts for possible different judgements between gender groups, and no significant differences were shown.

MB-05.2 [A] Selecting Medical Hardware: A Patient's Perspective for a Cochlear Implant Decision

Timothy R Anderson; Portland State University, United States
Shabnam R Jahromi; Jama Software, United States

Selecting medical hardware can be a difficult and permanent decision for patients that they are often unprepared for. The authors explore the use of pairwise comparison techniques to better inform medical decision making in an application of choosing between three major cochlear implant manufacturers.

MB-05.3 [R] Consistency Thresholds for Hierarchical Decision Model

Mustafa S Abbas; Portland State University, United States
Dundar F Kocaoglu; Portland State University, United States

The objective of this research is to establish consistency thresholds linked to alpha levels for hierarchical decision model's (HDM) judgment quantification method. Measuring consistency in order to control it is a crucial and inseparable part of any AHP/HDM experiment. The researchers on the subject recommend establishing thresholds that are statistically based on hypothesis testing and are linked to the number of decision variables and alpha level. Such thresholds provide the means with which to evaluate the soundness and validity of an AHP/HDM decision. The linkage of thresholds to alpha levels allows the decision makers to set an appropriate inconsistency tolerance compatible with the situation at hand. The measurements of judgments are unreliable in the absence of an inconsistency measure that includes acceptable limits. All of this is essential to the credibility of the entire decision-making process and hence is extremely useful for practitioners and researchers alike. This research includes distribution fitting for the inconsistencies. The superb fits obtained give confidence that all the statistical inferences based on the fitted distributions accurately reflect the HDM's inconsistency measure.

MB-06 Strategic Management of Tech 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Waikiki Salon 2

Chair(s) Robert Lagerstrom; KTH Royal Institute of Technology

MB-06.1 [R] Bridging the Gap between Business and Technology in Strategic Decision-Making for Cyber Security Management

Margus Valja; Royal Institute of Technology - KTH, Sweden
Robert Lagerstrom; Royal Institute of Technology - KTH, Sweden
Matus Korman; Royal Institute of Technology - KTH, Sweden
Ulrik Franke; Swedish Institute of Computer Science, Sweden

System architectures are getting more and more complex. Thus, making strategic decisions when it comes to managing systems is difficult and needs proper support. One arising issue that managers need to take into account when changing their technology is security. No business is spared from threats in today's connected society. The repercussions of not paying this enough attention could result in loss of money and in case of cyber physical systems, also human lives. Thus, system security has become a high-level management issue. There are various methods of assessing system security. A common method that allows partial automation is attack graph based security analysis. This particular method has many variations and wide tool support. However, a complex technical analysis like the attack graph based one needs experts to run it and interpret the results. In this paper we study what kind of strategic decisions that need the support of threat analysis and how to improve an attack graph based architecture threat assessment method to fit this task. The needs are gathered from experts working with security management and the approach is inspired by an enterprise architecture language called ArchiMate. The paper contains a working example. The proposed approach aims to bridge the gap between technical analysis and business analysis making system architectures easier to manage.

MB-06.2 [R] Structuring the Multi-Issue and Hub-Spoke Games Found in Public Administration

Femke Bekius; Technical University Delft, Netherlands
Scott Cunningham; Technical University Delft, Netherlands
Hans de Bruijn; Technical University Delft, Netherlands
Sebastiaan Meijer; Technical University Delft, Netherlands

Real-world decision making on socio-technical systems such as the railways is complex. The system contains technical uncertainties; multiple actors with different incentives are involved; institutional rules play a role and external events have a big influence on the process of decision making. Game theory helps in understanding the complexity of the

SESSIONS

situation by structuring the different elements of the process: the actors, actions, pay-offs and information. However, by only considering these elements, the situation is often made too simple and therefore not applicable by decision makers in real-life situations. The field of public administration entails various concepts that do take the rich context of the decision-making processes into account; however, the formal representation is missing. In this paper, we present examples of public administration concepts formalized using game theoretical methods. This way, we are able to capture more richness of the process while at the same time create structure and insight for the decision maker.

MB-06.3 [R] The Establishment of Performance Evaluation System of NSFC & High-speed Railway Joint Fund

Yuan An; China Academy of Railway Sciences, China
Jing Chang; China Academy of Railway Sciences, China
Xueshan Li; China Academy of Railway Sciences, China
Yun Liu; Beijing Institute of Technology, China
Yuhan Gao; China Academy of Railway Sciences, China

The High-speed Railway Joint Fund, jointly established by the National Natural Science Foundation of China (NSFC) and China Railway Corporation (the former Ministry of Railways), aims to play the guiding and coordinating role of NSFC to promote an industry-university research combination, and to upgrade the independent innovation capacity of the railway industry in China. Based on the analysis of the preliminary overview, use and management, and organization and implementation of the joint fund, this paper established the performance evaluation system in three aspects: the consistency between strategy and goal, the performance of organizational management, and the efficiency of funded projects.

MB-07 Innovation Management 1 **Monday, 9/5/2016, 10:30 - 12:00**

Room: Waikiki Salon 3

Chair(s) Paulo T Nascimento; Universidade de Sao Paulo

MB-07.1 [R] Effects of R&D Risk on Technological Innovation Performance: The Intermediary Role of R&D Specific Human Capital

Hongtao Wang; China JiLiang University, China
Shujing Chen; Zhejiang Sci&Tec University, China
Jing Hu; China JiLiang University, China

Differentiation of competitive strategy and diversification of technology make R&D-specific human capital more and more prominent. This paper discusses the impact of R&D risk to the enterprise technological innovation performance and takes R&D-specific human capital as a mediating variable. Depending on the analysis of existing research and theoretical deduction, the theoretical model of this paper is built and relevant hypotheses are put forward. Finally, by using the method of questionnaire survey and data analysis, the model is verified, and the following conclusions are drawn: (1) Technological uncertainty, market uncertainty, competitive uncertainty and policy uncertainty are significantly negatively correlated with enterprise technological innovation. (2) R&D specific human capital has a partial intermediary role in the impact of R&D risk on the enterprise technological innovation. R&D risk has a significant negative impact on R&D-specific human capital.

MB-07.2 [R] Big Data for Innovation: The Case of Credit Evaluation Using Mobile Data Analyzed by Innovation Ecosystem Lens

Simone S Luvizan; Getulio Vargas Foundation, Brazil
Paulo T Nascimento; FEA - USP University of Sao Paulo, Brazil
Abraham Yu; FEA - USP University of Sao Paulo, Brazil

Despite the high expectations about big data (BD) innovation potential, academy lacks studies exploring its implications and the process to achieve the announced benefits. This paper aims to help fill this gap, analyzing the case of an innovative credit assessment model, based on behavioral profiles generated over mobile network data. We ponder about the

innovative potential of such huge data sets when applied to purposes differing from the ones they were generated for. To this case theoretical lens, we propose a framework where innovation ecosystem concepts are articulated by contextualist elements. We explore this approach as an alternative to study the phenomenon's different dimensions. It was useful to highlight that, despite the potential benefits of the solution as an enabling technology for financial inclusion and new business models in the credit area, the ecosystem required for such innovation has critical dependencies delaying its progress. The study also revealed strategies used to break the inertia and create a minimum viable footprint (MVFP) as a first step to chase its innovation full goals. It shows that the planning of an incremental path can be a good gimmick to deal with dependencies and enable radical change in complex ecosystems.

MB-07.3 [R] The Role of Information and Communications Technology, Economy and Patents in Productivity of South-American Countries

Carlos A Mugruza-Vassallo; Universidad de Lima, Peru
Sofia Minano Suarez; N/A, Peru

The relationships between patents and information and communications technology (ICT), and labor productivity were proposed by Skorupinska & Torrent-Sellens. This paper represents an exploration of research and development expenditure, patents and general ICT in South America (SA) to support domestic innovation and productivity. However, no significant relations were found from year to year, possibly due to a number of different trends in patents. Further, we have found that the South American countries cataloged by the International Telecommunication Union have mostly dropped in their rankings, although they have made efforts in recent years. This has framed our discussion about productivity based on the countries explored and the conflicting policies towards innovation and industrial property ICT. The discussion was centered the Venn diagram generated as a result of a series of linear regressions, where each SA country was located in a different region of the diagram. On the other hand, in the group given, Paraguay Bolivia and Ecuador were outside the diagram, suggesting a different scenario to the multi-linear regression proposed.

MB-08 Knowledge Management 1 **Monday, 9/5/2016, 10:30 - 12:00**

Room: Milo I

Chair(s) Charles M Weber; Portland State University

MB-08.1 [A] Identification of Experts Using Social Network Analysis (SNA)

Edwin Garces; Portland State University, United States
Kevin Van Blommestein; Portland State University, Australia
Jamie Anthony; Bonneville Power Administration, United States
James Hillegas-Elting; Bonneville Power Administration, United States

Technologies are developing rapidly, and specific strategies and techniques that contribute to a more effective, congruent, and faster association of ideas are necessary and important. Many methods, tools, and techniques require the opinion of experts or debates of certain topics. Finding these experts is not easy, and the knowledge and experience of a determined field will determine the quality of the results. Therefore, research collaboration among experts has gained importance during the last decades, especially in the area of technology. Since the 1960s, the idea of identifying the main actors in a society or a person that has prestige in the community has gained interest. Social network analysis (SNA) is a common method for finding the knowledgeable person in a community. In this paper, SNA and bibliometric analysis are used to determine the lead authors, co-authors, institutions, and contact information in the period from 2005 to 2015. The main objectives of this paper are to identify experts in the area of energy efficiency - commercial refrigeration and to develop a methodology to identify experts by using SNA and bibliographic analysis using journal sources such as Web of Science and Compendex. Since the main objective is to identify experts that influence the R&D in the commercial refrigeration area, the study includes the identification of experts in the U.S. and around the world. A software was developed using "R." The results show detailed information about the authors in order to be

SESSIONS

used in the specific research areas.

MB-08.2 [R] A Privacy Continuum in a Conceptual Framework of Enterprise Privacy Architecture

*Yutaka Mizuno; Nagoya Institute of Technology, Japan
Nobutaka Otake; Nagoya Institute of Technology, Japan*

This paper examines a Personal Information Trust Service as a conceptual framework of a Personal Data Store to be one of common information models that manage smarter city data and shares information safely across multiple agencies within a city. This conceptual framework proposes a Smart Privacy Platform and an Enterprise Privacy Architecture. The Smart Privacy Platform is an open & close service platform that can be embedded into each smart system. The Enterprise Privacy Architecture is a privacy management model that has a four-layered service dimension in collection and safekeeping of Personal Identifiable Information (PII). PII in the smart systems can accidentally identify an individual with combining identified and identifiable PII. This paper discusses a privacy continuum as a process model of continuous data minimization of PII in the Enterprise Privacy Architecture. A privacy continuum proposes a solution to reduce risks of accidentally identifying an individual in social services of a smart city.

MB-08.3 [R] New Technology for Developing Facial Expression Recognition in e-Learning

Chih-Hung Wu; National Taichung University of Education, Taiwan

This project develops a face expression recognition system based on facial expression features that are extracted by FaceSDK in JAFFE database. To verify the performance of our facial expression recognition system, the system was tested on JAFFE database among a static picture environment and randomly moving picture environment. The system can capture in real time participants' facial features several times in one second and then records the information in a database for further analysis. Research results show the high performance and generalizability of our system via various machine learning algorithms. We believe that the developed facial expression recognition system with algorithms is an effective mechanism for e-learning system or other research issues.

MB-09 Entrepreneurship/Intrapreneurship 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Milo II

Chair(s) Min-Seok Cha; Changwon National University

MB-09.1 [R] A Model of Academic Community Entrepreneurship (ACE): Initiation, Innovation, and Impacts of PICMET

Min-Seok Cha; Changwon National University, Korea, South

Entrepreneurship is the process of creating problem solving systems that generate knowledge and provide value. It is also seen as an innovation engine. It could be applied in many fields including the academic community. This attempt at creating an academic community can be viewed as an academic entrepreneurship. The impactful process of academic entrepreneurship is worthwhile to be noticed and shared. Because PICMET has shown a model of building a sustainable scholar community and its coordinating organization at the international level, it could be a successful case of an academic community entrepreneurship (ACE) model. ACE is focused on creating new value of academic and practical knowledge and social capital through participation and collaboration. As a scholar, the founder and his team could be an innovator as lead users in the academic community platform. It was a vigorous attempt of the lead scholar in the Management of Engineering and Technology field. Its biannual rotation of the location with support of many international partners, publication of peer-reviewed proceedings, and Department of Engineering and Technology Management as the hosting institution are all contributing forces. The archive and ethnographic case studies are utilized to build a refined ACE model with multiple layered process research. The new model of entrepreneurial journey, entrepreneurial career staged ACE-HEROS model sheds light on the ACE model. This research aims to provide the platform of remembering and depicting engaged scholarship that has reached the realm of

academic entrepreneurship. The measuring of PICMET impact is still challenging, but the qualitative categories are proposed to suggest some constructive response to the dedicated academic entrepreneur and community. This is also a call for collaborative research on our community in the future.

MB-09.2 [R] Positioning Social Entrepreneurship Research in the Field of Entrepreneurship Research

*Tatsuya Kuroda; University of Tokyo, Japan
Shino Iwami; University of Tokyo, Japan
Ichiro Sakata; University of Tokyo, Japan*

Social innovation (SI) is becoming a more important concept in research and business. Various studies on SI are related to CSR of major companies and management systems of NPOs. Social entrepreneurship (SE) stands out in the field of entrepreneurship research, and some social entrepreneurs have changed society for the better. Firstly, we checked the relations between SI and SE in research fields through citation network analysis in the database of the Web of Science (WoS) provided by Thomson Reuter's, extracting 688 papers including the words "social innovation" or "social entrepreneurship" in the title, abstract, and keywords from WoS. We found that the two clusters are almost completely separate. Next, we extracted 71,145 papers including the words "venture," "startup" and "entrepreneur" from WoS, and specified five main clusters and 15 sub-clusters (including 19,499 papers) through citation network analysis. Additionally, we examined 265 papers including "social entrepreneurship" in these clusters and sub-clusters. As a result, we figured out that the 206 papers (78% of the whole SE papers) are concentrated to one sub-cluster (No.1-1) whose average published year is 2011.7, so this sub-cluster is one of "emerging" clusters.

MB-09.3 [A] Wanted Scenario Graph: Wants-based Mapping Method for Discovering Novel Ideas

*Hiroyuki Yagita; Keio University, Japan
Seiko Shirasaka; Keio University, Japan*

In this paper, Wanted Scenario Graph is proposed by extending Scenario Graph. The Scenario Graph is one of forced association measures and also one of structured mind mapping methods to generate potential scenarios for new products and services while visually organizing contextual information. Wanted Scenario Graph is a method for idea creation with consideration of wants into the scenario graph by adding the wants as a component of the graph, in order to discover novel ideas. We test 19 people with Wanted scenario graph for an identical theme, which is anything you like to have for safety and security in the future. It is described that Wanted Scenario Graph by individuals is useful when it is used for creating new ideas.

MB-09.4 [R] Do Peer Firms Affect Corporate Social Responsibility Policies?

*Mei-Chen Lin; National Taipei University, Taiwan
Hsiang-Lin Chih; National Taipei University, Taiwan*

This paper examines whether firms react to their peers' CSR actions by changing their firm's CSR practices. We show that one important corporate social responsibility (CSR) determinant is their peers' CSR. This effect is stronger in peer firms with lower free cash flows and a higher market-to-book value. Higher-compensated CEOs also have stronger tendency of CSR-mimicking behaviors. The CSR policies of smaller in market value, less profitable, younger firms with lower institutional ownership, smaller market share, and lower earnings growth are very sensitive to the CSR policies of their more successful counterparts.

MB-10

Intellectual Property 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Milo III

Chair(s) Deok S Yim; Science and Technology Policy Institute

MB-10.1 [R] Managerial Challenges in Intellectual Property Rights Control in Open Educational Settings: Perspectives from Management Literatures

SESSIONS

Neil Chu; National Taiwan University, Taiwan

Universities have introduced new experiential courses in curriculum offerings as a response to a perceived lack of practical marketing and design experience for students. Although being true in spirit to their predecessors originating from leading educational institutions, the established design-and-entrepreneurship mixed education models elsewhere have only recently raised heightened attention in Taiwan, and questions are growing mostly as to address how to best align students and third-parties' interests with institutional policies to appropriately reflect their non-employment status, and lack of engagement in the business of conducting university-sponsored research as with faculty and graduate students. This article continues the author's previous investigation describing the managerial needs in an engineering design course setting in Taiwan. Building on previous research assuming a process approach to consider students' legally debatable behavioral conducts, the current article proceeds further to analyze the context under which behavioral conducts can lead to intellectual property ownership disputes. A case study with an ethnographic approach is used to collect data, and an archival survey of official university documents and relevant cultural contexts are used to make sense of student behaviors and the unique challenge in managing IP conceived from an open student entrepreneurial course.

MB-10.2 [R] 'Expand/Offense' and 'Deepen/Defense' Strategy of Patent Acquisition for Leader and Follower: Evidence from Drug-Eluting Stent

Ming Chung Yang; Chaoyang University of Technology, Taiwan
Fang-Pei Su; Chaoyang University of Technology, Taiwan
Yu-Hsin Chang; Chaoyang University of Technology, Taiwan
Kuei Kuei Lai; Chaoyang University of Technology, Taiwan
Chien Yu Lin; Yunlin University of Science and Technology, Taiwan
Han yun Chang; Chaoyang University of Technology, Taiwan

This article explores the strategic intension of patent acquisition for drug-eluting stent manufactures by the approach of patent citation network. From the view of supplementary and complementary, we could understand the change of patent employments and patent portfolios of the leader, Johnson & Johnson/Cordis, and the follower, Boston Scientific/BSS, before/after patent acquisition. Four patent indicators - technological knowledge status, technological knowledge reliability, common internal knowledge, and common external knowledge - provide the movement of position and role and change of supplementary and complementary of manufactures. The result shows that the leader acquires patents of complementary technology and the follower acquires patents of supplementary technology. The leader employs "expand/offense" and the follower adopts "deepen/defense" strategy of patent acquisition.

MB-10.3 [R] Locate the Technological Position by Technology Redundancy and Centralities: Patent Citation Network Perspective

Yu-Hsin Chang; Chaoyang University of Technology, Taiwan
Wen Goang Yang; Chaoyang University of Technology, Taiwan
Ming Chung Yang; Chaoyang University of Technology, Taiwan
Kuei Kuei Lai; Chaoyang University of Technology, Taiwan
Chien Yu Lin; Yunlin University of Science and Technology, Taiwan
Han yun Chang; Chaoyang University of Technology, Taiwan

Patent citation is important to analyze technological ability of a company; however, it only tells the relationship between a pair of technologies or companies. Patent citation network constructed by the concept of social network could explore the relationship of companies within a whole network. This study builds up a model to locate the technological position by technological redundancy and centralities of patent citation network. Technological redundancy includes two indicators of technological knowledge status and technological knowledge reliability. Centralities have four indicators of degree, eigenvector, closeness and betweenness centralities. After the model is built, the study tries to locate the companies' technological position of the sector of Intelligent Transportation System with this model. The result suggests that the model is effective to locate the companies' technological position before and after patents' transfer. From the positions' changes, the study finds

out three kinds of acquisition strategies: 1) enhance barriers to consolidate position, 2) milch cow for non-practicing entities, 3) shortcut for periphery and new entrants.

MB-11 Supply Chain Management 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Milo IV

Chair(s) K. Jamie Rogers; University of Texas at Arlington

MB-11.1 [R] Build to Order Supply Chain Efficiency Using Stochastic Frontier Analysis (SFA)

Maysaa M Hamdan; University of Texas at Arlington, United States
K. Jamie Rogers; University of Texas at Arlington, United States
Amer Hamdan; University of Texas at Arlington, United States

The build-to-order supply chain (BTO-SC) is one agile supply chain that has received great attention in research and industry. Flexibility and responsiveness in mass customization have become major objectives of many companies, and this has led to the further development of BTO-SC. The main purpose of this study has been to measure, compare and analyze the impact of the BTO-SC and traditional supply chain on the company's performance and highlight the key performance measures that can influence the decision making. A methodology for analyzing the efficiency of the BTO-SC is developed using stochastic frontier analysis (SFA), which is compared to the traditional supply chain in which both are then compared to the deterministic data envelopment analysis (DEA) model. The targeted population for study has been companies in the computer industry functioning in BTO-SC and/or a traditional supply chain network. Such a comparative analysis provides a more informative tool for use as part of an investment guideline for companies who wish to adopt BTO-SC principles.

MB-11.2 [R] Systematic Embodiment of Supply Chain Network through Designing the Optimal Database Structure

Yoseob Heo; KISTI, Korea, South
Jongseok Kang; KISTI, Korea, South
Sungwha Hong; KISTI, Korea, South

In the past, many researchers suggested a variety of supply chain network models which encompass both the upstream and downstream sides. However, most of the supply chain models were conceptual network map and focused on individual firm or industry level. In this paper, we analyzed and embodied a more substantive supply chain network model based on the optimal database comprised of US patent data, STN International patent data and Harmonized System (HS) code data. We designed four relational database sets. The first set consists of the list of traded commodities and their HS code. The second is about matching the relation between traded products and their raw or intermediate materials. The third is composed of diverse usage databases of raw or intermediate materials compiled by using patent data, and the fourth is about the patent data of individual substances. Then, we implement visualizing the supply chain network from raw materials to traded products by linking the four database sets. We demonstrate the supply chain network of a medical patch as an application of our technique.

MB-11.3 [A] Examining the Role of Global Value Chains in the Context of Smart Specialisation Strategies (S3)

Louis Brennan; Trinity College, University of Dublin, Ireland
Ruslan Rakhmatullin; European Commission, Spain

This paper examines the EU's policy of Smart Specialization in the context of global value chains (GVC). Technology upgrading is highly dependent on whether countries and regions use GVCs and international R&D networks as levers, linkages and mechanisms of learning. The key challenge for S3, which is still very much unexplored, is how can the local production stage of GVC become a building block of regional innovation strategy? There are policy views which argue that GVCs are key to technology upgrading. Linking is everything and there are suggestions that countries or regions should link up only when they are able to

SESSIONS

benefit, i.e., they need to first build endogenous technological capability and only then link up. In the past a dominant feature of earlier regional and national research strategies has been an excessive inward orientation or domestic led modernization, but starting with S3, there is a requirement to provide evidence that each S3 strategy is sufficiently outward looking. While outward looking can mean inward oriented SSS which has taken into account the global context, within the EU context it also means taking account of what other regions are doing and where complementarities arise, engaging with those other regions. On the other hand, there are limits of only GVC led upgrading. This paper explores how to transnationalize S3 and offers insight into the key elements that need to be incorporated into a policy tool box that can help policy makers achieve such an objective.

MB-12 NPD 1

Monday, 9/5/2016, 10:30 - 12:00

Room: Milo V

Chair(s) Eric Rebentisch; Massachusetts Institute of Technology (MIT)

MB-12.1 [R] Measurement of Organizational Complexity in Product Development Projects

Eric Rebentisch; Massachusetts Institute of Technology (MIT), United States
Guenther Schuh; RWTH Aachen University, Germany
Kaushik Sinha; Massachusetts Institute of Technology (MIT), United States
Stefan Rudolf; RWTH Aachen University, Germany
Michael Riesener; RWTH Aachen University, Germany
Christian Mattern; RWTH Aachen University, Germany
Felix Stracke; RWTH Aachen University, Germany

Many modern products are becoming more and more complex in order to cope with customers' demands regarding performance and lifecycle properties. As traditional product development structures struggle to keep up with the rising complexity, companies may form cross-functional teams, integrate off-site experts or outsource certain tasks to external suppliers. This results in increasingly complex project organizations, requiring advanced management and coordination skills. Recent research has found a direct relationship between complex project organizations and missed cost and schedule targets, suggesting companies' inability to manage complex organizations. This paper develops a framework to measure organizational complexity and thus make it visible and more easily controllable for project managers. A broad literature analysis identifies a range of factors associated with organizational complexity. A mathematical model infers the complexity of a project organization based on the identified factors. A proposed visualization method identifies complexity hotspots, which can be used to assess project alternative structures. Finally, a project example illustrates the application of the overall method. Altogether, this approach may be useful to enhance project managers' awareness of complexity inside a project organization and thereby empower them to avoid overly complex, unmanageable structures.

MB-12.2 [R] Next Generation Hardware Development: Framework for a Tailorable Development Method

Guenther Schuh; Fraunhofer IPT, Germany
Tim Wetterney; Fraunhofer IPT, Germany
Felix Lau; Fraunhofer IPT, Germany
Stephan Schroeder; Fraunhofer IPT, Germany

Companies are adapting their traditional development processes, aiming for project-specific designs that are referred to as "agile product development" - flexible, adaptive and accelerated processes. Implementing these principles supports developers to react to challenges such as shortened innovation cycles and increased market dynamics. The project-specific tailoring of a development process has to be carried out right from the start. Early on, companies have to create a unique path for each development project by choosing the right development approach (plan-driven, agile or hybrid), assembling properly skilled development teams, and creating an enabling environment and applicable process design. But, due to the lack of appropriate methodologies for a project-specific tailoring, companies

find it difficult to adjust development methods according to the project requirements at hand. Therefore, development projects often do not meet expected budgets, deadlines or product goals. As a first step, the authors present a selection of essential development method elements based on a literature review. These elements, classified in content- and process-related elements, form the basis for a comprehensive method framework. The method framework supports companies in identifying and configuring crucial method elements based on which project-specific development strategies can be derived.

MB-12.3 [R] Comparative Analysis for Fuzzy Cognitive Mapping

Byung Sung Yoon; Portland State University, United States
Antonie J Jetter; Portland State University, United States

Fuzzy cognitive mapping (FCM) is a semi-quantitative system modeling technique that is used in technology management to capture, synthesize and analyze expert and stakeholder knowledge for the purpose of technology assessment, product planning, and scenario studies. The resulting FCM models are generated in interviews, focus groups, or workshops and represent complex and dynamic systems as system elements (so-called concepts) that are connected through cause-and-effect relationships. FCMs are often compared to investigate cognitive differences between individuals or groups, identify unique perspectives on a specific topic, or track changes in knowledge (i.e., learning). Comparison studies investigate diverse characteristics of FCMs, such as structure, cognitive complexity, and similarity, using a multitude of different comparison approaches and metrics. To date, no consensus has emerged about what comparison metrics to use and how to interpret the results. In order to strengthen the scientific value of FCMs as a research tool and lead the way towards the establishment of standard practices, this study systematically reviews existing metrics for content, structure, and dynamic behavior and applies them to the comparison of two FCM models. The study concludes with a discussion of the applicability and limitations of existing comparison metrics and an outlook on future work.

MB-12.4 [R] Next Generation Hardware Development: Requirements and Configuration Options for the Organization of Procurement Activities in the Context of Agile New Product Development

Guenther Schuh; Fraunhofer IPT, Germany
Stephan Schroeder; Fraunhofer IPT, Germany
Felix Lau; Fraunhofer IPT, Germany
Tim Wetterney; Fraunhofer IPT, Germany

Companies are adapting their traditional development processes, aiming for project-specific designs that are referred to as "agile product development" - flexible, adaptive and accelerated processes. Implementing these principles supports developers to react to challenges such as shortened innovation cycles. For successful implementation and use of these new principles, support functions such as procurement have to be adapted to the demands of flexible, agile and accelerated processes. Complexity of tasks and impact on corporate success of procurement increased significantly in the last decades resulting in specialized stand-alone procurement departments. Being optimized for traditional development methods such as stage-gate, these departments will be challenged by agile developers demanding highly flexible, hardly predictable procurement activities. Therefore, the authors present a scientifically derived catalog of requirements for procurement in agile product and technology development projects, e.g., shortened lead times and vague technical specification of products to be procured. Based on this catalog, options for the configuration of procurement in agile development projects, such as the organizational merging of development and procurement, are discussed. Adapting the procurement according to the requirements derived in this paper will help companies to successfully conduct procurement activities in regard to the needs of agile new product development.

MD-01 Technology Diffusion

Monday, 9/5/2016, 14:00 - 15:30

Room: Kona Moku Salon A

Chair(s) Markus Gunther; Bielefeld University

SESSIONS

MD-01.1 [R] Diffusion of Multiple Technology Generations: An Agent-Based Simulation Approach

Markus Gunther; Bielefeld University, Germany

Agent-based modeling has recently gained much attention in innovation and technology diffusion research. It enriches traditional approaches (like the well-known Bass model, based on differential equations) by modeling the diffusion process from a micro-level perspective. This allows, for instance, for considering the heterogeneity of consumers, who differ in their preferences, are distributed across geographical regions, are connected to each other in various ways within a social network, and act as well as react based on limited information. Although multiple successive technology generations got some attention in innovation and technology diffusion research using traditional approaches (since the Norton-Bass model in 1987), agent-based models have hardly focused on this important aspect of the diffusion process. Therefore, the presented agent-based simulation aims at investigating the diffusion of new products from multiple successive technology generations. The model accounts for novel product features in each generation, normative influences, and a social network that reflects both, spatial and social proximity between consumers. A historical validation is conducted by replicating the diffusion of computers (desktops, notebooks, tablets) on the German market from 1994 to 2013.

MD-01.2 [R] Patent Analysis in External Technology Acquisition: A Case of Taiwan Semiconductor Manufacturing Company

Chun-Chieh Wang; National Taiwan University, Taiwan

Dar-Zen Chen; National Taiwan University, Taiwan

Prior research mentioned that external technology acquisition is a shortcut for companies that seek to develop breakthrough technologies or products. In this study, we examine the external technology acquisition in Taiwan Semiconductor Manufacturing Company (TSMC) based on the USPTO patent assignment data and analyze the complementary relationship between externally acquired technologies and self-owned technologies in TSMC. Based on our analysis, we argue that external technologies usage does not always create complementary synergetic effects from integration with self-owned technologies. The data shows that most of the externally acquired patents at TSMC were acquired from assignors of NCR/MAGNACHIP SEMI. and AMBERWAVE SYS in 2006-2010. External technology acquisitions in TSMC are concentrated on "photovoltaic" and "computer hardware & electrical devices" technologies. According to the externally acquired patents cited by self-owned patents of TSMC, we conclude that although external technologies in "photovoltaic" appear integrated with TSMC's self-owned technologies, other external technologies are not well-integrated with self-owned technologies, particularly for patents in the field of computer hardware & electrical devices.

MD-01.3 [R] Investigating the Distinguishing Characteristics of Users with a Landline Preference vs. a Smartphone Preference in Taiwan

Mavis Tsai; Shih Hsin University, Taiwan

Taiwan is a country with fairly high mobile phone or smart phone penetration. By 2009, Taiwan's mobile phone penetration was hovering near 110%. By 2014, more than 70% of Taiwanese over age 15 owned a smart phone. However, some Taiwanese are not yet accepting of this new technology, the smart phone, for diverse reasons. Some prefer using only landline telephones; some use a traditional mobile phone but prefer landline for contacting their family and friends. Some Taiwanese use both a landline and a smartphone but still prefer the landline. In addition, cell phone-only consumers are increasing in Taiwan, especially among the younger generation. Rogers' "Diffusion of innovations" is a theory that seeks to explain how, why, and at what rate new technology or new ideas spread through societies. The technology acceptance model (TAM) is another information systems theory which investigates how users accept and use a technology. In the technology acceptance model, some factors like perceived usefulness (PU) and perceived ease-of-use (PEOU) influence attitudes, intention to use and actual use of a new technology. Nonetheless, not all change is necessarily healthy for all consumers. The innovation resistance of a consumer can be viewed as another perspective for studying how and why a society

or some consumers accept or refuse a new technology. Based on TAM and innovations resistance perspectives, the researcher studied what are the distinguishing characteristics of those preferring a landline vs. the smartphone? How can these different consumers be reached? What is their usage of internet, landline and smartphones? Thus in this study, the researcher launched two phone surveys, one sample via landline and another sample via mobile phone, interacting with more than 1,000 respondents in each sample. The population in Taiwan exceeds 23,000,000. The researcher used a CATI (computer-assisted telephone interviewing) system to get RDD (Random Digital Dial) phone numbers for both samples and made them representative of the population. In addition, the researcher used the participant observation records by auditing the survey process to further investigate the characteristics of Taiwanese who prefer landlines or prefer cell phones and smartphones.

MD-02 Social Innovation 1

Monday, 9/5/2016, 14:00 - 15:30

Room: Kona Moku Salon B

Chair(s) Ichiro Sakata; The University of Tokyo

MD-02.1 [A] A Road to Social Innovation

Masayoshi Ushikubo; Sanden Corporation, Japan

Hisato Tashiro; Sanden HD, Japan

Nobuzumi Fujii; Waseda University, Japan

Ichiro Sakata; The University of Tokyo, Japan

Sanden corporation is a global manufacturer of environmental technologies for heating and cooling of air-conditioning, compressors as automotive parts and housing and vending machines. Recent sustainable technological innovations of the company include its CO2 heat pump developed at its environmentally friendly plant and global center of technology, which are important constituents of Sanden Road that have provided quality management infrastructure over decades as the company leadership developed. This paper discusses components of Sanden Road and Sanden's corporate philosophy and how the applications influenced the R&D in sustainable technologies.

MD-02.2 [R] IoT Service Business Ecosystem Design in a Global, Competitive, and Collaborative Environment

Naoshi Uchihiro; Japan Advanced Institute of Science and Technology, Japan

Hirokazu Ishimatsu; Japan University of Economics, Japan

Keisuke Inoue; Japan Advanced Institute of Science and Technology, Japan

Internet of Things (IoT) is now making a new industrial revolution, which includes "Industry4.0" in Germany, "Industrial Internet" in US, "Made in China 2025" in China, and the "Industrial Value Chain Initiative (IVI)" in Japan. In the modern global, competitive, and collaborative business environment, IoT services must be designed as a business ecosystem. Although many business-model design methods, including our own design method presented in PICMET 2015, have been proposed, there exist few business-ecosystem design methods that target IoT services especially. Here, a business-ecosystem design method is proposed for IoT services using an "Open & Closed Strategy Canvas" on which designers can recognize both a closed area, where the company keeps and strengthens its core competence, and an open area, where complementary companies provide resources (knowledge resource, manufacturing resource, and deployment resource) to the business ecosystem.

MD-02.3 [A] Dream-based Social Innovation

Takashi Iwamoto; Keio University, Japan

The event by the name of Everyone's Dream Award (Minna-no-yume Award in Japanese) started in 2010 in Japan, and the competition for dream-based social innovation was executed at the event almost every year. The events has been executed five times so far. Several hundred organizations applied for the competition at every event, and 31 organizations in total were selected as finalists and made presentations in the big facilities which can accommodate several thousand people. Among 31 organizations, dreams based on

SESSIONS

deep technologies were selected for this research. Among the dreams based on deep technologies, the organization which won the best prize was selected from each event. Those organizations include WHILL from Everyone's Dream Award 3 held in January, 2013, Ory Laboratory from Everyone's Dream Award 4 held in February, 2014 and Astroscale from Everyone's Dream Award 5 held in February, 2015, and how these dreams had been coming true was investigated through the case studies. It was found that Everyone's Dream Award stimulated the other organizations to establish the eco-system for social innovation in Japan and that Everyone's Dream Award was playing a role of an "accelerator for social innovation" in the eco-system in Japan.

MD-03 S & T Policy 2

Monday, 9/5/2016, 14:00 - 15:30

Room: Kona Moku Salon C

Chair(s) Iwan Sudrajat; Agency for the Assessment and Application of Tech.

MD-03.1 [R] The Research of New Energy Industrial Innovation Effective Under Policy View

MingJie Lu; Shanghai Lixin University of Commerce, China

Chen Yu; Shanghai Lixin University of Commerce, China

Jing Li; Shanghai Lixin University of Commerce, China

This paper employs the negative binomial regression model (RENBM) to test the relationship between policy factors and the innovation performance of new energy firms. We considered 408 policies implemented by the central government of China which are most relevant to new energy industry innovation during the period of 2007-2014. We found out that only the stringency of productive innovation policy has positive effects on new energy industrial innovation performance; the stringency of environmental protection policy and technological innovation policy and policy instability have negative impacts on new energy enterprise innovation performance. Finally, it discusses policy implications.

MD-03.2 [A] Development of Science and Technology Park (STP) Using the Innovation System Strengthening Framework: Case Study of the Pelalawan Technopolis

Iwan Sudrajat; Agency for the Assessment and Application of Tech., Indonesia

Muhammad S Syarif; Regency Government of Pelalawan, Indonesia

The Government of Indonesia has a new initiative to establish and develop 100 science and techno parks (STPs) within the next five years starting in 2015. The development of STP is as a policy instrument to revitalize local economic development utilizing science, technology, and innovation, moving from a natural resources driven economy to an innovation driven economy. BPPT (The Agency for the Assessment and Application of Technology), a non-ministerial government agency of Indonesia, has been mandated to facilitate the development of eight out of 100 STPs. In planning and developing STPs, BPPT uses the innovation system strengthening framework consisting of five strategic initiatives: innovation ecosystem, industrial cluster, innovative capacity, technopreneurship, and green technology for people basic need. This presentation will discuss the implementation of this framework and the lessons learned, with a case study of the Pelalawan Technopolis in the Province of Riau, Indonesia.

MD-03.3 [A] Promote the Utilization of Science and Technology Resources Through Business Model Innovation: Case from Beijing, China

Quwen Deng; Guangdong Science and Technology Library, China

Min Liu; Guangdong Science and Technology Library, China

Fugang Zhao; Guangdong Science and Technology Library, China

To open and share S&T resources of universities and research institutes to enterprises and support innovation in industry, Beijing, the capital of China, explored a new business model with a win-win mechanism to develop dozens of "research and development (R&D) service base" in 2009. From 2009-2011, 25 R&D service bases are constructed, facilitating 475 national and municipal key laboratories and engineering centers with billions of S&T equip-

ment open to the society. This presentation first elaborates the background of constructing R&D service bases, introduces organizational structure, working mechanism and benefit distribution mechanism of R&D service bases in general, and gives a case study of Peking University R&D service base in detail. Furthermore, it summarizes the highlights of R&D service bases, discusses their future direction for sustainable development and makes discussions on promoting the utilization of S&T resources through business model innovation.

MD-04 Technical Workforce

Monday, 9/5/2016, 14:00 - 15:30

Room: Honolulu

Chair(s) Marina Dabic; Nottingham Trent University

MD-04.1 [R] Technology Driven University and Community College Collaboration: Faculty Training on ARM Microcontrollers

Nasser Alaraje; Michigan Technological University, United States

Aleksandr Sergeev; Michigan Technological University, United States

John Reutter; J. F. Drake State Community & Technical College, United States

Craig Kief; University of New Mexico, United States

Bassam Matar; Chandler Gilbert Community College, United States

David Hata; Portland Community College, United States

The electronics world is undergoing a transformation in the underlying technologies used to create new products for the world's consumers. The movement to reconfigurable electronics using microcontrollers is sweeping the electronics world in the rush to create smaller, faster, and more flexible consumer and industrial devices. Microcontrollers are becoming one of the most exciting devices in history. At the core content of microcontroller technology is ARM microcontroller; the ARM processor is an industry standard with annual sales of 5 billion units, and it will increase as the demand for powerful, low-power electronics increases. An engineer's and technician's exposure to this technology is critical in order to remain competitive. To meet this industrial need, university programs are updating curricula with courses in ARM microcontroller technology. Partners on this project have years of successful National Science Foundation (NSF) projects, educating and training hundreds of instructors and introducing thousands of students to advanced technologies. This paper will discuss the offering of a professional development workshop on ARM microcontrollers for electrical engineering technology faculty as part of an NSF grant. The project goals are to provide colleges with up-to-date educational equipment and educational resources, and promote best practices to enable instructors to teach advanced technologies.

MD-04.2 [R] Transforming Psychological Capital and Flow Experience of R&D Employees into Performance

Jinsong Xu; Tongji University, China

Song Chen; Tongji University, China

Dujuan Huang; Tongji University, China

Flow experience has not yet been fully addressed in the field of psychological capital (PsyCap) research. This paper finds that flow experience is an important positive psychological capacity which should be considered for inclusion into PsyCap. Based on the investigation of R&D employees, the results show the expanded PsyCap integrated with flow experience has good tested reliability and validity. It is revealed that expanded PsyCap has stronger predictive power on employee performance than original PsyCap (represented by Luthans' HERO model). Flow experience contributes to PsyCap with the emotional attributes resulting in the incremental effect of PsyCap. This paper also discusses motivating R&D workforce by leveraging expanded PsyCap.

MD-04.3 [R] Effects of Intentional Organizational Forgetting on New Product Performance of Each Stage: The Moderating Effect of Absorptive Capacity

Du-juan Huang; Tongji University, China

Song Chen; Tongji University, China

Ruiqian Jia; Tongji University, China

SESSIONS

Innovation is essential in economic conditions of uncertainty and crisis to guarantee the firm's long-term survival. Scholars have done plenty of research on innovation and have found a lot of factors that affect innovation, but ignore the impact of organizational forgetting on innovation. Accordingly, this research seeks to contribute to the scarce empirical evidence by analyzing the influence of intentional organizational forgetting on new product performance as well as the role of absorptive capacity. Based on the theory-driven conceptual model, using survey data on 320 enterprises in China, the empirical analysis shows that intentional organizational forgetting has significant positive effect on new product development performance, while absorptive capacity plays a moderation role between them. The results suggest stronger incorporation of intentional organizational forgetting into theory about product innovation.

MD-05 Infrastructure Management

Monday, 9/5/2016, 14:00 - 15:30

Room: Waikiki Salon 1

Chair(s) Schumpeter Tamada; Kwansai Gakuin University

MD-05.1 [R] The Impact of Competing Powertrain Technologies on the Formation of Automotive Innovation Networks

Philipp Borgstedt; University of Muenster, Germany

Florian Kirschke; University of Muenster, Germany

Bastian Neyer; University of Muenster, Germany

Gerhard Schewe; University of Muenster, Germany

The automotive sector faces a fundamental transformation due to technological change regarding low-emission vehicles. The simultaneous development of different alternative powertrain systems is a complex and expensive challenge for the whole industry. As the high risks and costs can be shared and complementary core competencies can be combined, innovation networks, representing a specific form of inter-organizational coordination, increase in importance. Based on network theory, we examine the institutional relationship of car manufacturers and suppliers to gain a better understanding of joint strategies. Our study contributes to the scientific discussion on patent analysis by developing an elaborate combination of patent classes and keywords. In this way, we create a highly valid dataset of over 71,000 patents consisting of four different powertrain technologies: internal combustion engine vehicles, hybrid electric vehicles, battery electric vehicles and fuel cell electric vehicles. We analyze the collaboration of different firms by extracting those patents that show a joint assignment of two or more assignees, leading to a total of 2,025 bi-lateral connections. This approach enables us to measure the spread of innovation networks over time and to reveal insights on the direction of partnerships and the role of certain actors within the network. Complemented by practice-oriented examples, our findings contribute to the understanding of automotive networks with respect to the ongoing and yet to be decided competition of powertrain technologies.

MD-05.2 [A] New Service Model for Railway Business as a 'Social Infrastructure Service': New Service Value Creation Model Using SLA Concept

Masahiko Suzuki; Japan Advanced Institute of Science and Technology, Japan

Michitaka Kosaka; JAIST, Japan

Social infrastructures are very popular for many people and are repeatedly used in their daily lives. The discussion on social infrastructures as services is less popular than that as systems. We think that social infrastructures are also services because they provide users with something of value. Customers usually use social infrastructures without considering them thoroughly as services because social infrastructures exist just like air does. Therefore, customers' values for social infrastructures are "invisible" from service providers in social infrastructure services. Many social infrastructures are provided by private companies in Japan. Therefore, providers should identify customers' values to increase their satisfaction. First, we explain the difficulty of applying existing service theories to social infrastructure "services" in this paper. This is because major service theories deal with

either enhanced supplementary services or direct interaction between staff and customers, although both situations are rare in social infrastructure services. Therefore, we propose a new model using a new concept called the Social Infrastructure Service Level Agreement (SISLA) induced from the Service Level Agreement (SLA) to explain "invisible" values. SISLA is different from SLA because SISLA is not a stipulated contract or a promise between service providers and customers. We concluded that: 1) SISLA was a discipline of social infrastructure services used by both service providers and society (groups of customers) and 2) SISLA was an appropriate new service model for social infrastructure services. This paper focuses on the railway business as a typical social infrastructure. The core service of the railway business is transportation. The service provider can only provide the core service to customers via facilities like rolling stock. Therefore, the staff of the service provider cannot consider customers and their value to be invisible. More concretely, SISLA in the railway business is comprised of safety and punctual train operations.

MD-05.3 [A] Changes in the Manufacturing Process of a Logging Company Aiming at Increasing Production Volume

Joao Chang Junior; Centro Universitario FEI, Brazil

Alexandre Coelho; Centro Universitario da FEI, Brazil

Small-sized logging companies in Brazil mostly have poor production structure and low production volume, and their survival largely depends on the search for improvement in their manufacturing processes. The aim of this study was to propose changes in the productive process of wooden trusses of a small business in order to obtain an increase in production. All information related to the current production process was raised. A system assessment model was created with the ProModel software, and the results showed that the current production line has a very low use of equipment and resources. Taking into account all alternatives evaluated, an increase in trusses production was obtained by considering three devices, called woodcutters, and nine operators, i.e., an increase of 170% in production. An economic feasibility analysis of the relative investment was carried out, and its results showed that it is viable to invest in two woodcutters (one already exists in production) and hire three more operators. The computer simulation proved to be a great tool to assist decision making in the production line of logging companies.

MD-06 Strategic Management of Tech 2

Monday, 9/5/2016, 14:00 - 15:30

Room: Waikiki Salon 2

Chair(s) Cheng-Mei Tung; Feng Chia University

MD-06.1 [R] Empirical Study Regarding the Leakage of Technological Know-How in Japanese Firms

Yuri Hirai; The University of Tokyo, Japan

Toshiya Watanabe; The University of Tokyo, Japan

Recently, technological know-how has become a significant option to keep the results of research and development confidential, especially in terms of using an open/close strategy. However, since the mobility of human resources and the expansion of firms overseas have increased, the leakage of confidential, technological know-how is of particular concern. Despite its importance, details of its leakage have not been sufficiently revealed since the information regarding technological know-how is not normally open to the public. Therefore, this study focuses on governance and detection activities, and conducts multiple linear regression analysis using the data from a questionnaire survey of Japanese firms to clarify what factors are related to the leakage of technological know-how. As a result, although governance activities are not significantly related to the leakage, the existence of an inverted U-shaped relationship between international detection activities and the leakage of technological know-how is revealed. The results suggest that detection activities themselves possess the deterrent capabilities to prevent the leakage of technological know-how.

MD-06.2 [A] Using Scenario Analysis to Manage the Strategic Technology Planning for Environmental Sustainability Issues in Taiwan

SESSIONS

Cheng-Mei Tung; Feng Chia University, Taiwan

Industry competitiveness will drive profitability when governments and companies invest the right resources in the right place to close the technology gap. Not only for the private company but also for government they are facing the challenges of making the limited resources in the right way. For industry development, the R&D investment should be the origin for its competitiveness. Government people want to know how to create a systematic process to understand future challenges. And based on the challenges, the government could identify the important issues, scenarios, and technology gaps that industry will face considering the environmental sustainability issues that industry and government will face in the future. The purpose of this study is to explore the scenario of environmentally sustainable issues and provide for technology development planning. The approach is composed of several methodical steps: scan, foresight, scenario analysis and technology development strategy. The scenario analysis uses workshops for in-depth discussion. The research proposes technology development themes for the government. The process helps the government to decide the direction of technology research development.

MD-06.3 [R] Concept for Development Project Management by Aid of Predictive Analytics

*Guenther Schuh; RWTH Aachen University, Germany
Michael Riesener; RWTH Aachen University, Germany
Christian Dolle; RWTH Aachen University, Germany*

Manufacturing companies in high wage countries strive towards shortened development and innovation cycles at decreased costs in order to strengthen their competitive advantage. These goals can be achieved by efficient development projects. However, approaches aiming at designing efficient development processes such as the value stream analysis only analyze development projects retrospectively as well as periodically and therefore do not continuously improve the efficiency of the respective projects themselves. Therefore, a concept is needed to anticipate deviations from the target process and thus inefficiencies within development projects by aid of predictive analytics. To derive a predictive analytics model, neural networks are applied to identify the impact of deviation indicators on the efficiency dimensions time, costs and quality of an activity. Upon reversion, it is possible to monitor the deviation indicators and use the respective indicator values as input for the neural networks. Based on the identified impact of the indicator on the efficiency dimensions, the neural network is able to predict the final values of an activity in terms of time, cost and quality. By comparing the predicted values with the defined target values, the deviation can be determined and preventive measures can be implemented to eliminate inefficiencies.

MD-06.4 [R] Next Generation Hardware Development: The Role of Technology Intelligence to Reduce Uncertainty in Agile New Product Development

*Guenther Schuh; Fraunhofer IPT, Germany
Felix Lau; Fraunhofer IPT, Germany
Stephan Schroeder; Fraunhofer IPT, Germany
Tim Wettermey; Fraunhofer IPT, Germany*

Companies are adapting their traditional development processes, aiming for project-specific designs that are referred to as "agile product development" - flexible, adaptive and accelerated processes. Implementing these principles supports developers to react to challenges such as shortened innovation cycles. Still, agile product development is an endeavor with many uncertainties. Agile methods aim at reducing these uncertainties through a balancing of predictive work (e.g., information gathering, forecasting, planning) and adaptive work (e.g., prototyping, trial-and-error, validated learning). However, companies often fail at successfully conducting predictive work in order to avoid uncertainties in the product development process. Methods for forecasting and information generation have to date not been described in the context of agile new product development. The authors explore if and how the concept of technology intelligence - a widely used method of information generation - can be used for agile new product development. Based on the identified

shortcomings of current technology intelligence, the authors draft an adjusted concept for agile technology intelligence. Underlying premises and suitable methods are presented and discussed as a first step towards a comprehensive methodology.

MD-07 Innovation Management 2

Monday, 9/5/2016, 14:00 - 15:30

Room: Waikiki Salon 3

Chair(s) Ronald Vatananan-Thesenvitz; Bangkok University

MD-07.1 [R] Is a Stable and Connective Network Important to Innovation?

*Gupeng Zhang; University of Chinese Academy of Sciences, China
Jianghua Zhou; Beijing Normal University, China
Guoqing Huo; University of Chinese Academy of Sciences, China
Huicong Li; University of Chinese Academy of Sciences, China*

With the patent co-inventing data of the top nine ICT firms with the highest patent application in China, this study establishes the co-inventing network and examines the moderate role of network connectivity, measured by classifying the individuals into two cohorts: inventors in the largest connected component and inventors in other isolated components. The network stability and innovation output demonstrate strong positive interactions, which is significant in not only the largest but also other isolated components. The clustering and centrality demonstrate significant effect on network stability and innovation output in the largest connected component, which is generally the same as that of extant studies. This impact is not significant in the other isolated components, which confirms the moderate role of network connectivity, i.e., fully connected networks constitute the basis for the network structure to be functioning. However, the significantly positive role of the structural hole is not moderated by the network connectivity. We discuss the contributions and implications of our findings.

MD-07.2 [R] Roots and Development of Capabilities in Economic Science: A Bibliometric Analysis

*Annikka Stuehmer; Stamford International University, Thailand
Alisa Kongthon; National Electronics & Computer Technology Center, Thailand
Ronald Vatananan-Thesenvitz; Bangkok University, Thailand*

To achieve a sustainable competitive advantage, a firm needs to pay close attention to its resources and capabilities. At present, identifying and assessing capabilities are considered as the main challenges due to different constructs, understanding and perspectives about the term "capability" itself and the role it plays in strategic management. This paper uses bibliometric analysis to profile and structure the body of knowledge of the research field "Capabilities in Economic Science." Co-word analysis is used to examine the relationships between different concepts of capabilities and their related sub-fields. The article shows that the research area of "Dynamic Capabilities" is not only highly relevant to develop an innovation strategy, but also considered a disputed research domain. The result of this research illustrates and classifies the current body of knowledge to identify gaps for future research and collaboration.

MD-07.3 [R] How Do Non-R&D-based Innovations Affect SMEs' Performance? The Mediating Role of Dynamic Capabilities

*Yanting Guo; Zhejiang University, China
Xiao Chen; Zhejiang University, China
Gang Zheng; Zhejiang University, China*

Non-R&D-based innovations as effective ways to promote firms' growth and performance have gradually been recognized in recent years. However, the reason why those innovations generate benefits is still underexplored and mixed, particularly for small and medium enterprises (SMEs) in the context of emerging economies like China. Using quantitative data from 506 SMEs in China, we analyze five kinds of non-R&D-based innovative activities and explore how those non-R&D-based innovations contribute to SMEs' performance from dynamic capabilities view. Our results provide evident support that SMEs' dynamic capabilities mediate the relationships between three kinds of non-R&D-based innovations,

SESSIONS

namely product and service customization, marketing innovation and organizational innovation, and business performance. We contribute to enriching dynamic capabilities research in non-R&D-based innovation context, on one hand, which is relatively neglected in previous research. On the other hand, we call for more attention on non-R&D-based innovative activities, which could complement the picture of innovation processes in SMEs in emerging economies.

MD-07.4 [R] Research on the Relationship among Ownership Structure, R&D Investment and Innovation Performance: Based on Data Analysis of Listed Auto Companies in China

Wei Wang; Tsinghua University, China

Xianjun Li; Tsinghua University, China

Wenchao Liu; Jilin University of Finance and Economics, China

Ownership structure is the basic institutional arrangements of an enterprise and will affect its innovation strategy decision-making process, thereby affecting its innovation performance. With 20 listed auto companies and 72 auto parts companies in China as the sample, this study regards the annual R&D investment as the main factor affecting the innovation performance, the relative share proportion of state-owned, private, foreign and institutional ownership as the threshold variables and the total assets, asset-liability ratio, operating income, net income, establishment age and listed age as the control variables to establish the panel threshold measurement model. Based on the relevant data of the above companies from 2012 to 2014, it uses the STATA software to conduct threshold panel data model analysis and draws a conclusion that there is not a simple influence relationship between the R&D investment and innovation performance of China's listed auto companies, and their R&D investment and innovation performance will show a remarkable interval effect because of the differences in ownership structure. The conclusion will help some countries' state-owned enterprises to design the ownership structure in mixed ownership reform.

MD-08 Commercialization of Tech 1

Monday, 9/5/2016, 14:00 - 15:30

Room: Milo I

**Chair(s) Byungchul Choi; Nottingham University Business School (NUBS)
China**

MD-08.1 [A] Business Model Innovation: From Technology Market to Market Success

Hans-Joerg Bullinger; Fraunhofer Gesellschaft, Germany

Rainer Naegele; Fraunhofer IAO, Germany

Marc Rueger; Fraunhofer IAO, Germany

Dietmar Fischer; AGILeVIA GmbH, Germany

Profitable commercialization of innovative technologies calls for goal-oriented business models. During the last years, business models have played a prominent role in the academic discussion, but only a few publications looked at business model management from a technology-management-perspective and their relevance to bring innovative technologies to market. Therefore, Fraunhofer IAO developed a holistic method to develop technology-induced business models. The Fraunhofer House of Business Model Engineering (BME) can be used to create models that ensure innovations are successfully positioned in the market from an early stage in their development. BME includes a "TrendArena" and Smart Scouting as tools to find future trends. A process based function-semantics is used to transform technology via their specific function(s) into potential values for customers. The technology-driven BME process itself is based on multiple different levels. Goals, design options and opportunities for exploitation are identified on the strategy level, while the design of the model takes place on the process phases level. Relevant structural elements are defined in specific configuration and planning contexts. The model creation process is supported by specially developed IT-based methods.

MD-08.2 [R] Marketing's Role in Capturing Value from Innovation:

Knowledge Resources, Strategic Emphasis, and Firm Value

Judy Ma; California State University, East Bay, United States

Byungchul Choi; Nottingham University Business School (NUBS) China, China

Gina O'Connor; Rensselaer Polytechnic Institute, United States

Investing in and integrating R&D and marketing efforts are critical activities for achieving innovation and new product success. A persistent question is how firms should allocate resources in favor of one or the other. In this research, we examine how the bottom-line impact of the balance between R&D and marketing is dependent on the firm's knowledge resources. We propose that, depending on the technological novelty and potential of a firm's knowledge resources, investing more in marketing may have a positive impact on firm value. We find that this positive impact is only present when a firm's knowledge resources have low technological novelty and/or potential. In such cases, the complementary role of marketing helps a firm increase its value when it is in an inferior technological position relative to competitors in its industry. Our study answers recent calls to demonstrate marketing's contribution to the firm's bottom-line. Our findings evidence that managers should consider their current stock of knowledge resources when making decisions concerning balancing R&D and marketing priorities.

MD-08.3 [R] Interaction Analysis between Innovation and Regulation: The Concept of Regulatory Science as a Process (RaaP) and Its Applications

Shingo Kano; The University of Tokyo, Japan

The jurisdiction against emerging technologies is a core process for designing "Technology Management for Social Innovation." The concept of regulatory science (RS) for technology jurisdiction has a diverse range of meaning among its users in the medical field. Thus, the analyses of interaction between innovation and regulation were not generalized and formed systematic approaches. RS is categorized as "a third party science," differed from a basic science or applied science, and recognized as "counter activities" against an innovator's activities. In this study, the concept of regulatory science as a process (RaaP) is proposed to analyze interactions between innovators and regulators by identifying process-process interactions. RaaP is defined by the total process of a regulator's policy value chains, which contains from upstream of technology jurisdiction, technology forecasting to technology prioritization, research and development for rule making, rule making, international harmonization, optimizing organization, draft rule operation, monitoring and revision. Based on an analytical framework for interaction between RaaP and the innovation process, two case studies in the medical field, US NIH/FDA collaborations and Japanese PMDA's collaborations with innovators, were conducted and validate the process-process interaction analysis and RaaP concept.

MD-09 Emerging Tech 1

Monday, 9/5/2016, 14:00 - 15:30

Room: Milo II

Chair(s) Nazrul Islam; University of Exeter Business School

MD-09.1 [R] Identification of Evolutionary Characteristics of Emerging Technologies: The Case of Smart Grid in Japan

Tiecheng Jin; Tokyo Institute of Technology, Japan

Kumiko Miyazaki; Tokyo Institute of Technology, Japan

Yuya Kajikawa; Tokyo Institute of Technology, Japan

Smart grid, as an emerging field whose evolution is featured by radical innovation, requires a great diversity of technologies from different disciplines. It has become rather difficult to figure out the technological capability accumulation process throughout the evolutionary process. In order to unfold the "buzzword," we explore how technological capability accumulated throughout the evolutionary process and what is the current technological structure of smart grid. We newly combined cluster analysis with main path analysis by conducting an empirical study over the period 1961 ~2014 in Japan using patent data retrieved with CPC (Cooperative Patent Classification) Code "Y04S" from the European Patent Office. First, centrality analysis was developed to identify the core inventions of smart grid. Second, com-

SESSIONS

munity detection analysis was utilized to investigate the detailed technological structure of citation networks. Last but not least, search path count (SPC) was designed to investigate the evolutionary trajectory of each cluster. Finally, three different dimensions of knowledge pattern were obtained: the core invention, technological trajectory and cluster of smart grid inventions. We find that most of the innovative activities are happening in Clusters 3, 4 and 5. Especially, radical innovation is identified in Cluster 4. The result also provided strong evidence showing significant differences of technological capabilities among power companies.

MD-09.2 [R] Specialization and Integration of Emerging Technology

Yun Liu; Beijing Institute of Technology, China

Xu Bai; Beijing Institute of Technology, China

There is a growing consensus that the emerging technology will have a substantially profound economic impact on the manufacturing sector. The purpose of this study is to present the specialization and integration state of emerging technology of institutions and countries by employing patent bibliometric analysis and statistic method based on the EPO database. There are two main findings from our empirical results: From the view of institution, some companies put emphasis on technology specialization, while other institutions are involved in various sub-fields. From the perspective of country, specialization and integration state of countries is rather different among four emerging technology fields. China appears to highlight the persistence in big data technology, but exhibits low level of persistence and depth in other emerging technology fields. Furthermore, our findings have important implications for countries and institutions to make policies and strategies.

MD-09.3 [R] Innovation Value Network in Emerging Technology

Nazrul Islam; University of Exeter Business School, United Kingdom

The paper develops a contemporary innovation value network model in emerging technology, particularly in the case of micro and nano-manufacturing technology (MNT), based on primary and secondary data analysis and a survey conducted on European research and development projects. A mixed-methods approach was adopted in this research which investigated the business and technical challenges to the commercialization of technology. The research was motivated by a systematic literature review. A notable finding is that the emergent MNT often does not have a direct link with market demand. An intermediary role between the emergent advanced technology and market demand should be included to act as coordinator for the complex design issues inherent when developing such technology.

MD-09.4 [R] Digital Manufacturing Tools Applied to Energy Analysis and Decision in Manufacturing Systems

Rodrigo L Antonioli; Centro Universitario da FEI, Brazil

Fabio Lima; Centro Universitario da FEI, Brazil

Global warming, outside pressures to the application of sustainable practices and rising energy prices are factors increasingly present in today's society. In addition, the cost of energy becomes increasingly significant, being an important vector to be considered in business competitiveness. Thus, this work includes the energy efficiency variables within the context of manufacturing systems analysis. The methodology includes the development of a simulation model over a digital manufacturing system, an emerging technology that seeks to improve the industrial plants' development processes by introducing new integrated software suites. The evaluated scenarios involve the collection and analysis of energy and manufacturing data of an automotive engine production line, where different simulation strategies were implemented aiming for the overall electricity consumption reduction. The results show that the simulation of control actions through digital manufacturing systems allows not only getting a current situation diagnosis of the facilities, but also enables a more efficient use of available resources by identifying opportunities to increase energy efficiency indicators, even in well-designed production systems.

MD-10 Intellectual Property 2

Monday, 9/5/2016, 14:00 - 15:30

Room: Milo III

Chair(s) Yoshitoshi Tanaka, Tokyo institute of Technology

MD-10.1 [R] The SWOT Analysis for Co-Operation Patent Classification and Its Development Strategy

Ben Zhang; Huazhong University of Science and Technology, China

Xiang Yu; Huazhong University of Science and Technology, China

The patent classification plays an important role in the patent examination and the patent search. In this research, the most important task of this research is to analyze for the relationship between Co-operation Patent Classification (CPC) and International Patent Classification (IPC).

MD-10.2 [R] A Study of Influencing Factors of Patent Value Based on Social Network Analysis

Ke-Chiun Chang; Wuhan University, China

Chihchang Chen; Taiwan Shoufu University, Taiwan

Yen-Jo Kiang; CTBC Financial Management College, Taiwan

Wei Zhou; Hunan Agricultural University, China

This study proposes a different angle to evaluate patent value, namely regarding patent value as a combination of static characteristics and dynamic relationship. On one hand, a majority of patent static characteristics are fixed in their application, which means these characteristics are controlled by the owner of the patent; on the other hand, the dynamic citation relationship is formed by forward citation and backward citation, which means not controlled by the owner. If a patent takes an important position in other citation relationships, this implies the patent has more chance to gain and control technology and knowledge, and to have an important influence on subsequent patents. In other words, this patent is valuable. This study applies social network analysis to carry out the research purpose, regarding patent as a node and citation as the connection between nodes to build a patent citation network. This study can provide a thinking mode based on social network analysis for companies; offer a more rational way to evaluate patent value from the perspective of dynamic development; and construct an effective early warning mechanism for patent litigation.

MD-10.3 [R] How Can We Predict the New Products and Services by Using the Trademark Information and the Patent Information?

Toshiyuki Inui; IPNJ Patent Attorneys Office, Japan

Yoshitoshi Tanaka; Tokyo institute of technology, Japan

The purpose of this research is to examine the new product prediction by using the trademark information and the patent information. We have focused on the adding goods and services, and the suggestive trademark. The additional goods and services are added by the applicant. The additional goods and services are expected to include the information about the type of the new product. The suggestive trademark is expected to contain the information about function and effect of the new product. We analyzed the additional goods and services, and the suggestive trademark. As a result, it was found that the information useful in new product prediction can be extracted from the trademark information. In addition, we examined how to search for patents related to new products by using the trademark information. The information extracted from the trademark information can be expected to be utilized as a keyword. Furthermore, designated goods and services were found to be converted to IPC information. Consequently, it was found that keyword and IPC search using the information extracted from the trademark information is possible. By using the trademark information and patent information, it is expected that it is highly possible to accurately predict new products.

MD-11 Environmental Issues 2

Monday, 9/5/2016, 14:00 - 15:30

Room: Milo IV

Chair(s) Manocher Djassemi; California Polytechnic State University

SESSIONS

MD-11.1 [A] An Expert System for Selection of Environmental-Friendly Manufacturing Processes

Manocheer Djassemi; California Polytechnic State University, United States

The manufacturing process is one of the major phases of product life cycle which can be a contributing factor to significant environmental pollution and energy consumption. In this study a rule-based expert system model for manufacturing process selection is proposed by focusing on the environmental impact of selected processes. Several environmental parameters including CO₂ emission, energy consumption, material waste, excessive heat and noise are taken into the decision making process. The proposed expert system model can serve as a manufacturing knowledge management tool by encoding knowledge acquired from academic and industry experts as well as printed/online sources.

MD-11.2 [R] Simulation Modelling of Logistics for Handling Bio-Waste from Waste Water Treatment

*Joe Amadi-Echendu; University of Pretoria, South Africa
Sameul A Oosthuizen; University of Pretoria, South Africa*

Water utility providers are liable for financial penalties and reputational damage for non-compliance with regulations regarding bio-waste handling and disposal. Social responsibility and compliance with regulations can be costly, and this paper discusses a study on approaches for re-engineering logistics processes for bio-waste handling and disposal. The business process simulation model developed during the research has been applied to evaluate and compare costs associated with at least three real operational scenarios on logistics for handling sludge generated in a case study waste water treatment utility.

MD-11.3 [R] The Interrelation of Lean and Green Manufacturing Practices: A Case of Push or Pull in Implementation

*Cory R. A. Hallam; University of Texas at San Antonio, United States
Carolina Contreras; The University of Texas at San Antonio, United States*

Literature in the environmental sustainability field has underscored the importance of "Sustainability" as a driver of innovation. In this mindset firms seek new approaches for how companies deliver value to their customers, the impact on the environment of these value delivery activities, and the resulting societal welfare created by changing the way products and processes are created. As companies rethink their business models to facilitate sustainability, they also find themselves looking for new manufacturing approaches to meet the challenges of competition. In this environment, companies are implementing Lean manufacturing to improve organizational performance and are introducing cLean practices to achieve environmental sustainability. Therefore, the main goal of this study is to analyze how companies can integrate Lean and Green production principles in order to take advantage of their synergistic effects and reach competitiveness in accordance with the objectives of sustainable development.

MD-12 NP2

Monday, 9/5/2016, 14:00 - 15:30

Room: Milo V

Chair(s) Seong-Jin Kim; Korea Institute of S&T Evaluation and Planning

MD-12.1 [R] Research on the Logic of Product Evolution Using Agent-based Model

*Seong-Jin Kim; Korea Institute of S&T Evaluation and Planning, Korea, South
Jeong-Dong Lee; Seoul National University, Korea, South
Euy-Young Jung; Seoul National University, Korea, South*

This research makes use of an agent-based model that simulates the product evolution affected by the producer's routine, consumer's preference, and complementarity of the product's features. We identify that the velocity of product evolution increases when the heterogeneity of producers or consumers and the complementarity between features increase. We draw some implications based on the results. In respect to policy, we see the

need to create a favorable environment for heterogeneous producers to participate in the market to enhance competition. In respect to product development strategy, we see the need to focus on highly complementary technologies.

MD-12.2 [R] Integrative Capability, Product Innovation, and the Moderating Role of Proactiveness and Technological Environment

*Wei Jiang; Xiamen University, China
Yushan Liu; Xiamen University, China
Yuhui Wu; Xiamen University, China
Shun Cai; Xiamen University, China*

Integrative capability refers to a firm's ability to purposefully acquire, combine and deploy resources that are available in business partnerships for achieving managerial visions. Research has yet to explore the benefits of integration in partnerships for different types of product innovation despite the increasing importance of inter-firm relationships for technology transfer and product innovation. This study proposes that integrative capability has curvilinear and differential effects on explorative and exploitative innovation. Based on multi-sourced survey data from 212 Chinese firms, the findings support the proposition that integrative capability has a positive linear effect on exploitative innovation but an inverted U-shaped relationship with exploration. That is, a high level of integrative capability impedes explorative innovation. The findings also indicate that proactiveness strategy moderates the integrative capability and exploration relationship, mitigating the decline in exploration at a higher level of integrative capability. In addition, under the unique context of emerging economies, technological turbulence enhances the benefits of partnership integration for both explorative and exploitative innovation.

MD-12.3 [A] Method to Identify Focus Areas for New Product Development

*Khairul Ridzwan B Mohd Ibrahim; PETRONAS Chemicals Group Berhad, Malaysia
Ross F Gilmour; PETRONAS Chemicals Group Berhad, Malaysia*

A key element in a new product development (NPD) strategy is the identification of focus areas. This determines the "hunting ground" for more successful NPD initiatives. However, companies still struggle and give less attention in this space due to the rigorous and complex processes involved. This then leads to a disconnection between the resources and goals in the NPD strategy, which results in failed initiatives, and the whole NPD system is seen as ineffective. To solve this and to identify these focus areas, we developed a systematic process and practical tools processes. These were then applied in a modified Delphi workshop approach discussed as a case study in this paper. The facilitated workshop enabled the identification of high numbers of potential focus areas. Prioritization of the outcomes was done using an Opportunity/Feasibility (OFM) matrix. The simple and straight forward method we developed has been shown to be practical and effective in identifying focus areas to pursue NPD projects, leading to a successful program. This process can be extended to use in other identification of business growth opportunities as well.

ME-01 Competitiveness in TM

Monday, 9/5/2016, 16:00 - 17:30

Room: Kona Moku Salon A

Chair(s) Neslihan Alp; University of Tennessee at Chattanooga

ME-01.1 [R] Costs and Benefits of Following Cost Strategies in Value Chains

*Luis Oliveira; University of Sao Paulo, Brazil
Paulo Tromboni S Nascimento; University of Sao Paulo, Brazil
Adriana M Mello; University of Sao Paulo, Brazil
Afonso Fleury; University of Sao Paulo, Brazil*

This paper looks into how cost-based competitive priorities affect a firm's upgrading in its value chain. The literature still considers cost-based competitive priorities relevant for firms under diverse strategic positioning, despite recommending contingencies for avoiding shortsighted approaches. It is opportune to understand how that holds under the perspective of global value chains literature, since upgrading is one of its central concepts and rep-

SESSIONS

resents the dynamic by which a firm is able to reach better positions in the value generation process. Researchers and practitioners have considered this dynamic as a way for avoiding predatory competition, reinforcing the dangers of employing short-term strategies when pursuing it. The research question is: How cost-based strategies interfere in the supplier's upgrading in a value chain? A multi-case study in the serious games segment of the digital games industry allows advancing this investigation. These games have purposes other than entertainment, usually focusing on supporting skills learning or acquisition, and find applications in very diverse fields. Results suggest that cost-based strategies have greater chances of leading a supplier towards upgrading when self-imposed, compared to when derived from the leading firm's guidance.

ME-01.2 [A] Regional Development in Brazil and the Challenges Facing Technology-Intensive Cities: A Proposal for a Framework of a Municipal Innovation System

Jose Henrique S Damiani; Institute of Aeronautical Technology, Brazil

There are Brazilian cities that have evolved from a low-tech status to become relevant players in the high-tech arena, as is the case of Sao Jose dos Campos, in the State of Sao Paulo. It is at the center of the Brazilian aerospace and defense industries, and it displays companies such as Embraer, Avibras, Petrobras, Visiona, Johnson & Johnson, National Panasonic, Monsanto, and General Motors, as well as important R&D institutions, namely the Department of Aerospace Science and Technology, the National Institute of Space Research, the R&D laboratories of Boeing and the Airbus Group, and universities, such as the Federal and The State Universities of Sao Paulo, and the University of the Paraiba Valley. Stakeholders have been addressing the strategic challenges facing the city and their impacts on the sustainability of its competitive position. Initiatives were implemented, including the creation of a competitiveness center and technological parks, reinforcing the existing innovation system. The paper will discuss current and future competitive issues and challenges, such as the development and production of a new fighter jet for the Brazilian Air Force, and it will propose a framework for an innovation system, supporting the political decision-making process regarding strategic initiatives.

ME-01.3 [A] Ambient Air Alert Services Based on Tailored Health Communication

Yih-Jiun Lee; Chinese Culture University, Taiwan
Chia-Chen Chou; Chinese Culture University, Taiwan
Kai-Wen Lien; Chienkuo Technology University, Taiwan
Pei-Chen Wang; Chinese Culture University, Taiwan

The development of technologies and industries has led us to an even more convenient life, but they might also be responsible for damage to the environment. Air pollution is one of the effects. At certain times, the most visible consequences of air pollution might be smog. Therefore, many governments issue open data of the Air Pollution Index (API) or Air Quality Index as outdoor references. However, indoor air pollution or ambient environment might also be a worse toxic source. This research aims to provide a solution to alert for ambient air pollution. The system, which is composed of hardware sensors and software agents, includes a set of web services to gather and compile data and a mobile application to communicate with users. The data sources of the system are official open data as wide area data source and devices sensing data as local data source. All data is compiled and sent to the mobile application. The application not only uses data directly, but also adapts itself to fit users' personal health requirements. The research model of Tailored Health Communication is applied in the system to learn from users' feedback in order to provide more personal and accurate messages. Therefore, it is believed that with this service, the health impacts of air pollution can be reduced.

ME-01.4 [R] Quality through Design: A Six Sigma Approach

Neslihan Alp; University of Tennessee at Chattanooga, United States
Jeremy Mau; University of Tennessee at Chattanooga, United States

The terms Lean and Six Sigma are often heard within an organization in regards to im-

proving the quality of products coming off the manufacturing floor. Changes in company culture that embrace continuous improvement are necessary for Lean and Six Sigma to work properly. One area that is not often addressed is how to utilize Six Sigma processes when designing a product from the ground up to ensure high quality when the product is implemented into a manufacturing environment. Design teams need to go a step further than just producing a good product by controlling factors that are contributors to potential quality issues before they happen. This leads to a reduction of resources needed to fix quality issues, less scraped or reworked parts at the supplier level, and fewer customer service calls. This paper examines methodologies utilized in the Design for Six Sigma (DFSS) process and discusses how these methodologies affect quality. It will also provide a roadmap for engineering design managers, who want to apply Six Sigma into their design before, rather than after, the product hits the manufacturing floor.

ME-02 Social Innovation 2

Monday, 9/5/2016, 16:00 - 17:30

Room: Kona Moku Salon B

Chair(s) Stefan Huesig; Technische Universitaet Chemnitz

ME-02.1 [R] Exploring the Innovative Practice of Social Innovations in Non-profit Organizations: An Analytical Framework

Julia Bresler; Technische Universitat Chemnitz, Germany
Sarah Langer; Friedrich-Schiller-Universitaet Jena, Germany
Stefan Huesig; Technische Universitaet Chemnitz, Germany

There are only vague ideas on what social innovations actually are, how they evolve and how they work in comparison to technical understandings of innovation management. In a comparative analysis of two case studies of two non-profit organizations advancing social innovation in Germany, we investigate their innovative practice by reconstructing reflexive practices and their potential to disrupt societal routines. The first case study examines a nonprofit organization working with online-maps for people with special needs (Berlin, Germany), and the second study investigates a social non-profit project focusing on urban redevelopment (Chemnitz, Germany). We aim to identify synergetic effects from the two cases in order to generate a new approach for the understanding of social innovation. Building on the theory of path dependency and the concept of institutional reflexivity, this contribution proposes three consecutive conceptual frameworks to investigate the characteristics and potential drivers of social innovation.

ME-02.2 [R] Modeling Management Strategy Impacts on the Organization Effectiveness and on the Social System

Rina Sadiq; Shenkar College of Engineering and Design, Israel

The objective of this research is to create a model for exploring practices and management interventions that can concurrently influence an organizational effectiveness, the quality of its culture and employee health. These three dimensions collectively determine, to some degree, an organization's long-term sustainability. A qualitative dynamic modeling representation is used to capture the interrelationships among these three dimensions and to explore key feedback structures discussed in the literature and which may exist within an organization. The modeling indicated linkages among the three dimensions and many others, and their potential for effecting organizational change. Dynamic hypotheses were formulated based on literature from the fields of management, engineering, social systems and organizational psychology. A field study of an actual organization confirmed these hypotheses and indicated greater dynamic complexity than what may be inferred from the literature.

ME-02.3 [R] Opportunities and Potential of the Internet of Things for Solving Social Issues

Yasutomo Takano; Tokyo Institute of Technology, Japan
Yuya Kajikawa; Tokyo Institute of Technology, Japan

The Internet of Things (IoT) is expected to change society, although it is a general-purpose

SESSIONS

technology and its concrete application, value, and feasibility are still obscure. In this study, we explored plausible social issues to which IoT solutions can be applied. First, we extracted promising research areas of IoT by measuring text correlations between citation networks of papers and those of patents. Then, semantic linkages between extracted research areas and social issues were investigated. In this research, we targeted social issues proposed at the World Summit on Sustainable Development in 2002, WEHAB (i.e., water, energy, health, agriculture, and biodiversity). On the basis of the results, we discuss potentials and challenges for IoT to solve social issues.

ME-02.4 [R] Knowledge Map of International Technological Innovation: The Research Trend and Research Frontiers

Daoming Su; Tongji University, China

Xing Tong; Tongji University, China

Zong-Fa Wu; Tongji University, China

With the help of the latest visualization technology of metrology knowledge map, combined with the scientific metrology, mathematics, computer graphics and computer science, based on co-citation analysis theory and path-finding algorithm of network, research the web of Science 6080 literatures on technological innovation from 2010 to 2014, using visualization software CiteSpace III, analysis on core journals, important authors, important documents and the research hot spot draw the knowledge maps of the technology innovation in the past five years, show development trends and research hotspots in international technology innovation in the past five years. Through exploration and analysis, the current international research on the technological innovation of the five major hot areas is summarized: "technological turbulence," "carbon capture," "innovation," "market vision" and "new technology generation." Finally, the paper puts up discussing and prospect to the research conclusion.

ME-03 S & T Policy 3

Monday, 9/5/2016, 16:00 - 17:30

Room: Kona Moku Salon C

Chair(s) Jungwon Lee; Science & Technology Policy Institute (STEP)

ME-03.1 [R] RIS3 in the Context of Northern Mexico: Lessons Learned in the Process of Drafting State Innovation Agendas

Jose Luis Solleiro; Universidad Nacional Autonoma de Mexico, Mexico

Rosario Castanon; Universidad Nacional Autonoma de Mexico, Mexico

The Research and Innovation Strategies for Smart Specialization (RIS3) methodology has been tested in Europe for the development of agendas for territorial economic transformation. In 2014, RIS3 was adapted in Mexico to define innovation agendas for each of the 32 states of the country. This process was promoted by the National Council for Science and Technology, and the authors of this paper participated in the development of the agendas of seven states in northern Mexico. Based on this experience, this paper analyzes the process carried out to develop these agendas, which included the following main stages: identification of the areas for smart specialization; integration of governance bodies and advisory groups; organization of consensus-building workshops to identify priority innovation programs, and roadmaps to achieve their objectives. This paper describes the process in detail, recognizing the main stakeholders participating in the process and the main factors favoring or hindering it. The role of government, academic and industrial sectors' representatives is evaluated under specific circumstances of access to critical information, political motivations and a short-term vision. Based on this analysis, the lessons learned are presented and recommendations for further work in innovation policy are drafted with the intention of enriching this process in countries with little tradition of defining smart specialization sectors.

ME-03.2 [R] A Quantitative Study on the Regional Patterns of China's Light Emitting Diode Industry Policy

Xuanting Ye; Beijing Institute of Technology, China

Jingru Yin; Beijing Institute of Technology, China

Liu Yun; Beijing Institute of Technology, China

Cui Huang; Tsinghua University, China

Jun Su; Tsinghua University, China

Jian Zhang; Central University of Finance and Economics, China

This paper studies the regional patterns of China's light emitting diode industry policy. The paper gathers policy contexts of the central government, Guangdong Province, Fujian Province and Jiangxi Province. By policy bibliometrics analysis and content analysis of the policy context's external and internal characteristics, the paper explores the regional patterns on the policy-making time, policy-making agency and policy tool and discusses the relationship between policy orientation and the reality of industry development in various regions. The paper finds that there exist differences on the frequency of policy-making time and the administrative departments. Particularly, there are remarkable differences on the aims, emphases, means and valid period of policy tools. The analysis framework and method are applicable to the research of other industry policy, and the conclusion may be supportive to the authorities on policy making.

ME-03.3 [A] STI Policy for Sustainable Growth: A Korean Experience

Jungwon Lee; Science & Technology Policy Institute (STEP), Korea, South

What would be a new vision of science, technology and innovation (STI) policy? Many countries have set economic development as the highest priority, such as GDP, GNI. Economic development is still important, but STI policy now needs a vision with more integrated perspective. This paper proposes "sustainable growth" as a new vision of STI policy. Sustainable growth includes economic sustainability, environmental sustainability, and social sustainability. Science and technology play a critical role to implement sustainable growth. In particular, there are increasing interest and demand for resolving emerging issues such as environment issues, aging issues, and polarization issues. Actually, many leading countries are trying to get sustainable growth and resolve social challenges based on science and technology. Korea is also expanding its science and technology investment to environmental sustainability and social sustainability, which has been mainly focused on economic sustainability. Since 2014, the Korean government has implemented an independent R&D program to meet the demand for social issues as a multi-ministerial program. Lessons and implications will be introduced from the experience of this program. This paper concludes with recognizing the need for transition to a new STI system that has characteristics of openness, balance, and a holistic view.

ME-04 Collaborations for TM 2

Monday, 9/5/2016, 16:00 - 17:30

Room: Honolulu

Chair(s) Nathasit Gertsri; Mahidol University

ME-04.1 [A] From Literature to Practice: Selection Criteria for Industry-University Partners

Nisit Manotungvorapun; Mahidol University, Thailand

Nathasit Gertsri; Mahidol University, Thailand

To strategically exploit open innovation, many companies continue to expand their research collaboration with universities to boost the novelty and speed of innovation development. Recently, the literature proposes various sets of criteria for selecting universities as partners, but the research on practicality and generalizability of such applications is still limited. This explorative study reveals how managers apply the criteria from the literature into practice for their industry-university collaboration. The structured interviews were conducted and the quotations were extracted to obtain common criteria. The result of case studies reveals that both systematic and traditional approaches are applied in partner selection. With a systematic approach, the academic databases and partner profiles are used along with expert judgment to support the decision, whereas a traditional approach relies on trust, which emerges from collaboration experiences and personal connection.

SESSIONS

ME-04.2 [R] New Bibliometric Analysis of Research Institutions Network

Kazuya Tanaka; The University of Tokyo, Japan
Ichiro Sakata; The University of Tokyo, Japan

To understand academic research, bibliometric analysis is tremendously important at any aspects. Research institutions such as the university, institution and research center are focal points of academic research. We have used simple and quantitative bibliometric analysis for the evaluation of research institutions. Nowadays, some studies show that qualitative and network-based bibliometric analysis has been implemented for this purpose as a new approach. As such a new approach, this research shows network-based bibliometric analysis to understand research institutions' characteristics qualitatively and show a new standard for the evaluation of research institutions, using co-authorship analysis. As a result and discussion, we suggest that some network index may represent their institutions' academic situation and power on their field and country.

ME-04.3 [R] Influence of Partners' Characteristics on the Effective Application of Technology Strategies: Case of a VTI

Arif Sikander; Murdoch University, Australia

Technology strategies have assumed an important role in providing technological leadership to firms. A study conducted by the author in the East, revealed that the performance of firms is influenced by the type of technology strategies adopted. This result provided the motivation to explore if such strategies are relevant to the management of the "services" sector and if their performance too is influenced by these adoptions. There is dearth of similar studies in the literature. More importantly, in this age of technology, there is a dire need for management to understand and implement appropriate technology strategies. The results could contribute to the literature/management in developing a set of strategies which could be termed as "global" and applied to any sector and those termed as "unique" which are specific to the firm/service sector. In terms of the services sector, the nearest similarity to the technology intensive firms appears to be the vocational and technical institutions (VTI). The other justification to focus on technical institutions was that their performance is more affected by technology strategies/policies than the traditional primary and secondary schools/colleges. The big study sought to identify and analyze the level of awareness of participants on technology strategy issues and the perception of departments (including those in the Ministries) about technology management, gender, local/expatriate, qualification, teaching experience, years since last professional course completed, industry experience, understanding of quality, and department employed. This paper attempts to presents the results on that part of the study which deals with the relationship between the type of the managers/management (gender, qualification, age, etc.) and the application of technology strategies.

ME-04.4 [R] Innovation for Inclusive Development in Health Sector: Mexican Experiences

Claudia C Diaz-Perez; Universidad Autonoma Metropolitana Cuajimalpa, Mexico
Jose Luis Sampedro Hernandez; Universidad Autonoma Metropolitana Cuajimalpa, Mexico

Inequality and wealth distribution have been widely researched but not in the field of innovation studies. Recent trends in innovation studies have pinpointed the necessity to strengthen research programs about innovation for disfavored populations over the world. Two main orientations have been identified: (i) Innovation requires the involvement of the people affected in demand definition, as well as solving processes to become an inclusive innovation problem. (ii) Inclusive development is oriented to identify and establish solutions for problems that affect marginalized populations. In addition, we found a variety of categories to study the problem: inclusive innovation, innovation for inclusive development, innovation for social development, innovation for the population at the bottom of the pyramid, among others. This research explored Mexican innovation experiences for inclusive development in the health sector. The role of intermediate organizations becomes very relevant: universities and public research centers, nongovernmental organizations, associations and local governments are all fundamental to achieve innovation efforts and develop knowledge to solve

health demands in disadvantaged populations. This article presents a variety of participants and crucial processes like learning and social capital construction as key points of innovation for inclusive development.

ME-05 Educational Issues 1

Monday, 9/5/2016, 16:00 - 17:30

Room: Waikiki Salon 1

Chair(s) Hsin-Ning Su; National Chung Hsing University

ME-05.1 [R] Transformability of Universities is Directed by Repositioning After Evaluations: Introduction to a SMTIE Model

Hebron C Chang; Asia University, Taiwan, Taiwan
Hsin-Ning Su; National Chung Hsing University, Taiwan

In the 21th century, the university is a knowledge factory for teachers and scholars to perform education and research, and a translation media of science to technology. Universities are emerged to transform that is directed by repositioning after evaluation. University policy makers are missioned to reposition their universities for the 21th century market. Foreseeing transformation from education/research to entrepreneurial due to market demand, policy makers are suggested to adopt Mintzberg's strategic planning principle for repositioning, CIPP and BSC models for internal evaluation, SWOT and Porter's 5 force analysis for internal and external evaluation to relocate the positions of universities. The indicators for self- and internal evaluation and repositioning may follow CAAA and Californian systems. A SMTIE model for university positioning is proposed. Using Taiwan as a local case study, it is suggested that public universities would be merged to "multiversity" and private universities would transform to "entrepreneurial" or become "omniversity" according to the evaluation based on the SMITE model.

ME-05.2 [R] Redesigning the Way Teams Work Smarter Using Comprehensive Assessment of Team Member Effectiveness (CATME)

Aisha Mahmood; Namal College, Mianwali, Pakistan
Muhammad Abbas Choudhary; Namal College, Mianwali, Pakistan
Aleena Hasan Qurashi; Namal College, Mianwali, Pakistan

Teamwork is the top desired professional skill by employers of the 21st century, yet it is observed that engineering and computer science graduates lack these skills. One of the reason is today's traditional teaming approach in the engineering classrooms, which is based on either friendship or random grouping schemes. CATME is a research-based innovative, online tool for team formation that provides a platform to support smarter teamwork. CATME facilitates the instructor to automatically group students in their most suitable teams based on more than 25 criteria/conditions like soft/hard skills and other academic and non-academic factors that can be manipulated. This study explores the effects of forming teams using CATME on the overall learning experience, satisfaction and teamwork skills of 75 undergraduate students enrolled in electrical engineering and computer sciences at a private university. This longitudinal study spanning over two semesters entails a mixed-methods, quantitative followed by qualitative approach using CATME entry surveys, team evaluation surveys and informal social media conversations. The experience of working in a team, formed by CATME, was peer evaluated to investigate its suitability for interactive learning spaces and help students develop and master team working skills.

ME-05.3 [R] University-Industry Cooperation in Taiwan Technological and Vocational Education across Academic Discipline

Wei Zhou; Hunan Agricultural University, China
Chihchang Chen; Taiwan Shoufu University, Taiwan
Yen-Jo Kiang; CTBC Financial Management College, Taiwan
Ke-Chiun Chang; Wuhan University, China

University-industry cooperation is not only a promotion of research but also an economic activity. It is essential for the purpose of science development and technology innovation. Vocational education plays an important role in product development and technology re-

SESSIONS

search in Taiwan. This study surveyed the performance of university-industry cooperation on productivity of patent, paper and resources of funding across eight academic disciplines in Taiwan technological and vocational institutions by providing an overview of research productivities and funding resources. The results reveal that college of agriculture, college of engineering and college of design perform quite well in university-industry cooperation with better mean of patent, paper and funding.

ME-06 TM in Finance

Monday, 9/5/2016, 16:00 - 17:30

Room: Waikiki Salon 2

Chair(s) Joseph C Paradi; University of Toronto

ME-06.1 [R] Managing Technology in Financial Innovation

Frederick Betz; Portland State University, United States

The topic of managing technology had traditionally focused upon the manufacturing industries; but the service industries grew to become a major sector of industry and commerce. We examine how to manage technology in the financial commercial sector. What is innovation in the financial sector? How does innovation occur in the financial sector? What are the criteria of technology safety in financial innovations? Why did financial innovation contribute to financial instabilities, such as the Global Financial Crisis of 2007-08? Why had governmental agencies failed to properly regulate the financial sector for safety? How did U.S. government financial agencies handle that financial crisis to result in a major recession rather than a second Great Depression? This paper is a cross-disciplinary study between MOT and economics.

ME-06.2 [R] Dynamics and Causality among Financial Development, Industrial Structure Optimization and Economic Growth

Yunfang Wang; Beijing Institute of Technology, China

Shifeng Han; Beijing Institute of Technology, China

This paper analyzes the long-term and short-term dynamic and the causal relationship among financial development, industrial structure optimization and economic growth. Co-integration and vector error correction model analysis are applied to China's annual data set covering the period 1978-2013. Several conclusions are drawn: in the long term, there is unidirectional causality between financial development and economic growth, financial development and industrial structure optimization; there is a negative bidirectional causal relationship between industrial structure upgrading and economic growth; there is a positive bidirectional causal relationship between industrial structure rationalization and economic growth. In the short term, there was bidirectional causal relationship between financial development and economic growth. However, the direction of interaction between them is opposite; there was unidirectional causal relationship between industrial structure optimization and economic growth.

ME-06.3 [R] Business Incubation Model for Startup Company and SME in Developing Economy: A Case of Thailand

Songphon Munkongsujarit; National Science and Technology Development Agency, Thailand

Nowadays, the business landscape has become more complex as increasingly large numbers of new startup companies emerge and enter the market. These startup companies, which start as small- and medium-sized companies, are considered to be the driving force of the economy, especially in developing countries. However, without proper business strategy and support, new startup companies often fail to survive in the highly competitive market. Business incubator is considered as one of the support mechanisms for startup companies. This paper examines a case study of Thailand as a developing country to analyze the necessary business incubation activities that support startup companies and small- and medium-sized companies. In addition to the analysis, the paper also presents the recommended business incubation model for a developing economy.

ME-07 Innovation Management 3

Monday, 9/5/2016, 16:00 - 17:30

Room: Waikiki Salon 3

Chair(s) Nathalie Sick; University of Muenster

ME-07.1 [R] How to Use Crowdsourcing for Innovation?: A Comparative Case Study of Internal and External Idea Sourcing in the Chemical Industry

Hangzi Zhu; University of Muenster, Germany

Nathalie Sick; Helmholtz Institute Muenster, Germany

Jens Leker; University of Muenster, Germany

Successful social innovation relies strongly on open innovation and the impact of crowds to find alternative solutions in a more transparent way. Social media as web-based communication platform leverages practices of crowdsourcing for idea generation to become a prominent tool for open innovation. The extant literature mainly focuses on external crowds, such as users and end customers. Although conducting internal crowdsourcing with employees has entered the research agenda, detailed examination on how and when to use external or internal crowds for open innovation is still missing. Thus, the research aim of the present study is to identify success factors and challenges for internal and external crowdsourcing by determining their differences. An exploratory multi-case study research design is used to investigate crowdsourcing activities within a specialty chemicals company. We compare a case of external crowdsourcing, where academic researchers were invited to submit solutions to a specialized problem with a case of internal crowdsourcing, whereby employees generate ideas for new products in an idea competition. Based on three key components - task, crowd and outcome and their interrelationships in three dimensions - social, technical and innovation dimension, we thus present a framework on how to use internal and external crowds best to source new ideas and solution pathways.

ME-07.2 [R] How to Motivate External Open Innovation-Partners: Identifying Suitable Measures

Maik Holle; Technical University of Munich, Germany

Luisa Elsesser; Technical University of Munich, Germany

Udo Lindemann; Technical University of Munich, Germany

Shorter product life cycles require shorter innovation cycles, which forces companies to launch new innovative products on the market at increasingly shorter intervals to stay competitive. A promising approach to face this challenge is described as the new paradigm of open innovation (OI), where knowledge of external partners (e.g., suppliers, product users or universities) is used to accelerate the company's internal innovation process. Thereby, the motivation of external partners is, among other things, crucial for the success of an OI-collaboration. So far there is no systematic approach available in the literature that provides guidance for finding the right "levers" to motivate these external partners to contribute their knowledge within an OI-collaboration. For this purpose, the present paper provides a methodology for identifying appropriate measures to motivate external partners depending on the type of cooperation (e.g., idea platform, lead-user-workshop or cross-industry innovations). Based on existing models in the research field of motivation psychology, suitable motivational factors are derived and considered. Finally, an interactive software-tool for raising the usability of the methodology is introduced.

ME-07.3 [A] Market-based Innovation for Sustainable Competitive Advantage

Wilson Zehr; Eastern Oregon University, United States

New technology and product-based innovation are important catalysts for new markets. However, as nascent markets mature, imitation becomes rampant, products become more commoditized, and firms must shore-up their value proposition to avoid strictly cost-based (scorched earth) competition. The term used in marketing to describe this is "differentiation." The essence of differentiation is turning the dials of the marketing mix (product, people, price, place, promotion) to create an offering that is the most attractive to current

SESSIONS

or potential customers. In order to differentiate, the mix must be “different” in a very good way - that means in a way that is both important and valuable. Creating this type of game-changing differentiation requires innovation - creating unique offerings with an unmatched and previously unseen value proposition. This process is called market-based innovation. When market-based innovation is based on the core competencies of an organization, then it can also lead to sustainable competitive advantage. Of course, sustainable competitive advantage is the key to market domination over the long haul. In this paper we will discuss several examples of successful market-based innovations and explore techniques for putting these principles to work in any organization.

ME-07.4 [R] T-Shape Competence Model for Firms to Leverage Innovation Capabilities and Create Impact in a Cluster

*Rahul Z More; The Leaders Ocean Pvt. Ltd, India
Karuna Jain; NITIE Mumbai, India*

Automobile clusters, driven by innovation capabilities, have emerged as competence centers and engines of new economic growth in India. Identified as a high potential sector, the automobile industry has been targeted under the “Make in India” initiative to foster inclusive growth in the country. The dynamism within a cluster emerges from the interaction between innovation systems and global value chain systems, which contribute to developing a framework for evaluating the innovation performance and maintaining competitiveness of firms. While evaluating innovation performance, this research examined the innovation capabilities of auto component firms and analyzed how firms in the Pune automobile cluster integrate technology management and innovation strategies with their business strategy. A mixed research methodology was adopted for this study. Structured equation modeling (SEM) was used to test the hypotheses, and the results show how firms utilize innovation capabilities and leverage their innovations through emerging practice domains. A T-shape competence model is proposed to achieve global competitiveness and create sustainable impact through social innovations.

ME-09 Entrepreneurship/Intrapreneurship 2

Monday, 9/5/2016, 16:00 - 17:30

Room: Milo II

Chair(s) Prescott C Ensign; Wilfrid Laurier University

ME-09.1 [R] Serial Entrepreneurs Speak Out

*Prescott C Ensign; Wilfrid Laurier University, Canada
Steve Farlow; Wilfrid Laurier University, Canada*

It is unequivocal that entrepreneurs are vital for society. But what role do serial entrepreneurs play? Is their contribution greater? Are serial entrepreneurs more restless than entrepreneurs who stick with one venture? Some serial entrepreneurs exit and move on; others hold onto the business while starting the next one. A number of studies suggest that the seasoned entrepreneur’s next venture is no more likely to succeed than a beginner’s first venture. Still other studies support just the opposite. In this article we explore the personal reflections of a sample of serial entrepreneurs. We categorize their insights and introspection; we look to discover why they consistently put themselves back in the game; and we look for their secrets of success. Finally, we pose questions and suggest some metaphors to spark reaction.

ME-09.2 [R] Entrepreneurs’ Failure Times and Their Well-Being, Moderated by Entrepreneurial Environment

*Chuqing Zhang; Tsinghua University, China
Cong Chen; Tsinghua University, China
Jizhen Li; Tsinghua University, China
Xiaoying Zhou; Tsinghua University, China*

In this paper, we explore the effect that failure experiences have on entrepreneurs’ well-being, and also observe the changes of such effect in different entrepreneurial environment.

By doing hierarchy regression, we found that entrepreneurs’ prior failure times have a negative relationship to entrepreneurs’ well-being, and such relationship is strengthened when entrepreneurs are embedded in a entrepreneurial friendly environment. Our marginal effect analysis also confirms our hypothesis that entrepreneurs’ overall well-being, as well as their job satisfaction, life satisfaction and psychological well-being, decreases with failure times increasing.

ME-09.3 [R] Creativity, Opportunity Recognition, New Venture Resources and Entrepreneurial Career Success in Creative Industries

Yu-Yu Chang; Southern Taiwan Univ. of Science and Technology, Taiwan

At the heart of entrepreneurial success in creative industries are entrepreneurial creativity and opportunity recognition, which influence entrepreneurs’ ability to create new ventures or significantly improve the position of an existing business. Entrepreneurial resource availability is pivotal to whether entrepreneurs can convert the creative ideas and identified opportunities into lucrative businesses. Recently, entrepreneurship research has suggested that resource availability represents a double-edged sword, simultaneously facilitating and impeding new venture outcomes, while little research has explored how entrepreneurial creativity, opportunity recognition, and resource availability jointly affect entrepreneurial career success. To address the theoretical gap, this paper reviews relevant literature and proposes a research framework, which aims to explain how resource availability moderates the effect of entrepreneurial creativity and opportunity recognition on entrepreneurial career success. To better reflect the career success perceived by entrepreneurs in creative industries, this paper also incorporates four indicators of entrepreneurial success, including career achievement, entrepreneurial happiness, capability enhancement, and financial satisfaction. Implications for future research and practice are discussed.

ME-09.4 [R] Exploring the Potential of Mobile Health for Product and Process Innovation

*Reiko Onodera; Tokyo Institute of Technology, Japan
Shintaro Sengoku; Tokyo Institute of Technology, Japan
Kumiko Miyazaki; Tokyo Institute of Technology, Japan*

Mobile Health or mHealth is an emerging concept of the use of mobile devices and wireless technology for healthcare purposes. Recently, mHealth-related technology is expected to form a new category of medical devices, particularly in the monitoring of patients. This is also anticipated to improve the efficiency and effectiveness of pharmaceutical clinical trials. However, there are challenges to utilize this enabling technology to innovate healthcare business. Considering this context, we explore the potential of mHealth. First, we position mHealth with respect to current innovation theories based on an intensive literature review. Second, we hypothesize that mHealth has two potential areas of innovation: product innovation in the medical devices industry and process innovation in the pharmaceutical industry. To test the hypotheses, we conducted a holistic observation of clinical trials to examine how large mHealth impacts a treatment pathway by innovative products. Consequently, we observed that 193 studies are registered; however, most of these remain at a primitive level of information and communication technology such as text messaging and application, which suggests a significant gap to the market forecasts. This present study forms the basis of the trend of mHealth and a future outlook from the viewpoint of technology and innovation management.

ME-10 Intellectual Property 3

Monday, 9/5/2016, 16:00 - 17:30

Room: Milo III

Chair(s) Harm-Jan Steenhuis; Hawaii Pacific University

ME-10.1 [A] Diversity of Reactions among Local People upon Commercialization of Traditional Knowledge under Intellectual Property Rights Systems

SESSIONS

*Kazuya Hayakawa; Japan Advanced Institute of Science and Technology, Japan
Yasunobu Ito; Japan Advanced Institute of Science and Technology, Japan*

The purpose of this study is to focus on the diversity of reactions among local people caused by the commercialization of traditional knowledge under intellectual property rights systems. While intellectual property rights systems tend to be globally unified, as in the negotiations regarding TPP (Trans-Pacific Partnership), local people having traditional knowledge react to and cope with such systems diversely; some reject such systems while others positively adopt such systems. This study specifically focuses on local people's diverse reactions and responses to the existing intellectual property rights systems. The cases from Hawaii illustrate that there are a variety of potential relationships between intellectual property rights systems and traditional knowledge. The analyses contained in this paper also show that, in cases where traditional knowledge is commercializing through intellectual property rights systems, it is advantageous for an enterprise as a rights holder to attempt to pursue a dialogue with local people, rather than simply pursue a patent right secretly in order to claim exclusive control over intellectual property rights. Through such a dialogue, risks for business development may be reduced and the values of cultural resources may be enhanced.

ME-10.2 [R] Who Does Not Maintain Patents?

*Huei-Ru Dong; National Taiwan University, Taiwan
Mu-Hsuan Huang; National Taiwan University, Taiwan*

This research aims to understand the patterns between the legitimate patents and expired patents in the field of communication technology. This study use patentometric methods to investigate USPTO data on expired patents in communication technology. We used the USPC - National Bureau of Economic Research (NBER) Patent Data Technological Classification to identify patents relevant to communication technology. A total of 195,391 utility patents in communication technology was granted between 1994 and 2009. The results show that the expiration rates in Phase II, III, and IV are 9.90%, 15.28%, and 15.10% respectively. Although the number of expired patents increased over the period studied, the proportion of patents expiring decreased slightly in all three phases. Although US corporations hold the greatest number of patents granted by the USPTO, the proportion of patents from foreign corporations has been increasing rapidly. Japan has a high number of granted patents and high expiration rates especially in Phase III and IV. Sweden has a relatively high number of patents but the expiration rates in Phases II, III, and IV are quite low. This may show that Swedish patentees attach much importance to patent protection and that their patents may have higher value.

ME-10.3 [A] Operating Rooms Optimization in a Cardiology Public School Hospital: The Joint and Sequential Use of the Models of Min and Belien

*Joao Chang Junior; Centro Universitario FEI, Brazil
Talles N de Carvalho; Centro Universitario da FEI, Brazil
Suzana Bierrenbach de Souza Santos; Centro Universitario da FEI, Brazil
Alfredo Fernandes; Instituto do Coracao da Fac. de Medicina da USP, Brazil*

This study uses joint and sequential models of Min and Belien to allocate elective cardiac patients in a finite number of operating rooms on any given day of the week, with particular medical staff, in a cardiology public school hospital. Currently, due to the process being empirical, most patients awaiting surgery have a critical medical condition. The lack of systematic programming also causes a prolonged wait time for scheduling, which further aggravates the patient's condition and extends his or her stay in the hospital. With this, the risk of the patient collapsing and having to undergo an emergency surgery increases, leading to imbalance of the surgical center's routine and hindering the surgical program. The joint use of the two models provides a weekly schedule of surgeries, prioritizing patients by level of criticality and increasing the level of use of post-operative beds. Therefore, a reduction of 29% was obtained in quantities of beds needed to meet the demand of the surgical hospital. The daily and weekly occupancy of these beds was maintained, thus avoiding the oscillations between idleness and burden on the medical staff. This work has used math-

ematical models to focus on optimization of scheduling elective surgeries, with attention to the level of critically of patients present on the current waiting list for their surgeries.

ME-11 Environmental Issues 3

Monday, 9/5/2016, 16:00 - 17:30

Room: Milo IV

Chair(s) Steven T Walsh; University of New Mexico

ME-11.1 [R] A Conceptual Framework to Investigate the Adoption of On-Site Waste Management Innovation in Australian Building Projects

*Timothy M Rose; Queensland University of Technology, Australia
Karen Manley; Queensland University of Technology, Australia
Duzgun Agdas; Queensland University of Technology, Australia*

Building waste accounts for over half of the solid waste generated worldwide and has an environmental impact on all stages of the building process, including raw material extraction, manufacturing, transportation, construction and disposal. The recycling and re-use of construction and demolition (C&D) waste in Australia is currently below optimal levels and the industry faces ongoing barriers to improvement. Ideally, the industry needs to put greater attention on innovative on-site waste capture and segregation practices, including on-site processing technologies that offer significant benefits, particularly in reducing transport requirements and associated environmental impacts. In order to establish a starting point for empirical research into this topic area, this paper outlines the results of an early review of the literature about on-site waste management innovation and proposes a conceptual framework to be used to investigate the behavioral intentions influencing relevant innovation decisions in building construction projects. To interpret the behavioral dynamics of project-based organizations within the C&D waste management innovation system, a novel conceptual framework is proposed that integrates two key behavioral decision-making theories: Innovation Diffusion Theory (IDT) and Theory of Planned Behavior (TPB). The proposed conceptual framework provides a sound basis for a large-scale empirical study of on-site waste management innovation adoption on Australian building projects.

ME-11.2 [R] A Comprehensive Overview and Promotion of Bioenergy Systems for Social Development in South Africa

*John Francis Agwa-Ejon; University of Johannesburg, South Africa
Antoine F Mulaba-Bafubiandi; University of Johannesburg, South Africa
Jan-Harm Pretorius; University of Johannesburg, South Africa*

The need for energy demand is dependent on the worldwide growth in population which keeps on rising exponentially. South Africa as part of the global arena is currently experiencing a major problem in generating electricity nationally. Eskom, the entrusted company to supply electricity, has over the years been generating power through burning coal. Faced with a huge energy consumption, the country has become the leading carbon dioxide CO2 emitter in Africa and the 12th largest worldwide. Biofuels and other alternative fuels have the potential to reduce the nation's dependence on imported fuels, which currently stands at 70% of the petroleum consumed. In order to lower pollution levels, South Africa has established several biofuel policies and mandates such as the biofuel industrial strategy aimed at promoting the production and use of biomass fuels. The purpose of this paper is to provide an overview, development trends and concretization of bioenergy in South Africa. The factors used in the design and implementation of energy policies regarding bioenergy are also discussed. The paper further exhibits the usefulness of biofuels in the management of the environment and integration of bioenergy as an essential contribution to the eco-system re-equilibrium.

ME-11.3 [R] A Study on the Environmental Regulations and Innovation: The Case of the European REACH Regulation

Kenji Nagasato; Hitotsubashi University, Japan

SESSIONS

Concerning the relationship between environmental regulations and innovation, the Porter hypothesis is known as “properly designed environmental regulations induce innovation in enterprises, resulting in an increase in the improvement and benefit competitiveness.” It had been carried out in various studies for a long time, and one of research topic is, “What kind of environmental regulations can cause innovation?” In this study, the author discusses the relationship between environmental regulation and innovation on this topic using the case study of European chemical regulations, called REACH regulation. It is said to environmental regulations of stakeholder participation, so the interaction of REACH regulations and corporate innovation is discussed. In general, “Restrictions on hurdle is high, but there is no alternative and society requires the product.” In this case, there is a high possibility to induce innovation. The “stakeholders can participate in policy processes regulating” and in the present case, it was indicated it is difficult to induce a revolutionary innovation.

ME-12 NPD 3

Monday, 9/5/2016, 16:00 - 17:30

Room: Milo V

Chair(s) Kentaro Nobeoka; Hitotsubashi University

ME-12.1 [R] Matching Potential Customer Needs to Technology Seeds: Using a Virtual Catalog to Extract Customer Needs in B2B Manufacturing Companies

Tetsuro Sorabayashi; Japan Advanced Institute of Science and Technology, Japan
Yasuo Sasaki; Japan Advanced Institute of Science and Technology, Japan
Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan

Effective technology marketing that extracts potential needs from customers and matches them with a manufacturer's core technology seeds is very important in the current global, competitive market. Several methods have been proposed to extract these needs, including rapid prototyping, agile development, and design thinking. However, it is sometimes difficult to apply these methods in business-to-business (B2B) products such as industrial machinery because customer needs are complicated and context-dependent. “Virtual catalogs” (imaginary catalogs for future products) have been used by several B2B companies. Using virtual catalogs, product designers can specify their images of future products and use them to extract potential needs from customers. Although several procedures to construct virtual catalogs have been established, the methods for using these catalogs have not been scientifically investigated, and the effectiveness of their utilization depends on individual communication skills. This paper proposes an effective method of utilizing virtual catalogs and verifies the effectiveness by a laboratory experiment as a role-play test of technology marketing using virtual catalogs.

ME-12.2 [R] Target Compliant Configuration of Conceptual Structural Features of Modular Product Platforms

Guenther Schuh; RWTH Aachen University, Germany
Michael Riesener; RWTH Aachen University, Germany
Sebastian J Barg; WZL of RWTH Aachen University, Germany

Due to globalization as well as increasing competition and cost pressure, business strategies extensively focus on individual products tailored to customer's needs. In order to meet this challenge, numerous companies structure their products and technologic solutions according to the design principles of modular product platforms. Therefore, the modular product platform approach of the automotive industry is often directly transferred on other industries, e.g., machinery and plant engineering. However, the attempt of simply transferring the automotive approach leads to missing targets and full potentials of a modular product platform. This circumstance is due to the overall situation of the applying company in terms of boundary conditions and an individual target system for the modular product platform. The lack of target achievement consequently results from the missing alignment of the modular product platform to these circumstances. To resolve this situation by increasing the level of target achievement, this paper introduces a methodology for a target compliant configuration of Conceptual Structural Features in the early development phase

of modular product platforms. By taking company-specific influencing factors as well as the individually pursued target system into account, the approach helps in aligning a modular platform project to the company's individual overall situation.

ME-12.3 [A] Art Thinking beyond Design Thinking MAZDA Design: Car as Art

Kentaro Nobeoka; Hitotsubashi University, Japan
Megumi Kimura; Hitotsubashi University, Japan

This research proposes the importance of art-thinking as compared with design-thinking, using a case study of Mazda. The Japanese automobile firm has been introducing a series of successful new products in the past few years, featuring art-thinking approach. Mazda publicly declares that “the car is art,” and has been winning numerous design awards. In our definition, design-thinking tries to meet specific customer needs, while art-thinking pursues more fundamental values. There are two critical differences between the two. First, art-thinking focuses more on fundamental values than specific customer needs. Artists try to express their emotions and beliefs. Second, with art-thinking, designers would not compromise themselves easily, partially because they pursue internal expression. The purpose of this paper is to develop a theory of art-thinking and to investigate its actual application with in-depth study of Mazda. The design team at Mazda led by a charismatic design director, Ikuo Maeda, has been working on car design motivated by art-thinking. We have interviewed five chief designers and Ikuo Maeda to achieve these research purposes. We believe that this paper proposes the importance of a concept of art-thinking for social innovation, using empirical evidence from the Mazda case.

ME-12.4 [R] Outsourcing of New Product Development Activities: The Case of an Automaker

Rogério A Pereira; University of FEI, Brazil
Gabriela Scur; University of FEI, Brazil

In the context of global competition, companies are searching for strategies to stand out and gain competitive advantage. One of these strategies is the outsourcing of activities. Researches over the years have addressed the process of production outsourcing, but the outsourcing of new product development (NPD) activities is a relatively new phenomenon. This paper aims at analyzing this phenomenon in the Brazilian Volkswagen subsidiary in order to know the reasons why the company performs the outsourcing of activities regarding NPD. It also addresses the factors that affect the decisions of outsourcing. The analyses were conducted in the light of the resource-based view and transaction costs. The results reveal two ways of outsourcing: engineering services and product development. The former occurs when the automaker is in charge of the equipment, risk and rework. The latter occurs when a set of tasks is subcontracted. Thus, the supplier is in charge of the equipment, financial and rework risks. The reasons for subcontracting are the lack of an important resource that the company does not have to complete the development internally and the lack of capability to perform certain activities, reduce costs and limit headcount.

TA-00 PLENARY - 2

DATE: TUESDAY, 9/6/2016
TIME: 08:30 - 10:00
ROOM: KONA MOKU BALLROOM
CHAIR: DILEK CETINDAMAR; SABANCI UNIVERSITY

TA-00.1 [K] Creativity and Genius: Inside the Minds of Leonardo, Shakespeare, Newton, Beethoven and Einstein

Bulent Atalay; Scientist, Artist and Author, United States

What happens when the objective (scientific) part of the mind intersects with the subjective

SESSIONS

(artistic) part? Professor Atalay explores this fascinating question by probing the genius of Leonardo da Vinci, Shakespeare, Newton, Beethoven, and Einstein. Leonardo, the creator of the two most famous works in history, was a scientist doing art, and an artist doing science. Newton and Einstein were towering scientific figures. But Newton spent much of his time experimenting in a pair of distinctly non-scientific areas in the mysterious precincts of alchemy and in scrutinizing the details of Biblical scripture. Einstein, the greatest scientist since Isaac Newton, was a gifted violinist who frequently found inspiration for his scientific endeavors while playing, especially the music of Mozart. And Beethoven was a pianist and composer, a pure musician, or so it seems. Finally, Shakespeare is without a peer in the history of literature. Atalay shows how they were able to weave their disparate passions, often with extraordinary results. Was this an anomaly or something that can be mapped onto the brain? Understanding the patterns of their creativity will provide an entirely new appreciation of their work and genius and perhaps that of others, too.

TB-01 TM in Health 1

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Kona Moku Salon A

Chair(s) Nasir J Sheikh; State University of New York

TB-01.1 [A] A Comparison Analysis between Manufacturing & Service Approaches in the Medical Device Industry

Kuan-Chung Lin; National Chiao Tung University, Taiwan

Rui-Teng Hsueh; National Chiao Tung University, Taiwan

Joseph Z Shyu; National Chiao Tung University, Taiwan

The medical device industry is an industry with obviously interdisciplinary characteristics and suitable for manufacturing and service approaches study. A manufacturing approach of industrial portfolio model, and a service approach of IIS (innovation intensive service) platform model are used as analytical tools for industrial innovation. From the perspective of the manufacturing side, an industry portfolio has been conducted and it consists of two dimensions: industrial value chain and technology life cycle. On the other side, the IIS platform has been considered with innovation strategies, externalities and value activities. This research focuses on the industry level of policy making for medical device industry development in upcoming years of Taiwan. The result reveals that the industrial innovation requirements of "market information", "management skills" and "financial resources" should be emphasized for Taiwan's medical device manufacturing. This research also indicates that "connectivity", "receiver competence" and "nature of knowledge and spillover mechanisms" in the dimension of technological system will be essential; meanwhile, "factor conditions", "demand conditions" and "firm strategy, structure, and rivalry" in the dimension of industrial environment are indispensable. Not only does the conclusion provide a mechanistic comparison of manufacturing and service approaches, it also allows strategic suggestion of resource allocation for medical device industrial development.

TB-01.2 [R] Forecasting of Biosensor Technologies for Emerging Point of Care and Medical IoT Applications Using Bibliometrics and Patent Analysis

Nasir J Sheikh; State University of New York, Korea, South

Omar Sheikh; Oregon State University, United States

Healthcare is beginning to embrace point of care (POC) diagnostics and medical applications that are based on the internet of things (IoT) and the ubiquitous smart phone. Advanced medical diagnostics will utilize biosensors for biological data acquisition. This paper introduces the forecasting of biosensors that have the potential to be used in POC and IoT applications. For this research three types of biosensors were selected. These are biosensors for testing of blood, saliva, and breath. Bibliometrics and patent analysis of these biosensors are used to develop technology maturity rates based on the Fisher-Pry model. The Science Citation Index (SCI) is used for bibliometrics and patent analysis and is derived from global patent databases. The Fisher-Pry projections or S-curves enable insights into the maturity levels of the emerging biosensor technologies under consideration and forecasting their growth. Patent analysis based on cumulative annual patent count indicated that blood

biosensors reached their technology maturity midpoint in 2009 with the midpoints of saliva and breath biosensors lagging by 8 and 14 years respectively. Bibliometrics with annual publication count did not appear to provide much value in forecasting the maturity growth of the three biosensors.

TB-01.3 [A] Technology Evaluation of Robotics Technology in Power Industry

Byung Sung Yoon; Portland State University, United States

Judith Estep; Bonneville Power Administration, United States

Terry Oliver; Bonneville Power Administration, United States

Robert Grizzi; Electric Power Research Institute, United States

John Lindberg T.; Electric Power Research Institute, United States

The electric power utilities as important social infrastructures should be operated stably without any failure in supply of electricity. For stable operation, it is necessary to input a huge amount of resource and investment throughout power generation, transmission and distribution facilities. Particularly, constant inspection and maintenance of the facilities require highly skilled manpower and advanced technologies. In spite of endless efforts, the electric power industry is facing serious challenges from social, economic and environmental problems. In this regard, a number of robotic systems have been tested and applied for inspection and maintenance in nuclear power plants and high voltage power transmission lines. The Electric Power Research Institute (EPRI), which conducts research, development and demonstration (RD&D) relating to the generation, delivery and use of electricity for the benefit of the public, has also required efficient technology management in providing a blue print of robotics technologies in the electric power sector for the future. The organization wants to centralize the R&D capability of robotics technologies which are dispersed by each division in order to prevent duplicated investments and manage its R&D capability effectively. This research is a step towards assessing the current robotics technology being used in the power industry and identifying the technologies that would benefit the industry most by using the Technology Development Envelop (TDE) approach.

TB-02 Social Innovation 3

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Kona Moku Salon B

Chair(s) Yoshihiro Tabira; Panasonic

TB-02.1 [R] Empirical Studies on Elderly Welfare Science and Technology Needs

Lucheng Huang; Beijing University of Technology, China

Ertao Zhang; Beijing University of Technology, China

Hong Miao; Beijing University of Technology, China

An aging population brings challenges and opportunities at the same time to science and technology. Science and technology provides a broad market prospect for solving the problems of an aging society, while analysis of the needs of older age groups has also drawn increasing attention to the market. Based on the plight of social welfare and access to livelihood technology in China's aging population, this paper analyzed the current situation confronted by elderly welfare science and carried out an empirical study on old people's demand for elderly welfare science and technology in four areas of health, housing, communication, and social participation, which contributes to identify market opportunities for the elderly. In accordance with the analysis and summaries, the paper elaborates how to develop market opportunities for the elderly from the aspects of welfare science and technology supply, policy development, and participation in social activities. Finally, this paper presents corresponding countermeasures and suggestions to promote the development of China's elderly welfare science and technology. This article presents us with an opportunity to capture the attention of decision makers and individuals to address the technology needs of an aging population today and of the boomers tomorrow, and thus deploy a theoretical and empirical understanding of science, technology and ageing that captures how later life co-evolves with the practices of technology use and design.

SESSIONS

TB-02.2 [A] Strategic Collaboration between NPO and Local Government for Social Innovation: A Case of Implementing Web Based Video Conference for Global Communication Program at Osaka, Miyakojima

*Yoshihiro Tabira; Panasonic, Japan
Francis Otieno; Ritsumeikan University, Japan
Satoru Goto; Toyo Gakuen University, Japan*

Japan has embarked on aggressive global outreach programs in various sectors and administrative levels in order to develop people with a global outlook to cope with the rapid advancement of globalization. In this regard, regional local governments have also embarked on a number of initiatives in designing localized global outreach programs. A case study analysis is used to show how regional local governments (hereinafter referred to as the municipal government) strategically build collaborative networks to advance the global human resources development programs designed to train the work force who can address the challenges affected by globalization. Specifically, this paper employs the social network framework to analyze the collaboration between the Osaka Miyakojima municipality and a non-profit organization (NPO) in developing social networks to link Osaka municipality schools and their international counterparts for the purpose of conducting online-based international exchange programs that enable the students to conduct real-time communication and give them exposure at an early age in this notoriously closed society.

TB-02.3 [R] A New Role for Universities: Technology Transfer for Social Innovations

Dilek Cetindamar; Sabanci University, Turkey

Universities have played a significant role in stimulating technological change and innovation; the focus has been commercialization of technical knowledge generated within science, technology and mathematics disciplines. Universities have increased disseminating knowledge as well as integration with industry in the form of the entrepreneurial university. The transformation of the university mission has supported university-industry-government interactions in creating commercial entrepreneurial spinoffs while it neglected to interact with a critical stakeholder of the university: society. To our knowledge, the transfer of knowledge generated within universities into social enterprises / social entrepreneurs has not been studied in the literature. This paper will present the gap in the literature review that might be an invitation for researchers to focus on the topic.

TB-03 Project Management 1

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Kona Moku Salon C

Chair(s) Krige Visser; University of Pretoria

TB-03.1 [R] Project Management and Project Portfolio Management in Open Innovation: Literature Review

*Sabin Srivannaboon; Sasin, Chulalongkorn University, Thailand
Songphon Munkongsujarit; National Science and Technology Development Agency, Thailand*

Managing open innovation is typically viewed as managing a project with a set of expectations. It requires careful planning and proven management principles to enable companies to respond to their needs in the most effective and efficient way possible. However, the literature on integration and comparison among project management, project portfolio management and open innovation principles is limited. Viewing open innovations as a series of separate projects can lead to many problems including those related to transaction costs and risks. This paper extensively reviews the literature of project management, project portfolio management, and open innovation in the hope that these principles can be better integrated and synergized both in terms of the literature and in practice.

TB-03.2 [R] Suitability of Different Probability Distributions for Performing Schedule Risk Simulations in Project Management

Krige Visser; University of Pretoria, South Africa

Project managers are often confronted with the question on what is the probability of finishing a project within budget or finishing a project on time. One method or tool that is useful in answering these questions at various stages of a project is to develop a Monte Carlo simulation for the cost or duration of the project and to update and repeat the simulations with actual data as the project progresses. The PERT method became popular in the 1950's to express the uncertainty in the duration of activities. Many other distributions are available for use in cost or schedule simulations. This paper discusses the results of a project to investigate the output of schedule simulations when different distributions, e.g., triangular, normal, lognormal or betaPert, are used to express the uncertainty in activity durations. Two examples were used to compare the output distributions, i.e., a network with 10 activities in sequence and a network where some of the activities are performed in parallel. The results indicate that there is no significant difference in the output distributions when different input distributions with the same mean and variance values are used.

TB-03.3 [R] Front-Line End-User Interactions' Impact on Front-End Activities: A Co-Creation Journey for Immigrant Integration Services, the Finnish Case

*Hani Tarabichi; Aalto University, Finland
Pekka Berg; Aalto University, Finland
Jussi Pihlajamaa; Aalto University, Finland*

Trends are changing leading to shocks; organizations are faced with challenges and cannot operate at the same level. Developing a dynamic business and operational model relying on new technological opportunities and clearer and faster customer insight is a must. Co-creating with end-users and various stakeholders through digital platform may offer the solution. When resources are becoming scarce, networks of collaboration could play an important role in value co-creation and access to business opportunities which leads to solutions being more inclusive and thus acceptable, adoptable, and scalable. Benefits are in applying technology to provide value at reduced cost and appropriate scaling. Multidisciplinary teams could offer solutions to achieve sizable understanding of how to develop dynamic capabilities for renewal. The aim is to form a comprehensive understanding of organizations' ability to create impactful new offerings from multiple hierarchical viewpoints - civil workers, immigrants, managers, directors - by developing new business and operational models while preserving, promoting, and empowering stakeholders to generate a productive impact and increase social inclusion. Acumen on front-end activities, co-creation, and value networks are sought after by combining innovation management, information management, and design thinking for new insights. The output of this research is to make an impact on the integration and societal ecosystem.

TB-04 Collaborations for TM 3

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Honolulu

Chair(s) Nazrul Islam; University of Exeter

TB-04.1 [A] Analyses of Collaborative Innovation Activities Throughout the Stages of Innovation Process

*Sercan Ozcan; Bahcesehir University, Turkey
Nazrul Islam; University of Exeter, United Kingdom*

The aim of this study is to analyze collaborative innovation activities based on the different stages of the innovation process. There are various studies that examine determinants of collaborative innovation with regards to involvement of different types of actors, national differences and technological factors. This study examines collaborations focusing on three main stages that are input, transformation and output. It adapts these three stages through-out case studies that are within the nanotechnology field to identify key issues related to the innovation process. For this study, the key nanotechnology experts who have knowledge and involvement in collaborative innovation were interviewed in the in-depth interviews to capture the required data. The interview data for this research was collected from the UK, the US, China and Germany from 42 experts within academia, industry and intermediar-

SESSIONS

ies. Each expert gave an example of collaborative innovation that they were involved in within the nanotechnology field. After the collection of the interview data, it is analyzed by using the axial hierarchical coding procedure by embedding the findings into the innovation processes. Finally, this study proposes a framework to differentiate various stages of collaborative innovations between academia and industry. Evidently, industrial or academic players do become involved at different stages of an innovation system. The collaborations between them do not start from the beginning of an innovation process when the idea is generated, though sometimes collaboration occurs for intellectual property related issues. Based upon the findings, the cases and their determinants are explained according to the input, pre-transformation, transformation, post-transformation and output stages. The results show that there is a great variance between the key success factors of different stages of collaborations. Additionally, national differences were identified with regards to the frequency of actors' involvement within the various stages of the collaborative process.

TB-04.2 [R] Empirical Research on International S&T Cooperation Promoting the Progress of Academic Frontiers from the View of Case Analysis

Yijie Cheng; Beijing Institute of Technology, China
Yun Liu; Beijing Institute of Technology, China
Xiaojie Dang; Beijing Institute of Technology, China
Shifeng Han; Beijing Institute of Technology, China
Zhenwei Zhang; Beijing Research Center for Science of Science, China

Disciplines that best reflect the current academic trends, best represent the latest research progress, and can solve the most critical scientific issues and challenges in the S&T development are academic frontiers. So, does international S&T cooperation promote the development of Chinese academic frontiers? Or, what effect does international S&T cooperation have on Chinese basic research fields? The present paper analyzes the degree and mode of international S&T cooperation, employing the emphasis papers that belong to the "Top 10 News of Basic Research of China" (later renamed "Top 10 Science Advances of China") from the perspective of disciplines from 2005 to 2014. The major findings of this study confirm that the synergistic effects of international S&T cooperation are conducive to enhance the forefront of research questions, broaden the research ideas and improve the research capacity of researchers. In addition, there are obvious positive roles in promoting the development of Chinese vulnerable discipline and traditional preponderant discipline.

TB-05 Decision Making 2

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Waikiki Salon 1

Chair(s) Fred Y Phillips; Yuan Ze University

TB-05.1 [R] An Intelligent Performance Assessment System for Enhancing the Service Quality of Home Care Nursing Staff in the Healthcare Industry

Valerie Tang; The Hong Kong Polytechnic University, Hong Kong
King-lun T Choy; The Hong Kong Polytechnic University, Hong Kong
Paul K.Y. Siu; The Hong Kong Polytechnic University, Hong Kong
C.H.Y. Lam; The Hong Kong Polytechnic University, Hong Kong
G.T.S. Ho; The Hong Kong Polytechnic University, Hong Kong
Stephen W.Y. Cheng; The Hong Kong Polytechnic University, Hong Kong

Due to the aging population in Hong Kong, the need for home care service is growing rapidly and requires nursing staff to frequently visit the homes of the elderly for service. For years, a shortage of qualified nursing staff and the tight service schedule has brought increasing pressure to the existing home care service, sometimes leading to high complaint rates by the elderly and their family members. In order to maintain the home care service quality, it is critical to have an evaluation approach by assessing the workload and characteristics of the home care nursing staff. In this paper, an intelligent performance assessment system (IPAS) is designed to evaluate the performance of home care nursing staff in the healthcare industry. IPAS integrates Online Analytical Processing (OLAP) for the collecting and storing of data on the elderly patient, nursing staff and healthcare agency when providing home

care services, and fuzzy logic for evaluating the service quality of the nursing staff. The healthcare agency can then formulate a follow up plan based on the assessment results. By conducting a pilot study in a local healthcare agency, the nursing staff loyalty can be increased while the quality of home care service can be enhanced.

TB-05.2 [R] Contingency Waste Disposal and Energy Conversion Decision Support Model

John Crutchfield; Air Force Institute of Technology, United States
Huan Li; Air Force Institute of Technology, United States
Robert A Wolfe; Air Force Institute of Technology, United States
Alfred E Thal, Jr.; Air Force Institute of Technology, United States
Matthew J Robbins; Air Force Institute of Technology, United States
Brandon M Lucas; Air Force Institute of Technology, United States
Edward D White III; Air Force Institute of Technology, United States

Managing solid waste is an enduring issue for many U.S. and combined force contingency operations. While various options have been explored to mitigate the problem, there are significant drawbacks and cost implications to many of these alternatives. Therefore, a systematic analysis of various expeditionary solid waste disposal options was conducted to develop a multi-objective decision model, which should aid decision-makers' planning for future operations and acquisition decisions. The decision model was built using the value-focused thinking approach and incorporated quantitative and qualitative values in conjunction with cost. This was accomplished by developing a hierarchy of waste management objectives, which improves performance utilization of scarce expeditionary resources. The research also included an economic analysis to evaluate each alternative compared to a baseline operation. The intent of the research was to increase the mission effectiveness of deployed military units, maintain Department of Defense environmental compliance, and strengthen the resilience of the U.S. military energy portfolio. The primary conclusion of the research is that current waste-to-energy (WTE) technologies represent a justifiable investment and contribute significant value in certain contingency environments if forward operating base processes are designed to accommodate and apply WTE technologies.

TB-05.3 [A] Risk Assessment and Comparative Analysis for Technical Standards Alliance Based On Fuzzy-AHP Method and BP Neural Network Method

Jing Hu; China Jiliang University, China
Minrui Tian; China Jiliang University, China
Yilin Wang; Zhongchao Ink Co., Ltd, China

Establishing unified industrial technical standards for a single enterprise in a highly global integrated market is becoming increasingly difficult. In recent years, enterprises in leading positions have often built technical standards alliances around a key core technology to develop industrial standards together so that they can learn from each other and optimize their resource allocation. The competition of maintaining and raising technical standards among the enterprises can be avoided in order to achieve a mutually profitable situation. Although such technical standards alliances bring huge gains to their members, their internal and external risks also threaten both the alliances and their members. Compared to other forms of strategic alliance, technical standards alliances have a much larger scale and the relationships between their internal members are more complex. Moreover, the structural hierarchy of a technical standards alliance is large and its risk has fuzzy characteristics. Furthermore, it is difficult to fully and accurately identify the real state of such an alliance. This paper uses a fuzzy pattern-recognition method to evaluate the risks of technical standards alliances and to clearly depict the essence of its risks. A fuzzy analytic hierarchy process (AHP) evaluation and the back propagation (BP)-logic fuzzy neural network methods are used to construct a risk-evaluation model of technical standards alliances, taking the alliance centered around new-energy automobiles in Zhejiang as an empirical example. Then, the two evaluation models are contrastively analyzed and cross validation is carried out for the evaluation results. Finally, the advantages, disadvantages and applicable scope of the two kinds of evaluation methods are clearly identified in order to provide theoretical

SESSIONS

guidance and support for the application of two fuzzy evaluation models in practice.

TB-06 Global Issues in TM

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Waikiki Salon 2

Chair(s) Hsin-Ning Su; National Chung Hsing University

TB-06.1 [R] Dynamics of Multi-national R&D: Evolving Patterns in East Asia

Hsin-Ning Su; National Chung Hsing University, Taiwan

International R&D collaboration is perceived as an important R&D strategy to obtain complementary resources, learn from the partner as well as share risks and costs. Previous studies suggested that international R&D collaboration has positive impact, but the impacts investigated in the literature are either not clearly defined or largely focused on business or technological impact. This study investigates social and legal impacts of international R&D collaboration by analyzing East Asian collaborative patents with multiple assignee countries from the perspectives of social network theory as well as cross-border patent infringement probability. It is found that international R&D collaboration has positive influence on both social and legal impacts. The evolving pattern shows that China and Taiwan are the most prolific and fastest-growing patenting countries. Also, Taiwan is the most important partner country in East Asia's internationalization of R&D. Two important contributions of this study can be summarized as follows: 1) this study defines social and legal impacts based on which of the dynamics of East Asia's international R&D collaboration can be obtained, 2) the legal impact defined in this study can be used to evaluate patent value as well as evaluate the quality of R&D partnership in East Asia.

TB-06.2 [R] Regional Economic Integration in the Innovation Sector in the Former Soviet Union and Russia's Role in Its Revitalization

E V Fakhruddinova; Kazan (Volga region) Federal University, Russia

Ruslan G Zakirov; Kazan (Volga region) Federal University, Russia

E M Korostyshevskaya; St. Petersburg State University, Russia

D V Yurkov; Northern (Arctic) Federal University, Russia

L A Mierin; St. Petersburg State University of Economics, Russia

The modernization of the Russian economy on an innovative basis depends on external factors to a certain extent, including the full integration into the various regional economic groupings. Due to the very limited possibilities of scientific and technological breakthrough in all priority areas, our country vitally needs mutual (but not enslaving) cooperation and integration with other countries. It is obvious that the industrialized western countries are not interested in the technological revival of Russia. Therefore, despite the official political "divorce," the former Soviet republics, including the Russian Federation, economically cannot do without each other. The development of industries based on high technology can be more or less costly and long, depending on how well the resources and competitive advantages of each country in the Commonwealth are combined. Let us analyze the state of regional economic integration in the post-Soviet space, as well as major challenges to effective technical and scientific cooperation between Russia and the former fraternal republics.

TB-06.3 [R] Estimation of Using of Social Networks for Business Development

I A Kabasheva; Kazan (Volga region) Federal University, Russia

I A Rudaleva; Kazan (Volga region) Federal University, Russia

I S Bulnina; Kazan (Volga region) Federal University, Russia

Ruslan G Zakirov; Kazan (Volga region) Federal University, Russia

L I Arsenyeva; Kazan (Volga region) Federal University, Russia

By polling people of various ages and professional groups, we have assessed the possibility to implement social networks as an efficient tool for business development in the modern society. The results showed that consumer attitudes to advertising on social networks for goods and services are described as positive, neutral, and only 10% of it is irritating. At the

same time we have obtained the results of efficient using of social networks, first of all, for polling the consumers, selecting the personnel and promoting goods and services. If the consumers purchase by 1% more goods via social networks, the efficiency of using of social networks for business development will increase by 0.3048%; if the employees use the social networks by 1% to solve the corporate tasks, the efficiency of using social networks for business development will increase by 0.4056%.

TB-07 Innovation Management 4

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Waikiki Salon 3

Chair(s) Shanthi Gopalakrishnan; New Jersey Institute of Technology

TB-07.1 [A] Compatibility-Management Between Innovation and Earning: Business Management of Cutting-Edge Photonics Company, Contributing to Three Nobel Prize Wins

Mitsuhiro Kurashige; Kochi University of Technology, Japan

Makoto Hirano; Shibaura Institute of Technology, Japan

Sadayo Hirata; Shibaura Institute of Technology, Japan

Kiyonori Sakakibara; Chuo University, Japan

Hamamatsu Photonics, an excellent Japanese photonics company which began as a phototubes business as its original vocation, is indispensable for light detection (HQ; Hamamatsu city, Shizuoka prefecture, Japan) and has been growing while keeping high compatibility between innovations and earnings, so as to have contributed to Nobel Prize wins. We investigated the reason why the company can effectively balance both innovations and earnings while consistently pursuing the unexplored dreams of photonics through top interviews, etc., and as a result, we found that the corporate management systems have been built in a cross-sectorial manner such as (1) unique SECI model like in-company knowledge circulation system, (2) open innovation practice system enhancing R&D covering very wide industrial areas around its core technologies, (3) on-site compatibility management between dreams (pursuit of the unknown and the yet-undiscovered) and wallet (earning and expense), (4) autonomous decentralized management system to meet its customers' needs agilely and flexibly, and (5) a non-achievement-based human resource cultivation system to encourage self-motivated challenges.

TB-07.2 [R] Vertical Technology Alliances: The Impact of Technological Depth and Breadth on Alliance Governance Structure

Mohammad Saleh Farazi; Pablo de Olavide University, Spain

Shanthi Gopalakrishnan; New Jersey Institute of Technology, United States

Ana Perez-Luno; Pablo de Olavide University, Spain

New high-tech firms have extensively used strategic alliances with large incumbent partners to access complimentary resources and capabilities and to finance their technology projects. However, due to their initially weak bargaining position, they tend to relinquish a disproportional amount of control rights to the larger firm that finances the R&D alliance. This raises the question: How can new high-tech firms, e.g., biotech firms, leverage their knowledge resources to retain control in alliance with larger partners, e.g., pharmaceutical incumbent firms? And, does alliance experience add to their leverage? Focusing on equity and non-equity types of alliance governance, we examine how the firm's depth and breadth of technological knowledge resources impact the choice of governance structure. Our findings suggest that high-tech firms with deeper technological resources are better able to retain control when allying with the larger firm. The relationship is stronger when the new firm has more alliance experience.

TB-07.3 [A] Social Innovation in Sabae City: As a New Type of Industrial Movement in Japan

Makoto Hirano; The University of Fukuchiyama, Japan

Taeko Yamamoto; Chuo University, Japan

Kiyonori Sakakibara; Chuo University, Japan

SESSIONS

Mitsuhiro Kurashige; Kochi University of Technology, Japan

This paper describes one case of regional manufacturing SMEs (small and medium enterprises) in Sabae, a small local city in Japan. Their conventional business field was an old-fashioned, low-tech, craft industry. However, the entrepreneur challenged to develop their original material/process technologies based on their conventional tacit knowledge. As a result, their newly developed contemporary technologies enabled them to be connected with ICT to produce innovative services on meal delivery. There are many similar stories in the same region. Although they were lacking huge capital investment and support by famous universities/laboratories, such as Silicon Valley in the USA, the people in Sabae have successfully grown many innovative entrepreneurs/enterprises in the region by utilizing mutual collaboration/trust in the regional community as what we call "social capital." The case indicates a new wave of "social innovation" in the Japanese local area regarding vitalization of regional industries. To clarify the background of the movement in Sabae, historical characteristics of industries, cultures, people, community, and religion are described in advance. The current status on their regional government's policy and their public services regarding Open Data Project is also introduced to characterize the region. The mutual relationship among the regional community, entrepreneurs and business innovation is analyzed, and the role of ICT regarding the movement is also discussed.

TB-08 Commercialization of Tech 2

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Milo I

Chair(s) Hiroko Nakamura; The University of Tokyo

TB-08.1 [A] Fund Management for Carve-Out Start-ups: A Scheme to Lead Innovations Outside the Business Scope of Large Corporations

Seiichi Watanabe; Health Improvement Net Service LLC, Japan

Hitoshi Masuya; TechGate Investment Inc., Japan

Seiichi Kato; TechGate Investment Inc., Japan

Amidst the revolutionary change of today's business environment due to progress of semiconductor technologies and the Internet, existing corporations as well as their R&D groups find it increasingly challenging to realize technology-based innovations; these innovations require disruptive business models with substantial risk. It seems particularly true in new fields, such as social innovations, where traditional businesses lack the necessary skills and vision for success. The authors successfully raised the Technology Carve-out Fund to offer opportunities to "carve out" technologies and key personnel from traditional corporations or research institutes, and enable pursuit of innovative business models in start-ups, outside the existing business scope of large organizations. The concept was reported at PICMET 2005, and the ongoing efforts at PICMET 2014. Since the fund duration ended on December 31, 2015, the authors summarize their work and highlight lessons for future "carve-out" efforts.

TB-08.2 [R] Understanding Risk Perception Using Fuzzy Cognitive Maps

Pei Zhang; Portland State University, United States

Antonie Jetter; Portland State University, United States

When making decision that can have far-reaching effects, such as governmental policies or decisions on new technologies, decision-makers use their understanding of the risks that are associated with their choices to guide their decisions. Measuring how people perceive risks can be helpful for understanding and possibly improving the decision-making process. Building on a review of existing methods for investigating risk perceptions, this paper suggests fuzzy cognitive maps (FCM) as a method for investigating differences in risk perception among stakeholders and stakeholder groups. The approach is illustrated with an example of wildfire risk perceptions. Results suggest that FCM can contribute to risk perception studies and provide means to improve communications between different stakeholder groups and their involvement in the decision-making process.

TB-08.3 [R] Transition Management of a Risky Technology: Case of Small

Unmanned Aerial Vehicles

Hiroko Nakamura; The University of Tokyo, Japan

Yuya Kajikawa; Tokyo Institute of Technology, Japan

Taking the technology innovation system (TIS) of small unmanned aerial vehicle (sUAV) in Japan as a case, we extend the TIS framework to understand and manage the transition of risky technologies. In Japan, the environment for sUAV was dramatically changed in 2015 due to an incident of sUAV at the official residence of the Prime Minister of Japan. In December 2015, while amendment of Civil Aeronautics Act (Act) to include sUAV in the scope took effect, the Public-Private council (Council) for improvement of the environment concerning to sUAV business was formed. This paper assumes the Council reflects the TIS of sUAV in Japan and analyzes the discourse at the Council to understand the status of the sUAV TIS. Then we discuss how we can manage the transition.

TB-09 Emerging Tech 2

Tuesday, 9/6/2016, 10:30 - 12:00

Room: Milo II

Chair(s) Ichiro Sakata; The University of Tokyo

TB-09.1 [A] Learning Systems' Learning Analytics

Adam Marks; Zayed University, United Arab Emirates

Maytha AL-Ali; Zayed University, United Arab Emirates

Kees Rietsema; Embry-Riddle Aeronautical University, United States

This paper presents the findings from a study conducted with a number of universities regarding their use of learning analytics (LA) available within their learning management systems (LMS). Data was collected from a number of data collection instruments including an online survey, in-depth interviews with IT directors and academic administrators, and a case study in Embry-Riddle Aeronautical University. It is evident from the study that universities are attempting to make better use of their learning management systems to make more informed decisions regarding short-term and long-term goals. Some of the most popular usage includes analytics performed at the institutional level, college level, degree-program level, course level, and even course section level. Courses and degree programs as well as learning performance and objectives can be measured and analyzed using different goals, criteria, and accreditation requirements.

TB-09.2 [R] Managing the Ethical and Risk Implications of Rapid Advances in Artificial Intelligence: A Literature Review

Taylor J Meek; Portland State University, United States

Husam Barham; Portland State University, United States

Nader Beltaif; Portland State University, United States

Amani Kaadoor; Portland State University, United States

Tanzila Akhter; Portland State University, United States

The development of emergent technologies carries with it ethical issues and risks. We review ways to better manage the ethical issues and risks of one emerging technology: artificial intelligence (AI). Depending on how AI's development is managed, it may have beneficial and/or deleterious effects. The processing capacity of Tianhe-2, the world's fastest supercomputer, by some measures, exceeds the processing capacity of a single human brain, but at a prohibitive processing/power consumption ratio and physical size. Given the current pace of AI R&D activities, some estimates in the literature suggest that the technology could become capable of self-determination and super intelligence in only a few decades. This demands a serious analysis of the ethical implications of AI's development and the risks it might pose, in addition to technology management recommendations. We review the state of AI development, the timeline and scope of its possible future development, and potential ethical risks in its implementation. Further, we briefly review ethics and risk management practices as they relate to technology. Finally, we make technology management recommendations, which may help to address the ethical implications and to mitigate existential risks to humanity - with the development and dissemination of AI - by guiding its proper management.

SESSIONS

TB-09.3 [R] Detecting Structural Changes in the Nanocarbon Domain Based on the Time Distribution of Text Information of Academic Papers

Yuko Nakashio; The University of Tokyo, Japan
Tadayoshi Hara; The University of Tokyo, Japan
Junichiro Mori; The University of Tokyo, Japan
Ichiro Sakata; The University of Tokyo, Japan

In recent years, there has been an increasing need for the early detection of emerging research fronts. Research in this field usually employs citation networks, but this methodology does not address the citation lag problem. Text information is required to solve the time gap in citation networks because text information is available immediately when papers are published. However, text information has an inherent domain dependency problem. To address this, we introduce the "Dynamic Topic Model" (DTM). In a DTM, text information is represented in an abstract "topic" form and text information is captured as an increase or decrease in topics. We apply a DTM to the nanocarbon domain, which has experienced significant structural changes. We note that the choice of a suitable number of topics for the DTM requires further research. In this paper, we show that the proposed methodology, text information analysis with a DTM, can detect emerging research fronts earlier than the citation network technique.

TB-10 Intellectual Property 4 **Tuesday, 9/6/2016, 10:30 - 12:00**

Room: Milo III
Chair(s) Remy Magnier-Watanabe; University of Tsukuba

TB-10.1 [R] The Mechanism of Patent Cooperation Networks Influence Technology-based Small and Mid-sized Enterprises Growth

Liyang Wang; Zhejiang University of Technology, China
Weijia Yu; Zhejiang University of Technology, China
Jiamin Wang; Zhejiang University of Technology, China
Zong Cai; Hangzhou Kelin Aier Qiyuan Equipment Co., Ltd, China

With the rapid technological reform and increasingly fierce competition in the global market, the quantity and quality of patents have become the keys to the survival and growth of enterprises. However, technology-based small- and mid-sized enterprises (TSMEs) have a lack of innovation resources and their innovation capacity is always weak; only by choosing and embedding themselves to patent cooperation networks (PCNs) that suit their growth can TSMEs truly improve their innovation performance. So what model and characteristics do TSMEs' PCNs have? And which models are a benefit to improving their innovation performance? How to dynamically adjust the PCNs evolution models to promote the continuous improvement of TSMEs' innovation performance? All of them are the key issues to be solved during the study of using PCNs to promote TSMEs' growth. Breaking away from the paradigm of studying the network as a whole in previous studies, this research starts from the structure of self-centered enterprise PCNs, and based on the breadth and depth of the patent cooperation, carries out dual structure classification and multi-model construction of the network, explores and analyzes its characteristics, evolution law and the impact mechanism of the co-regulation of absorptive capacity and network capacity on the TSMEs' growth performance.

TB-10.2 [R] The Empirical Study of Region Patent Intensive Industries Construction and Contribution to Economy and Employment

Liyang Wang; Zhejiang University of Technology, China
Jiamin Wang; Zhejiang University of Technology, China
Weijia Yu; Zhejiang University of Technology, China
Zong Cai; Hangzhou Kelin Aier Qiyuan Equipment Co., Ltd, China

From the perspective of global economic development and innovation practice, it is important for promoting industrial restructuring and upgrading to gradually increase the proportion of "intellectual property right (IPR) intensive industries" in the economic structure, and to turn from relying on intensive labor and resource investment to relying on intensive

intellectual property right (IPR) creation and using, which will push it to the top of the value chains. But what are the structures of intellectual property right (IPR) intensive industries in the region? How do IPR intensive industries contribute to regional economic growth? Are they forming a virtuous circle from R&D investment to innovation driven? All of them are the key issues in the process of transformation and upgrading of industrial structure. Zhejiang province has a lot of IPR, which makes it rank at the forefront of the country. Combined with the characteristics of Zhejiang industry development, carry out regional patent intensive industry division standard and industrial directory, analysis of the regional intensive industry structure and its impact on economic and social development, strengthen classification guidance, integrated innovation resources. Then, there are countermeasures and suggestions on promoting regional innovation-driven strategy through the development of regional patent-intensive industries.

TB-10.3 [R] The Evolutionary Process of IT Concept Words: A Case Study on Bigdata

Rieko Kataoka; Japan Advanced Institute of Science and Technology, Japan
Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan
Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan

In information technology (IT), new concept words appear every few years and affect the business environment. In several cases, the core technologies and architectures have remained the same despite minor changes in concepts. For example, grid computing is the forerunner of cloud computing and bigdata is now regarded as a part of the Internet of Things (IoT). The trend in concept words reveals an evolutionary pattern. In this study, we applied a text mining approach to analyze all the articles published in several popular IT magazines in the period of 2002-2015. This analysis revealed a gap between cloud computing and bigdata in the evolutionary process of IT concept words. An evolutionary model was identified that reached cloud computing, indicating that another episode of evolution might start from bigdata. We focused our analysis on the evolution of previous major concept words and examined emerging concepts, which reveal a trend from a human-oriented to a machine-oriented world; the former world is characterized by advancements in social networking and the latter is based on advancements in artificial intelligence. As a result of this analysis, we can determine a turning point in concept evolution, i.e., the change from computing series to data centric. Understanding this phenomenon facilitates detailed interpretation of concept evolution.

TB-11 Manufacturing Management **Tuesday, 9/6/2016, 10:30 - 12:00** **Room: Milo IV** **Chair(s) Hideki Hayashida; Osaka University**

TB-11.1 [R] Design of a Data Structure for the Order Processing as a Basis for Data Analytics Methods

Guenther Schuh; RWTH Aachen University, Germany
Matthias Blum; RWTH Aachen University, Germany

Today, manufacturing companies are facing the influences of a dynamic environment and the continuously increasing planning complexity. Using advanced data analytics methods, processes can be improved by analyzing historical data, detecting patterns and deriving measures to counteract the issues. The basis of such approaches builds a virtual representation of a product - called the digital twin or digital shadow. Although applied IT systems provide reliable feedback data of the processes on the shop-floor, they lack on a data structure which represents real-time data series of a product. This paper presents an approach for a data structure for the order processing which overcomes the described issue and provides a virtual representation of a product. Based on the data structure, deviations between the production schedule and the real situation on the shop-floor can be identified in real time and measures to reschedule operations can be identified.

TB-11.2 [R] Measuring the Effect of 3D Printing Machinery on Technology

SESSIONS

Management

Yoshiki Nakamura; Aoyama Gakuin University, Japan
Chihiro Hayashi; Tokyo Metropolitan University, Japan
Masaaki Ohba; Nihon University, Japan
Satoshi Kumagai; Aoyama Gakuin University, Japan

Three-dimensional (3D) printing technology has arrived and is changing a philosophy of "management." A 3D-printed product is made from a powder or resin and can virtually shape any item from a digital graphics file. This new printing device, however, poses several unforeseen questions. The 3D printing technology calls for time and cost considerations. Once a private firm actually begins to operationalize the new technology, it will have to measure both merit and demerit in terms of a before-and after adaptation perspective, in addition to a future prospect of further advantages the device might bring. Similarly, perhaps this is the most important, the use of this new technology might part away with the significant role and function of the core technology in production of different matters. Considering these topics, this study attempts to focus on the 3D printing technology and its influence on technology management. It specifically discusses the impact of 3D printing technology applied to manufacturing companies on their cost, time, quality and activities. To answer this question, a cost structure is developed using the IDEF0 method. The cost calculation is also considered using the cost-matrix method. After making the model and matrix, possibilities are shown as research collaborators and outsourcing selection to organize with the concept of technology management. Through these analyses, problems are clarified, and the discussions indicate the results of introducing 3D printing technology, R&D innovation, and technology management.

TD-11.3 [A] Opening the Door for the New Methodology for Optimizing Functional Material Development in Technology Management Framework

Hideki Hayashida; Osaka University, Japan
Hiroki Funashima; Osaka University, Japan
Hiroshi Katayama-Yoshida; Osaka University, Japan

For the chemical companies, functional material development is the cornerstone of sustainable competitiveness. From the technology management perspective, it is quite difficult to understand the present R&D project status within the overall process. Therefore, companies struggle to allocate and organize their resources for material development. Dynamic technology management replies to this need. In the previous work, there were various kinds of approaches to solve this need, but it was difficult to explain the R&D project status as a quantitative dynamic model. In this paper, we attempt to express the state of the R&D process by means of quantitative physical model as modified magnetic model. We defined the R&D project as a dynamic model and estimated interactions among internal elements within the company. The model can distinguish the success/failure case beyond the function of the time of the project. In addition, the visualization of the result of the model simulation gives feedback on the improvement point from the R&D process status. Our highlight is the optimization strategy for the technology management framework which enables a practical feedback of optimizing functional material R&D.

TD-01 TM in Health 2

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Kona Moku Salon A

Chair(s) Marina Dabic; Nottingham Trent University

TD-01.1 [A] Medical Device Tracking via QR Code and Efficiency Analyze

Burak Tiryakioglu; Istanbul Technical University, Turkey
Gulgun Kayakutlu; Istanbul Technical University, Turkey
Irem Duzdar; Duzce University, Turkey

Anesthetic gases called Desflurane are supplied by a distributor company to the hospitals. These anesthetic gases are transferred to the patients in a controlled manner via medical devices named vaporizers (VAP), which are integrated with the anesthesia devices; they

are used especially in operating rooms. Updated hospital VAP inventories are reported to the head office by the sales team on a monthly basis. By tracking the monthly gas consumption of the VAP's, we are calculating the efficiency of devices per hospital. Thus, the performance metrics of the sales team can be evaluated. Which device belonging to which hospital and under whose responsibility, device manufacturing date, etc., can be easily observed at the first look. However, missing/false statements have a huge negative impact on inventory, efficiency and performance indicators. The newly established tracking and analysis system, at the base of the clustering method, comes with Quick Response (QR) Barcode systems which will be scanned via smartphones or tablets. The sales team easily shares the VAP's current GPS coordinates, correct inventory list and device data, responsible person, etc. Analysis and evaluation of inventory, efficiency and performance will be done clearly, reliably and easily. This will be a useful application, for such an integrated system does not already exist.

TD-01.2 [R] Exploring Adoption of Smart Glasses: Applications in Medical Industry

Muge Goken; Izmir Institute of Technology, Turkey
Nuri Basoglu; Izmir Institute of Technology, Turkey
Marina Dabic; Nottingham Trent University, United Kingdom

This research is a study exploring the utilization of smart glasses by physicians and their adoption to these products in the medical industry. Although varied smart glasses were examined in the process by literature review, in whole work M100 was used as a physical product. In this research study, three research methods were applied. These are semi-structured in-depth interview, expert focus group work and experimental study. Ninety five constructs were extracted from the literature review and interviews by physicians. Approximately 40 most significant constructs were selected by physicians in the expert focus group work. At the end, 75 physicians answered a survey related with these 40 constructs. Furthermore, these constructs include the most significant design inputs of smart glasses for the expert group. The survey included approximately 50 questions. According to the survey and results of multiple regression analyses, it is revealed that compatibility, ease of reminding, speech recognition and ease of use affect usefulness positively. Moreover, ease of learning, ease of medical education, external influence and privacy affect ease of use positively too. In addition, usefulness, ease of use affect attitude and attitude affects intention. To sum up, designers should focus on these design inputs at the first stage of the product development process of smart glasses for physicians.

TD-01.3 [R] Detecting Candidate Combinations of the Keywords Organ - Material - Technology in Regenerative Medicine

Hiroko Yamano; The University of Tokyo, Japan
Hajime Sasaki; The University of Tokyo, Japan
Ichiro Sakata; The University of Tokyo, Japan

Regenerative medicine, especially in the area related to biomaterials, is a rapidly advancing interdisciplinary field. Although there are many possibilities in applying materials and technologies in the treatment of different organs, little is quantitatively known about candidate combinations because this field requires extensive knowledge over multiple research fields. The purpose of this research is to detect candidate combinations of the keywords Organ - Material - Technology using a citation network and text-based co-word analysis. We first analyzed the citation network of academic papers to visualize an overview of regenerative medicine. We retrieved papers from the Web of Science using specific search queries. Using a topological-based method, papers were categorized into clusters according to the feature words. After obtaining the high-ranked keywords of the main clusters, we divided them into three regions: Organ, Material, and Technology. By comparing the co-occurrence of words among the three regions, we detected plausible linkages within a cluster as well as existing linkages within each paper in the whole dataset. The results suggest the potential effectiveness of new combinations that have not yet been examined in detail, and can be used to predict niches and missing links in regenerative medicine.

SESSIONS

TD-02 Social Innovation 4

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Kona Moku Salon B

Chair(s) Cory Hallam; University of Texas at San Antonio

TD-02.1 [R] First Domino Tile in the Social Innovation Process: Idea Creation of University Students

Nihan Yildirim; Istanbul Technical University Faculty of Management, Turkey
Hacer Ansal; Isik University, Turkey

Interrelations among creativity, innovativeness and entrepreneurial skills of individuals have long been discussed in the literature. Due to the challenges regarding their measurement, most studies focused on the intentions rather than the outcomes. The idea generation that requires creativity is the first stage of social innovation. The young population's creative potentials in participating social innovation practices deserve special attention as they play a critical role in the innovativeness and entrepreneurship of societies. This study aims to explore the factors that determine the creative intentions of university students that are important in generating social innovation projects. A structured survey based on the literature was conducted among 600 management and engineering students from three universities from the different percentiles of the Entrepreneurial and Innovative University Index for 2012 of the Turkish Ministry of Science, Industry and Technology. The survey included questions on the demographic characteristics, environmental factors, motivators, university/institutional context, perceptions and creative thinking attitudes. By conducting reliability and factor analysis, accuracy and validity of data is tested and the impact factors were identified. Findings reveal that visionary attitude, curiosity, exploration and learning, attitude for own creativity, self-esteem, perception about the learnability of creativity, university and social environment are components of creative thinking intentions of students, and some of these factors vary by year of study and university.

TD-02.2 [R] Licensing for Good: Social Responsibility in the University-Industry Technology Transfer Process

Ruben Mancha; Babson College, United States
Cory Hallam; The University of Texas at San Antonio, United States
Bernd Wurth; University of Strathclyde, United Kingdom

Universities are increasingly endowed with the responsibilities of addressing social problems and partaking in the creation of a sustainable future. Teaching, research, and social engagement must be complemented with the successful transference of technologies from academia to markets. As universities re-envision their position in society and embark in new approaches to tackle social and environmental challenges, supporting interdisciplinary collaborations, designing programs with experiential components, and priming social relevance across all of their endeavors, they cannot forget the role of the university-industry technology transfer process in spreading innovation and securing social value creation. This is particularly relevant for technologies with a potential for environmental or social impact and those funded with federal grants. University Technology Transfer Offices (JTTOs) should make use of licensing terms and practices ensuring that the technologies under their purview reach the market and realize both their financial and social potential. In this study, drawing from literature on corporate social responsibility and university licensing, we evaluate the strategy and social responsibilities of universities when licensing their technologies, and provide guidelines on licensing practices that are aligned with the pursuit of profit and the enabling of social value.

TD-02.3 [A] PPP (Public Private Partnership) Frontier: A Study on Local Abenomics-driven Social Innovation

Hitoshi Abe; ABE Souken Ink., Japan
Seiichi Watanabe; Tech-Gate Investment Ink., Japan
Akihiko Onodera; Ministry of Internal Affairs and Communications, Japan
Yoshinao Ishiki; Tokorozawa Municipal Office, Japan

Local Abenomics vitalizing the local economy is one of the most important political issues

in Japan. SMEs and micro enterprises have supported the local economy until today. They have rooted in the community and provided an employment basis. Job creation in rural areas was chosen as the key problem to be solved, while strengthening "earning power" of regional industries is essential to promote a virtuous cycle between communities, people and work. From this standpoint, we studied 10,000 local projects and proposed problem solving methods as PPPs and local innovation ecosystem. Two hundred eighty seven projects have been started by the Ministry of Internal Affairs and Communications. Four performance indexes - financing amount, local job creation, local resources utilization, and cash flow creation - were selected and evaluated. We analyzed some of the 287 projects by MOT tools (innovation ecosystem, business model) and report validity and effectiveness of policy-making contents. This study has been done in a group of SMECA (Japan Small and Medium Enterprise Management Consultant Association) since the summer of 2015.

TD-03 Project Management 2

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Kona Moku Salon C

Chair(s) Xiaohong Quan, San Jose State University

TD-03.1 [R] Characterizing and Measuring Activity Dependence in Engineering Projects

Nepomuk Chucholowski; Technical University of Munich, Germany
Phillip Starke; Technical University of Munich, Germany
Bryan Moser; Massachusetts Institute of Technology, United States
Eric Rebentisch; Massachusetts Institute of Technology, United States
Udo Lindemann; Technical University of Munich, Germany

In an increasingly complex business environment program managers have to take dependencies within the product domain, process domain and organization into account. While activity dependence is still predominantly perceived as only an input-output relationship, a more detailed understanding of activity dependence is expected to improve program and project performance. This paper contributes to the understanding by presenting eight characteristics of activity dependence and 21 respective measures, all derived from literature and expert discussions. We further present an attempt to validate the characteristics and measures by means of a survey with 139 responses. While we could not prove the proposed characteristics wrong or right, we learned about the understanding of activity dependence and show future paths for further research in the paper. The possibility to significantly characterize activity dependence should support program and project managers with the identification of unknown but important dependencies and facilitate to select appropriate means for coordination.

TD-03.2 [R] Towards a Methodology to Support the Development of Flexible Company-Specific Engineering Design Processes

Christoph Hollauer; Institute of Product Development, TUM, Germany
Niklas Kattner; Institute of Product Development, TUM, Germany
Udo Lindemann; Institute of Product Development, TUM, Germany

Engineering design processes are complex systems resulting from complex tasks. While the definition and management of engineering design processes are important tasks, as evidenced by empirical studies, a number of unsolved research questions persists in literature. Within this paper, current research issues identified in a literature review are compared with results from empirical studies in order to triangulate the most pressing research issues. Currently, two interview studies have been conducted with small-to-medium sized enterprises and startups of varying sizes: a case study concerning process development within an engineering department of a global enterprise, and an observation of a workshop to define a new product development process in another global enterprise. As a result, two issues have been concretized: A lack of methodology concerning the development of company-specific standard engineering design processes and a lack of flexibility and adaptability of these standard processes in practice due to different project contexts. Consequently, a first draft for a methodology to support the development of flexible and

SESSIONS

adaptable engineering design processes has been developed. The methodology combines traditional process-development activities with a bottom-up analysis of project contexts and influencing factors. The methodology currently represents a work in progress and its constituent steps will guide further research activities.

TD-03.3 [A] A Contemporary Chinese Returnee Entrepreneurship Case Study

Sharon Qi; San Jose State University, United States

Xiaohong Quan; San Jose State University, United States

We present a case on how a returnee entrepreneur succeeds in the Chinese high technology chemical material supply market through its understanding of local market and local customers, and through its innovative commercialization process. Innovative factors that may have made a contribution to this successful case are explored, for instance, the entrepreneur's intangible assets due to his training and experiences overseas in high technology knowledge, outstanding strategic operation management skills, and deep customer knowledge, including unique sales strategy.

TD-04 E-Business

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Honolulu

Chair(s) Joe Amadi-Echendu; University of Pretoria

TD-04.1 [R] A Study on Data and Information Integration for Conveyancing, Cadastre and Land Registry Automation

Anthea Amadi-Echendu; University of South Africa, South Africa

Joe Amadi-Echendu; University of Pretoria, South Africa

Land is immovable, thus, the transfer of landed property from a seller to a buyer and registration thereof involves conveying pertinent data and information between private and public sector agencies, firms, and institutions. Conveyancing processes, cadastres and land registers are intended to provide clarity with respect to legal rights and privileges associated with landed properties. Incorrect conveyancing data or incomplete information in the cadastre and registry can undermine legal rights as well as compromise security relating to landed property. Modern era information and communications technology systems feature capabilities like capturing, recording, storage, retrieval and transmission of data. These capabilities can facilitate data and information integration and interconnectivity necessary to align conveyancing processes to both the cadastre and registry. It is in this context that this paper qualitatively discusses business issues for the application of information and communications technologies towards the automation of property transactions and land administration systems.

TD-04.2 [R] Enhancing the Health and Sustainability of e-Commerce Ecosystem by Bringing Manufacturers Online: Evidence from Tao-Factory

Xuefeng Liu; Xiamen University, China

Shanshan Zhang; Xiamen University, China

Yanan Lin; Xiamen University, China

Yuying Xie; Shepherd University, United States

E-commerce has been rapidly growing in China, but the problem of low quality products is becoming more and more serious and has become one of the most important bottlenecks for the sustainable development of e-commerce, especially online retailing. In a typical e-commerce industry chain, the retailing business is already online while upstream activities such as manufacturing and the majority of wholesaling are still running in the traditional offline mode. We think this creates a set of problems for the health and future development of e-commerce: First, limited choices of products are available for retailers to choose, leading to product homogeneity and price competition; second, it is difficult for retailers to control the quality of the sourced products, and some of the low-quality products, even counterfeits, may end up getting to consumers; third, it causes a great deal of friction in transactions. In this paper, we explore how Tao-factory is able to help overcome the defects of traditional e-commerce. The result of our study showed that bringing manufacturers

online, commercializing their production capacity, nurturing long-term ties between manufacturers and retailers, and reducing transaction costs are four ways to enhance health and sustainability of the entire e-commerce ecosystem which extend studies on e-commerce and ecosystem.

TD-04.3 [R] The Influence of Culture on M-banking Technology Adoption: Integrative Approaches of UTAUT2 and ITM

Mohammad A Mahfuz; Wuhan University of Technology, China

liza Khanam; Wuhan University of Technology, China

Wang Hu; Wuhan University of Technology, China

The proliferation of information technology, smart phones, and mobile technologies has encouraged potential customers to use more mobile banking services. Accordingly, banks are offering more m-banking services than competitors do. The adoption of m-banking is dependent on the characteristics of the countries' people (culture) and the perception (trust) of m-banking to the potential and existing customer. In regards to this, we proposed a new model that integrated three models, UTAUT2 model with ITM model (propensity to trust, structural assurance, firm's reputation) with Hofstede six cultural dimensions model (CVI, MVF, PDI, UAI, PVN, and RVI) to investigate the impact of m-banking adoption in developing country perspectives like Bangladesh. There has been research on m-banking adoption, but we found few studies investigating cultural dimensions and trust together to measure their impacts on m-banking adoption. The collected data will be analyzed by the partial least squared (PLS) method based on structures equation modelling (SEM) and bootstrapping method. This study found price value, initial trust model, masculinity and power distance have a significant relationship to the behavioral intention to the adoption mobile banking of Bangladeshi customers. And also the facilitating condition has an impact on usages behavior. It also found that the propensity to trust and structural assurance had influences on m-banking adoption. It will help the banking sectors to regulate their strategies and future plans to successful adoption and diffusion of m-banking services in Bangladesh.

TD-05 Decision Making 3

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Waikiki Salon 1

Chair(s) Steven T Walsh; University of New Mexico

TD-05.1 [R] Integrated Value Engineering: Consideration of Total Cost of Ownership for Better Concept Decision

Sebastian Maisenbacher; Technical University of Munich, Germany

Manfred Kloppel; Technical University of Munich, Germany

Jonas Laubmann; Technical University of Munich, Germany

Florian Behncke; Technical University of Munich, Germany

Markus Mortl; Technical University of Munich, Germany

National and international competition demands companies to sell products with maximum value for the customer, which is reflected by high functionality for the customer for low costs within the company. Approaches in cost management support practitioners in developing valuable products and to reduce costs. The relatively new approach of integrated value engineering (IVE) uses matrices to combine target costing and value engineering in a structural model. The approach currently uses manufacturing costs to find optimization potentials in the product's value and to valueate different concepts of new products. However, the customer's utilization costs during the use phase of the product play an important role in the decision for buying a new product. The amount of these costs can be already influenced during the development of the product. Therefore, this publication discusses an approach to extend the concept of IVE by utilization costs. Several concepts from the field of lifecycle costing and total cost of ownership are presented in a literature review. The main ideas are integrated in the structural model of the IVE approach to allow for a better decision on the most valuable concepts for the customer. The benefits and limitations of the resulting approach are shown in a case study.

SESSIONS

TD-05.2 [A] Comparison of Intelligent Classification Techniques by Practicing a Specific Technology Audit

Ali Berkol; Baskent University, Turkey

Gozde Kara; Middle East Technical University (METU), Germany

Abdurrahman Turk; Sabanci University, Turkey

Technology audit activities are carried out for assessment of firms' technological requirements, capacity or management capability. The aim of these assessments is to define the weaknesses of firms and develop actions in order to improve firms' technological capacity and/or technology management capability. Generally these activities are implemented with survey questionnaires. These questionnaires can be filled by managers of firms or can be implemented as an interview by independent experts. However, evaluating surveys and preparing useful comments related to results can consume lots of time and also contain lots of biases/subjectivity. In accordance to ease the decision making process and provide more verified/accurate results, we develop a methodology based on an artificial neural network (ANN) algorithm, which is aimed to behave like a decision maker. And in this study, we use a synthetic data set which is prepared for assessment of technology management capability of the selected 70 Turkish firms.

TD-05.3 [R] An Intelligent Cloud-Based Customer Relationship Management System to Determine Flexible Pricing for Customer Retention

Stephen W.Y. Cheng; The Hong Kong Polytechnic University, Hong Kong

King-lun T Choy; The Hong Kong Polytechnic University, Hong Kong

C.H.Y. Lam; The Hong Kong Polytechnic University, Hong Kong

Due to fierce competition in the market, effective customer relationship management approach is necessary in order to gain competitive advantage. In general, customers can be divided into different categories based on their purchase behavior, historical ordering pattern and frequency of purchase. Customized sales and promotion on specific items can be offered so as to increase sales. However, due to the lack of a flexible pricing strategy, companies can only offer the same sales and marketing strategies to all customers. Valuable customers may be neglected which results in the loss of customer loyalty and even the loss of sales orders. In this paper, an intelligent cloud-based customer relationship management system (ICRMS) is designed to formulate the sales and marketing strategies on flexible pricing in the supply chain. The system integrates cloud technology and the fuzzy logic approach to manage sales and order data on the Internet, and to determine the discount price of products respectively. By conducting a pilot study in an advanced manufacturing technology company, the results show that the service quality can be enhanced while customer satisfaction is increased.

TD-06 Sustainability Management 1

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Waikiki Salon 2

Chair(s) Pule A Kholopane; University of Johannesburg

TD-06.1 [R] Analysis of the Sustainable Water Management Impact in Business Performance in the Mining Industry

Clandia M Gomes; Santa Maria Federal University, Brazil

Isak Kruglianskas; Sao Paulo University, Brazil

Jordana M Kneipp; Santa Maria Federal University, Brazil

Roberto Bichetti; Santa Maria Federal University, Brazil

Beatriz Maffini Gomes; Santa Maria Federal University, Brazil

The mining activity is essential in the economic context. However, there are several potential impacts caused by this activity, from the environmental and social perspective. In this regard, it is worth noting the relationship of this industry with the management of water use, a strategic resource for the business activity. This study aims to identify the relationship between the management of water use and the business performance in industries in the Brazilian mining sector. To that end, we conducted a survey with managers from industries in the sector. The results of the survey lead to the acceptance of the central hypothesis of

the study, where there is a positive relationship between the management of water use and business performance, corroborating the significant importance of this resource to the competitiveness of industries in the mining sector.

TD-06.2 [R] The Application of Lean Six Sigma in Alleviating Water Shortage in Limpopo Rural Area to Avoid Societal Disaster

Severin M Ngoune; University of Johannesburg, South Africa

Pule A Kholopane; University of Johannesburg, South Africa

This paper aims to illustrate the implementation of lean six sigma principles in a water management system. It draws on process information and primary data from real water shortage situations which affect the lives of rural people. Lean Six Sigma are business management strategies commonly used in production industries to improve process efficiency and quality. During the past decade, these process improvement techniques have increasingly been applied outside of the manufacturing sector, for example, in water management systems. This article presents a description of the main principles, practices, and methodologies used in Lean Six Sigma. It is based on a case study conducted in the province of Limpopo in South Africa to illustrate the application of Lean Six Sigma tools. Furthermore, literature is reviewed involving applications of Lean and Six Sigma to manufacturing together with other production related environment research. As a result, specific issues concerning the use of these techniques in different phases are identified. Assessments of the monitoring program were identified which indicated that significant savings could be achieved in water shortages whilst still meeting all operational, regulatory and other requirements to supply water to rural areas.

TD-06.3 [R] Sustainable Trend: A Study about Innovations in the Productive Chain of the Textile Sector

Saulo F Amancio-Vieira; Universidade Estadual de Londrina, Brazil

Marissa Y Godoy Lima; Universidade Estadual de Londrina, Brazil

Karina R Henriques Gehlen; Universidade Estadual de Londrina, Brazil

The productive chain of the textile sector comprises steps and processes that have an impact on the environment. Such impacts range from the high consumption of raw material to the generation of waste and its consecutive disposal. Sustainable design, however, consists of developing products and services with low environmental impact, while not neglecting the social demands and the economic viability of the business. Considering this context, the present study aims to analyze the contribution of a sewing studio to sustainability in the production chain of the Brazilian textile sector. Regarding the theoretical background, the following are covered: innovation, sustainability and trend, and sustainable production chain. Thus, the methodological procedures are qualitative, exploratory, descriptive, and conducted via a case study in the Bianca Baggio studio. Data was collected using a semi-structured research script that was conducted with the company managers. The results show a change in the profile of companies in the textile sector, especially regarding the sustainable production chain and its acceptance in society, so that the innovations contained in its processes contribute to sustainability and the dissemination of responsible consumption.

TD-06.4 [A] Designing a Mechanism for Collaborative Governance of Climate Change Adaptation Planning for Water System in Taiwan

Hai-Chen Lin; STPI, National Applied Research Laboratories, Taiwan

Liang-Huey Lo; STPI, National Applied Research Laboratories, Taiwan

Yueh Wu; STPI, National Applied Research Laboratories, Taiwan

Albert C. T. Lee; STPI, National Applied Research Laboratories, Taiwan

According to the Global Risks Landscape 2015 published by the World Economic Forum, water crises and failure of climate-change adaptation are perceived as more likely and impactful than many other risks in the next 10 years. Water security is also deemed as a cross-cutting issue for many other related policy domains such as energy, agriculture, infrastructure, biodiversity, disaster risk reduction and health. In Taiwan, increased water risk and growing uncertainty about future conditions has also been reported by local scientific research, which may exacerbate existing water security challenges and complicate the

SESSIONS

adaptation planning of water system. This research focuses on designing a mechanism for collaborative governance of climate change adaptation planning for water system in order to form integrated adaptation responses to climate change. Also, a risk-based framework, which was developed by International Risk Governance Council (IRGC), is also integrated into our mechanism to provide a systematic approach for the analysis, assessment and governance of adapting water systems to climate change, in order to enhance the adaptation planning methodology widely used in Taiwan status quo, such as downscaling techniques and traditional risk assessment methodology.

TD-07 Innovation Management 5

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Waikiki Salon 3

Chair(s) Paulo T Nascimento; Universidade de Sao Paulo

TD-07.1 [R] The Perception of Innovative Organisational Culture and Its Influence on Employee Innovative Work Behaviour

Khathutshelo Lukoto; University of Pretoria, South Africa
Kai-Ying Chan; University of Pretoria, South Africa

The role of innovation within an organization is undeniably important. An organizational culture that embraces innovation is one that will encourage employees to behave innovatively. This investigation is set out to explore the determinants of innovation within an organization that will prompt employees to behave innovatively. The investigation suggests that when employees perceive a positive innovative culture, they are likely to show innovative behavior in specific stages of innovative work behavior. These stages are: opportunity exploration, idea generation, idea championing and idea realization. The investigation identified 10 determinants, namely: autonomy, external contacts, communication, collaboration, risk taking, decentralized structure, reward, resource, participative leadership and strategy. We proposed 10 hypotheses to test the impact of these 10 determinants on employee innovative behavior. Based on the findings, some of the determinants are found to have a high support to innovative behavior, and these vary according to the specific innovation behavior stages.

TD-07.2 [R] Using the Social Analysis Method to Examine the Evolution of Three-Dimensional Printing Materials Technology

Chiung-Wen Hsu; Feng Chia University, Taiwan
Cheng-Mei Tung; Feng Chia University, Taiwan

Three-dimensional printing has seen rapid development around the world, being regarded as an important component of the third industrial revolution. The industry has focused on lowering cost and improving efficiency, while prioritizing the pursuit of innovation in material technology. This study examines the evolution of three-dimensional printing materials technology using patent searches, patent citations, and by surveying the technology's momentum. First, the study analyzes the social networking produced by the relationships among patent citations for patent technologies. Second, the evolutionary momentum of patent technology is discussed. Then, the patents emerging from the developing technologies are identified from the cited patents. The study analyzes approximately 5,000 United States patents to describe the evolution in three-dimensional material technology. The study contributes to current research by analyzing the technological evolution and future development trends in the patenting of three-dimensional material technology. The main results should provide businesses and research institutes with a reference for technology development decision making.

TD-07.3 [R] Fuzzy Front End Integration: Describing Roles and Defining Boundaries on Multi Companies

Lilian C Schreiner; University of Sao Paulo, Brazil
Paulo T Nascimento; University of Sao Paulo, Brazil
Murilo Thomaz; University of Sao Paulo, Brazil

The fuzzy front end (FFE) is the early phase of the product development process, respon-

sible for idea generation and an important driver of innovation success, but with difficulties such as its dynamism and ambiguity. The models developed in the literature have not discussed the roles and activities. To tackle this issue, this research aims to examine the division of labor and its logic in a complex industry. The main question that guided this research is, "How is the integration among companies in the FFE in a complex industry?" This is a qualitative and exploratory research, based on multiple cases studies, analyzing the projects of chain constituent parties of the packaging industry, which has a complex and problematic relation among its parties, i.e., brand owner, design agencies and packaging producers. Each project was classified by type of innovation, strategy, the way of relationships among companies; and checked the division of labor for activities of opportunity identification, target and technology evaluation, ideas generation and screening; explaining the logic of involvement of each company in each project. There are different roles among the agents because some contingencies such as degree of strategic importance, degree of novelty, reputation, and reliability mediated their relationships.

TD-07.4 [A] Dynamic Capabilities and Business Model: An Analysis of Radical Innovation inside Midsized and Large Companies in Brazil

Karine Liotino; University of Sao Paulo, Brazil
Márcia Carvalhina; University of Sao Paulo, Brazil
João Amato; University of Sao Paulo, Brazil
Paulo Tromboni; University of Sao Paulo, Brazil
Abraham Yu; University of Sao Paulo, Brazil

Theories on innovation management argue that the life cycle of radical innovation projects is different from the life cycle of incremental innovation projects, which have higher risks and uncertainties. As a result, the skills that a business needs to develop innovation are directly related if they are incremental or radical. Many discussions on the radical innovation theme are focused on large companies or startups, but few extend discussions to medium-sized enterprises. In this work, we selected two cases of Brazilian companies in the textile sector, one of a large company and the other of a midsize one, in order to draw a comparison between them, considering that they compete in a new market with similar technologies but with different sizes. The main dynamic capabilities identified were: ability to manage uncertainties; ability to create and participate in networks, ability to attract external resources; attract and retain innovative people; adaptability and strategic flexibility. These are the dynamic capabilities that had different grades of influences on the innovation of both companies. However, the size and knowledge about the market did not influence their capabilities and ability to the field of technology, but in the way they explore and communicate the innovation and their business model selection.

TD-08 TM in Service

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Milo I

Chair(s) Louwrence D Erasmus; University of Pretoria

TD-08.1 [R] The Antecedents and Effects of Manufacturer Service Innovation: A Relationship-Learning Perspective

Feng-Hsu Liu; Shih Hsin University, Taiwan

Although the importance of supplier/buyer relationships in product innovation has been acknowledged by many researchers, empirical evidence remains scarce regarding the effects of relationships between original equipment manufacturing (OEM) suppliers and buyers on service innovation. Surveys were completed by representatives of 142 Taiwanese OEM suppliers in the electronics industry. This paper aims to broaden the understanding of service innovation as it relates to relationship learning through the development of three aspects of organizational competence that influence the competitive advantage of an OEM supplier. This study concludes that information-sharing competence, joint-innovation competence, and coordination competence have positive effects on exploitative service innovation and explorative service innovation. Additionally, there appears not to be a significant relationship between information-sharing competence and explorative service innovation.

SESSIONS

Furthermore, these two aspects of service innovation contribute to a supplier's internal competitive advantages, but only explorative service innovation contributes to a supplier's external competitive advantages. In other words, this study provides deep and clear explanations for the antecedents and effects of service innovation of OEM suppliers.

TD-08.2 [R] Developing Technology Supported Management Approaches for Reducing Food Safety Problem Based on Bangladesh

*Iffat T Haque; JAIST, Japan
Youji Kohda; JAIST, Japan*

Bangladesh is one of the countries in the South-Asian region which is dominated by agricultural production, and the major portion of the rural livelihood is surviving on this sector. But the rural farmers of the country are still living under the poverty line. On the other hand, food safety and food adulteration problems currently are the burning issues not only in Bangladesh but also in other developing countries as well. Due to improper knowledge about agricultural technique, market price and poor infrastructural facilities in the supply chain, a large amount of perishable agricultural products like fruits and vegetables are becoming unsafe for consumers. The traditional value supply chain system is dominated by middlemen who are responsible for the poor economic condition of farmers and food safety issues as well. Therefore, it is essential to replace the traditional supply chain system by some technology supported new system which not only improves the food safety situation but also empowers the rural smallholder farmers through economic benefit. This conceptual paper proposes the implementation of some technological system in the value chain from production to consumption. The major focus of such a concept is to develop the awareness among producers and consumers which will be supported by a proper supply chain system.

TD-08.3 [A] Services Marketing within South African Engineering Enterprises: A Comparative Study of Theory and Practice

*Maria Cillie; University of Pretoria, South Africa
Louwrence D Erasmus; University of Pretoria, South Africa*

South African enterprises that provide engineering services have a multi-industry scope contributing significantly towards South Africa's GDP. This motivates the need to gain an insight into the marketing of engineering related services such as that of engineering consultants. Knowledge of services is dispersed across different disciplines resulting in inconsistencies between the definitions of services amongst different disciplines. It would appear that the marketing strategies of engineering services enterprises in South Africa do not necessarily consider and articulate the services value proposition of the engineering enterprise as a service system entity. The primary objective of this research is to determine whether the marketing strategies that prevail in engineering services enterprises in South Africa are built upon a service science system foundation as described in literature. The research field known as Service Science Management and Engineering (SSME) has been established to integrate service research across disciplines. A knowledge framework that conceptualizes services marketing approaches described in literature is presented and contributes towards the integrated service research body of knowledge. The knowledge framework is then compared to the mental model as articulated in engineering services enterprises in South Africa. A descriptive narrative inquiry research methodology is used to conduct the research. Discrepancies between the mental models pertaining to services marketing strategies as articulated in engineering services enterprises are highlighted by comparison to the knowledge framework of service marketing.

TD-09 Emerging Tech 3

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Milo II

Chair(s) Harm-Jan Steenhuis; Hawaii Pacific University

TD-09.1 [R] 3D Printing and Disaster Shelter Costs

*M. Gregory; Eastern Washington University, United States
S. A. Hameedalddeen; Eastern Washington University, United States*

*L. M. Intumu; Eastern Washington University, United States
J. J. Spakousky; Eastern Washington University, United States
J. B. Toms; Eastern Washington University, United States
Harm-Jan Steenhuis; Hawaii Pacific University, United States*

Natural disasters cause significant disruption to the lives of those affected by them. One of the major effects of natural disasters is the loss of housing. Additive manufacturing is a relatively new manufacturing technology that has advantages over traditional manufacturing. For example, AM facilitates rapid prototyping and offers cost advantages for lower volume production. In this paper, the potential of additive manufacturing for providing shelters after a natural disaster is evaluated. The costs of providing shelters to victims of natural disasters is compared with traditional shelter options. It is found that the cost of 3D printed structures falls within the range of traditional shelter options. With continuing improvements in additive manufacturing technology as well as in terms of materials used, additive manufacturing may become an increasingly competitive option for disaster housing.

TD-09.2 [R] Innovation Created from Differences in Regulations: A Case Study of the Electric-Assist Bicycle

Manabu Eto; Hitotsubashi University, Japan

Electric assist bicycle (e-bike) technology was developed by various companies around the world. Although Swiss company Dolphin E-bikes has started the development of this technology first in the world, Japanese company Yamaha motor was the first launched electric-assist bicycle product in the world. In Japan, the targets of this product are women and elderly people who have weak physical strength. However, this technology which was accomplished in Japan is progressing in the European sports type bicycle. Another Swiss company Biketec entered the European market by using the Japanese unit. This is because the Japanese e-bike technology has been developed to pass the regulation in Japan. Japan's Road Traffic Act relates to a bicycle and is the most stringent in the world. In order to clear this regulation, Yamaha developed some of the advanced control technologies. China-made electric bicycle, which runs by pressing a button, cannot be sold in Japan. In Japan, when the regulation of road traffic law has changed, the market of e-bike has expanded for people with weak exercise capacity. Despite the China-made electric bicycle selling in Europe because of lax regulation of the e-bike, e-bike technology developed by Japan is expanding in the sports area of Europe. From this case, the author will discuss the importance of companies to management regulations as a technology management.

TD-09.3 [R] Typology of Business Models for Adopting Grid-Scale Emerging Storage Technologies

*Kourosh Malek; University of Waterloo, Canada
Jatin Nathwani; University of Waterloo, Canada*

Electricity grids are nowadays facing various market and technological challenges that influence their reliability and profitability. As a viable solution to those challenges, energy storage technologies provide multiple service delivery along the electricity grid value chain. In addition to their role for penetration of renewables in the future of the electricity grid, electricity storage technologies possess a number of societal and environmental benefits, such as reducing the carbon footprint and securing regional energy demands. The primary challenge for utilities and regulators, however, is to find a business model that best fits to technology, application, and the regional electricity market. We propose a typology of different business models for adopting energy storage technologies among utilities. The business model frameworks are tailored to provide a customized analysis platform for adopting emerging energy storage technologies. For industry looking to adapt new energy storage technologies, such analysis can provide multi-dimension considerations (cost, efficiency, reliability, best practice business operation model, and policy instruments), which can potentially lead to a complete view for strategic decision-making purposes.

TD-09.4 [R] The Valuation Methods and Applications for Academic Technologies in Taiwan

Ming-Yeu Wang; National Chiayi University, Taiwan

SESSIONS

Many universities in Taiwan have taken action to commercialize and to license out academic technologies. During the processes of technology transfer, the determination of technological value greatly affects the successes of transfer. Although previous studies introduced several valuation methods for technologies, how Taiwanese universities execute the methods remains unknown. Therefore, this study aims at identifying the valuation methods used by Taiwanese universities, the concerns of usage, and the difficulties in implementing the valuation methods. After interviewing managers of technology transfer offices in five universities, this study obtains that the universities typically use cost approach, market approach, income approach and auction to value the academic technologies, among which cost approach is the most widely used. The difficulties suffered by Taiwanese universities include lacking staff specialized in valuation, expensive valuation service by external consultants, and the restrictions by government regulations. Based on the interview findings and previous studies, this study further designs a technology valuation framework for Taiwan universities and applies the framework to valuing the vaccines of duck viral hepatitis owned by a Taiwan university. At last, this study offers suggestions for valuing academic technologies by integrating the results from interviews and the experiences in empirical applications.

TD-10 S & T Communication

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Milo III

Chair(s) Dan Wu; China Research Inst. for Science Popularization

TD-10.1 [R] Science Communication on TV: An Analysis on Current Status and Communication Competence in China

Dan Wu; China Research Inst. for Science Popularization, China

With the rapid development of mass media, the role of media in science communication is growing in China. Television, as a traditional media of long history, is still the highest coverage and always ranks first in obtaining science and technology information, but even the Internet is developing very fast today. Television has always played the important role in science communication. The main content of this paper is to analyze the current status and influence of science and technology communication on TV in China. The paper consists of four parts: the first part is to introduce the current development situation of TV for science communication in China, including the status of TV channels and programs. The second part is to study the science communication competence of TV in China from three levels: firstly, the analysis of own science communication ability on TV; secondly, the analysis of science communication credibility on TV; thirdly, the analysis of science communication influence on TV. The third part draws some relevant conclusions through data analysis. The fourth part summarizes the problems and puts forward some proposals.

TD-10.2 [A] Producing and Communicating Scientific Topics for New Media: How Interactive vs. Linear Science and Technology Communication Videos Affect the Attentiveness of Audiences

Mavis Tsai; Shih Hsin University, Taiwan

Chun-Hui Zhang; Shih Hsin University, Taiwan

Jun-Lang Chen; Shih Hsin University, Taiwan

Science is a truly important part of human life. Scientific and technological concepts should be familiar to the public rather than abstract or seemingly irrelevant. To adequately communicate scientific information, the mass media need to provide appropriate information and channels so the community can acquire new information, and thus bring the generation of new innovations. In addition, new media have become quite essential and convenient for a new generation. The purpose of this study is to investigate methods of communicating scientific topics via new media to reduce costs and offer convenient channels for the audience, and compare the communication effects of interactive vs. linear popular science videos. In this application paper, the researchers produced two popular science videos, one interactive and one with a linear narrative regarding invasive species and environmental protection; the purpose was to investigate which narrative style was more effective in edu-

ating the audience regarding this issue. The researchers produced the popular science videos and launched an experiment with 50 persons. Both videos' stories are identical and both use animation. Based on the literature review and our experiment, this study found interactive videos to be more effective in drawing the audience's attention, piquing their interest and enhancing their understanding. For online interactive popular science videos, if the producer can find an adequate hyper-narrative type to arrange some "nodes" to allow viewers to answer questions or decide how the story will continue, more interest and engagement can occur. Those who watched an interactive version of a popular science video can obtain an average scientific knowledge score of 12.32, which is considerably higher than those viewers watching the linear version.

TD-10.3 [R] Analysis on Science & Technology Innovation and Its Culture in China

Peixiao Qi; China Research Inst. for Science Popularization, China

Nian Zheng; China Research Inst. for Science Popularization, China

Gang Wang; China Research Inst. for Science Popularization, China

Innovation is the distinctive theme of our times and innovation spirit is the greatest zeitgeist. Innovation is the best generalization on human society but also the exemplification of zeitgeist and soul. Competition currently is the competition of talent and science & technology strength, and innovation is the essence of science & technology. That can be found by looking back as the history of society development times focus has shifted to cultural development from politics and economy, and at the same time, science & technology innovation has a rich cultural heritage. The culture in science & technology innovation is an important part of the whole social cultural system, and is the collective result of participating in science & technology innovation activities, and its evolution originates actions from science & technology innovation subjects. Based on culture, science & technology innovation regulates the innovators' behaviors and provides the most lasting and stable strong power for social economic development.

TD-11 Software Process Management

Tuesday, 9/6/2016, 14:00 - 15:30

Room: Milo IV

Chair(s) Robert Lagerstrom; KTH Royal Institute of Technology

TD-11.1 [R] Have the Factors Affecting Software New Product Development (S-NPD) Changed in the Age of Mobile Apps and Agile Methods?: A Position Paper

Samuel A Ajila; Carleton University, Canada

It has been long recognized that time-to-market, cost-of-delay, and uncertainty are the three major factors that can impact the new product development (NPD) process. Software new product development (S-NPD) is even more notorious with delay and cost overrun. Time-to-market is the length of time it takes to get a product from idea to marketplace. Therefore, shortening the production cycle is a major goal for software development companies so that they can get to the market faster and be the "first mover" of a particular product. Delay, on the other hand, can bring added cost to the product development, and this is referred to as cost-of-delay. This cost is normally hidden. The opposite of delay is speed, but in the S-NPD process, speed has a monetary value and if the cost of speed is too expensive to achieve, then delay may be a preferred option. The agile method was introduced in the 1990s, and the aim is to shorten the time-to-market and reduce delay. Mobile apps are software applications designed to run on mobile devices such as smartphones and tablets. The constraints attached to mobile devices make the development of apps more difficult compared to desktop software development. The goal of this position paper is to examine the three factors - time-to-market, cost-of-delay and uncertainty - through observation vis-a-vis apps development and the use of agile methods in order to see if something has changed over the years. In addition, a controlled group interview was conducted to support the observation method. The questions this paper seeks to answer include: Are we getting to market on time? Are we delivering software products on budget?

SESSIONS

Do we have reduced uncertainty when it comes to apps development and the use of the agile method?

TD-11.2 [A] Product Feature Prioritization Using the Hidden Structure Method: A Practical Case at Ericsson

*Robert Lagerstrom; KTH Royal Institute of Technology, Sweden
Mattin Addibpour; Ericsson AB, Sweden
Franz Heiser; Ericsson AB, Sweden*

In this paper, we present a case where we employ the hidden structure method to product feature prioritization at Ericsson. The method extends the more common design structure matrix (DSM) approach that has been used in technology management (e.g., project management and systems engineering) for quite some time in order to model complex systems and processes. The hidden structure method focuses on analyzing a DSM based on coupling and modularity theory, and it has been used in a number of software architecture and software portfolio cases. In previous work by the authors, the method was tested on organization transformation at Ericsson; however, this is the first time it has been employed in the domain of product feature prioritization. Today at Ericsson, features are prioritized based on a business case approach where each feature is handled isolated from other features, and the main focus is customer or market-based requirements. By employing the hidden structure method, we show that features are heavily dependent on each other in a complex network, thus they should not be treated as isolated islands. These dependencies need to be considered when prioritizing features in order to save time and money, as well as increase end customer satisfaction.

TD-11.3 [R] Integration of Mechanical-Electric-Software Design and Architectural Analysis: Case Study of Japanese Firms

*YoungWon Park; Saitama University, Japan
Kin'ya Tamaki; Aoyama Gakuin University, Japan*

This paper examines the source of complexity involving synergistic products that require mechanical-electric-software interfaces integration and suggests plausible reasons of why collaboration in the engineering chain (i.e., mechanical-electric-software network) is difficult to achieve. Furthermore, we analyze the integration processes of engineering and supply chain by using architectural analysis and present a product development strategy responding to complexity.

TE-01 TM in Health 3

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Kona Moku Salon A

Chair(s) James K.C. Chen; Asia University

TE-01.1 [R] Design Study of a Medical Device

*Burcu Taskin; Izmir Institute of Technology, Turkey
Nuri Basoglu; Izmir Institute of Technology, Turkey*

For the new product design in the medical industry, the designer's role is to identify requirements of the product by focusing on the target need, demand and market supply. This research aims to explore the main problems of existing crutches in the medical industry with two phases: to identify the crutch design requirements by research and to define market position involving financial analysis with three economic scenarios. Therefore, the study, which is based on a research with reuse multiple techniques for walking aid design requirements through needs and demands, aims to discuss the collected data from different perspectives of medical experts, medical store owners and crutch users to create design criteria. In conclusion, the study claims that the crutches should be designed with rich interaction, integration form and function. Besides, the economical scenarios are planned to create the crutch to be considered accessible, feasible for users and cost/price benefit for stakeholders. The product concept was constructed considering the ergonomics, economics and medical issues to define requirements of the new crutch idea for temporary users. Therefore, the new crutch design specifications aim to alternate in terms of body-raise aid,

stair ascent, arm-elbow support and self-standing functions.

TE-01.2 [R] 3D Bio-printing in Medical Treatment: A Technology Acceptance Model

*Shujen Lee Chang; Asia University, Taiwan
James K Chen; Asia University, Taiwan*

The 3D printing technology has been broadly applied in many industries. In medical science, 3D bio-printing is used for generating biological tissues and provides customized biological needs for patients. Nowadays, 3D bio-printing can print blood vessels, skin tissue, heart tissue, and artificial bones for surgical therapy or transplantation. The potential of 3D bio-printing in medical science may create many business opportunities and greatly benefit patients. Although many successful cases have been reported in the USA and UK, 3D bio-printing technology is relatively new in Taiwan. The question concerning how people in Taiwan approach the new technology or whether they would accept the new technology used in their medical treatments remains unknown. Thus, this study investigates the acceptance of 3D bio-printing applied in medical treatment from the perspectives of people in Taiwan. Two hundred forty nine adults (86 males, 163 females, average age 31) voluntarily completed an online survey. We used item analysis, factor analysis, and structural equation model (SEM) to build a TAM 3D bio-printing applied in medical treatment, which included perceived usefulness and confidence. This model may facilitate business in promoting 3D bio-printing in medical treatment, from which patients may gain benefits.

TE-01.3 [R] The Application of Active Notification Medical Procedure for the Assistance of Elderly Patients

*Shih Chieh Chang; St. Joseph's Hospital, Taiwan
Telung Pan; St. Joseph's Hospital, Taiwan*

Care of elderly patients usually differs from standard medical procedures. The medical examination of elderly patients should be done with a different approach. The elderly also have different, often more complicated health care problems, such as multiple disorders and disabilities, which may require additional time to transfer for further examination and should not be rushed. This study proposed that an active notification medical process combined with well-trained elder assistants can be applied to improve medical flow to deal more effectively with older patients. When an elder patient is identified by the register system or wristband RFID, a notification agent will push an alert message to notify the assistant group on the system and provide instant help in the exact location. A satisfaction survey was conducted with 106 patients evaluated, where 32.1% were between the age of 70 to 75, 24.5% between the age of 60-70, and general medicine patients 33.5% (69), obstetrics and gynecology 8.7% (18), and the most satisfied item is the decrease of waiting time.

TE-02 TM Framework

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Kona Moku Salon B

Chair(s) Robert Lagerstrom; KTH Royal Institute of Technology

TE-02.1 [R] Automated Architecture Modeling for Enterprise Technology Management Using Principles from Data Fusion: A Security Analysis Case

*Margus Valja; Royal Institute of Technology - KTH, Sweden
Matus Korman; Royal Institute of Technology - KTH, Sweden
Robert Lagerstrom; Royal Institute of Technology - KTH, Sweden
Ulrik Franke; Swedish Institute of Computer Science, Sweden
Mathias Ekstedt; Royal Institute of Technology - KTH, Sweden*

Architecture models are used in enterprise management for decision support. These decisions range from designing processes to planning for the appropriate supporting technology. It is unreasonable for an existing enterprise to completely reinvent itself. Incremental changes are in most cases a more resource efficient tactic. Thus, for planning organizational changes, models of the current practices and systems need to be created. For mid-sized to large organizations this can be an enormous task when executed manually.

SESSIONS

Fortunately, there's a lot of data available from different sources within an enterprise that can be used for populating such models. The data are, however, almost always heterogeneous and usually only representing fragmented views of certain aspects. In order to merge such data and obtain a unified view of the enterprise, a suitable methodology is needed. In this paper we address this problem of creating enterprise architecture models from heterogeneous data. The paper proposes a novel approach that combines methods from the fields of data fusion and data warehousing. The approach is tested using a modeling language focusing on cyber security analysis in a study of a lab setup mirroring a small power utility's IT environment.

TE-02.2 [R] An Analysis of Fuzzy Cognition on Factors Affecting the Co-branding in Technical Standards Alliance: From Partner Selection Perspective

Jing Hu; *China Jiliang University, China*
Yong Zhang; *China Jiliang University, China*
Yueyi Zhang; *China Jiliang University, China*

Brand is an important resource in the technical standards alliance. As a kind of essential resource utilization pattern, the brand joint is beneficial for enterprises in the alliance to realize the increment of value. The selection of a cooperative partner is the first step of co-branding, which plays a significant role in co-branding. This paper emphasizes the critical significance of alliance member selection to the co-branding and regards it as the breakthrough point to analyze the key influence factors and causal correlation of co-branding. By the combination of fuzzy cognitive map and non-linear Hebbian learning algorithm, this research establishes the fuzzy evaluation model, realizes the dynamic simulation of a complex network system with multiple causal correlations, and obtains the final steady state of co-branding for the technical standards alliance to better understand the mutual relations among different influence factors of co-branding and their effect degrees in order to propose the policy reference for the improvement of numerous influence factors and the conversion efficiency of optimal results.

TE-02.3 [R] Prediction of Emerging Papers in Nanocarbon Materials-related Research Using a Citation Network

Hajime Sasaki; *The University of Tokyo, Japan*
Tadayoshi Hara; *The University of Tokyo, Japan*
Ichiro Sakata; *The University of Tokyo, Japan*

Nanocarbon materials made from graphite are used in diverse applications as semiconductors, fuel cells, optical devices, and structural materials because of their excellent mechanical, electrical, and thermal characteristics. Numerous papers are published annually in this area, and thus it is difficult to assess overall development in the field. Consequently, there is a need for approaches that predict advances from diverse and numerous sources of information. In this study, we used machine learning to examine papers on nanocarbon materials and related topics and to predict papers with emerging ideas that are expected to grow in popularity. We specifically predicted emerging papers that were ranked in the top 5% by number of citations. A total of 411,084 related papers were extracted from the Web of Science Core Collection (Thomson Reuters). A time-expanded network was produced from these data using citation links, and features of each paper were used as explanatory variables to build a prediction model. In this model, 9 of the top 10 papers from 2011 predicted to be emerging satisfied the conditions for emerging papers. These results suggest that the model can predict the direction of nanocarbon materials technology, which is of considerable value for private companies and research institutions.

TE-03 Project Management 3

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Kona Moku Salon C

Chair(s) Remy Magnier-Watanabe; University of Tsukuba

TE-03.1 [R] Capturing Knowledge from Research Projects: From Project

Reports to Storytelling

Marcelo A Machado; *Kwantlen Polytechnic University, Canada*
Remy Magnier-Watanabe; *University of Tsukuba, Japan*
Tero Peltola; *Tampere University of Technology, Finland*

Research projects are essential tools for creating knowledge and fueling societal developments. Consequently, research efforts are consistent with requirements from accepted scientific methods as they are exhaustively recorded and stored. Traditional approaches are equally effective in helping assess the robustness of research methods. However, approaches to recording research projects leave behind a wealth of tacit knowledge and contextual information. Tacit knowledge and contextual information are essential to enable the development of individual researchers and research teams, which in turn have the potential to increase productivity, effectiveness and impact of future research. Found within the project management literature is the idea of utilizing storytelling to record projects' lessons learned. This paper's main research question is "how would a storytelling framework for capturing and sharing knowledge and contextual information improve organizational memory and the management of research projects?" The framework will be piloted at Canadian, Finnish, and Japanese universities. The effectiveness of the framework will be assessed by comparing it with established procedures to record research projects. In terms of organization, this paper will include a review of the literature, a description of the logic and application of the framework, findings from pilot studies, next steps, and opportunities for future research.

TE-03.2 [R] Factors for Electronic Media Selection in Project Communication

Rachel Magwenzi; *University of Pretoria, South Africa*
Cornelis C van Waveren; *University of Pretoria, South Africa*
Kai-Ying Chan; *University of Pretoria, South Africa*

Knowledge transfer in projects is more complex and challenging than such transfers in normal operations due to the temporary nature of project teams in which team members often do not see the capturing and transferring of knowledge across projects as important for long-term benefits to the organization. Understanding how and why different communication media, computer-mediated or otherwise, are used in organizations becomes essential to prescribe and to predict sound rationale organizational investments in different media choices. Although a lot of research has been done on factors that influence media selection as a knowledge transfer tool, organizations are becoming more dependent on using the electronic media for communication, and further advancement in the electronic media necessitates continued research. This study investigates the key factors that influence the selection of electronic media in projects communication focusing on the engineering sector as well as identifying factors which are more dominant than others. The communication factors which were identified during the study were grouped into four groups: system characteristic factors, task factors, organizational factors and people factors. The study investigated the influence of the communication factors on the following forms of electronic media: e-mail, internet, intranet, extranet, electronic bulletin boards, television networks, audio recordings, video conferences, tele conferences, instant messaging, telephonic systems and multimedia presentations. Results showed that the top 10 key factors which influence selection of electronic media consisted of: six system factors, three task factors, one organizational factor and one people factor. Systems factors were more critical than the other factors in influencing the choice of electronic media.

TE-03.3 [R] The Influence of China Regional Patent Subsidy Policy to Patent Application: An Empirical Analysis

Zhe Yan; *Beijing Institute of Technology, China*
Yun Liu; *Beijing Institute of Technology, China*
Fangjuan Yang; *Beijing Institute of Technology, China*
Long Tan; *Beijing Institute of Technology, China*
Xuanning Ye; *Beijing Institute of Technology, China*

Patent subsidy policy is an important policy tool for the government to encourage and guide the innovation subjects to apply for patent. This paper mainly adopts the Mann-Whitney U

SESSIONS

test to quantitatively analyze the impact of regional patent subsidy policy on patent application. It takes four provinces as the research objects. The result shows that patent subsidy policy of each region has different effects on different kinds of patent application, and thus some policy suggestions are proposed. In addition this paper presents the thinking and prospect for the applicability of Mann-Whitney U test in patent issues.

TE-04 Collaborations for TM 4

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Honolulu

Chair(s) Nathalie Sick; University of Muenster

TE-04.1 [R] The Relationship of Calculated and Perceived Distance Dimensions in Interdisciplinary Collaborations: Evidence from a Battery Research Project

Nicole vom Stein; University of Muenster, Germany

Nathalie Sick; University of Muenster, Germany

Jens Leker; University of Muenster, Germany

Innovation collaborations experienced a substantial growth, so that the research interest in factors contributing to successful collaboration increased. One important factor in this context are distances like technological and geographical distance. The distinction between objectively calculated and individually perceived distances provides possible starting points to bridge high distances. Therefore, the study at hand aims to answer the following research question: How are calculated technological and geographical distances related to their perceived counterpart and how do these different distance dimensions influence each other? The data is collected from an interdisciplinary battery research project. The calculated technological distance is measured via a publication-based approach while the calculated geographical distance is defined as the distance between the respective working places. Perceived distances, in contrast, are received via an online questionnaire. The influence model confirms a positive relationship between the calculated distance dimensions, technological and geographical distance, and their perceived counterparts. However, respective measures do by far not entirely overlap, so that the perceived ones are further influenced by factors like, e.g., scientific background or shortest travel time. This approach is especially promising to foster social innovation as the awareness of bridging mechanisms might provide avenues to deal with technological distance, which can be assumed to be comparably high in this context.

TE-04.2 [R] Drivers of Vendor Satisfaction with Clients in IT Outsourcing Relationships

Shanthy Gopalakrishnan; New Jersey Institute of Technology, United States

Melodi Guilbault; New Jersey Institute of Technology, United States

Abhoy Ojha; Indian Institute of Management, India

This research begins to help us understand the factors that help build the trust between the vendor and client and this is one of the keys to maintaining a long-term relationship between the parties. Both contractual and relationship factors affect the ability of vendors and clients to work together over time. A recent study had demonstrated that relational factors such as trust and information exchange dominated in their ability to explain client satisfaction when compared to contractual factors. In this study we further explore the role of trust and other relational factors such as social control and mutual dependence on vendor satisfaction with the clients. India has established itself as the premier location for offshore outsourcing because of its availability of a skilled talent pool with strong communication skills and English language capabilities. Using data collected from 214 vendor firms in the Indian subcontinent, we found that mutual dependence and competence based trust were significant predictors of vendor satisfaction with the client. Social control or the ability to resolve conflicts did not impact satisfaction. We discuss the importance of these findings for managing vendor client relationships in the short and long term.

TE-04.3 [A] The Relationship between Open Innovation and Innovation

Performance: Focused on the Firms in South Korea

Do Bum Chung; KISTI, Korea, South

Byungil Kim; Andong National University, Korea, South

Recently, because the environment is changing very rapidly and becoming increasingly complex, it is difficult for a firm to survive and maintain a sustainable competitive advantage through internal R&D. Accordingly, the importance of open innovation is emphasized, and the ratio of external R&D in various industries has been increasing steadily. However, it has been criticized whether firms achieved internal R&D only in the past and that we can see as open innovation when firms used a certain extent of external R&D, and so forth. Therefore, this study analyzed open innovation through Korea Innovation Survey (KIS) data that was conducted by the Science and Technology Policy Institute (STEPI). We confirmed the extent of open innovation of the firms (by separating manufacturing and service) in South Korea, and examined the relationship between open innovation and innovation performance based on the performance of the manufacturing industry in 2013. This study suggests that open innovation is not a new activity, and open innovation doesn't always influence innovation performance due to the difficulties associated with managing the process of open innovation between firms. The results of this study will be used to establish the strategic direction and support the decision making when firms conduct innovation activities in the future.

TE-05 Educational Issues 2

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Waikiki Salon 1

Chair(s) David J Kruger; University of South Africa

TE-05.1 [R] The Influence of Enforced Changes on Systems Performance

David J Kruger; University of South Africa, South Africa

Progressively more tumultuous times are experienced by organizations in the manufacturing and service sector in South Africa. The higher education institutions (HEI'S) are not excluded. The HEI's are required to be adaptable and responsive to students' demands. It brings into stark contrast the relations linking the recognized organizational configuration and casual systems. Consequently, improvement programs do not succeed in a shifting systems performance. The result is changes are made to systems and processes the way it looks rather than change their objectives. Industry settings currently are characterized by vigor, nonlinearity and evolving properties. In a nutshell, it is identified through its complexity. Affirming the world and thus industry systems are multifaceted, denotes it is impractical to appreciate each by allowing for individuality of elements in isolation. Replication of complexities linked with service systems continues to be an opaque question that most HEI's struggle with. The mission is acutely made complex by student activism and the changing demands on HEI's and the uncertainties coupled to it. The Cynefin Framework is an important tool in this regard. The purpose of the paper is to enlighten how the utilization of systems thinking and complexity theory and associated methodologies could prevent negative influences on HEI's.

TE-05.2 [R] Curriculum Engineering: A South African Case

Kem Ramdass; University of South Africa, South Africa

Constructive alignment of curricula in terms of content, formative and summative assessments are imperative for student success in higher education and career pursuit. The development of curricula in an open distance learning context also considers notional hours and credits through institutional guidelines. All formal qualifications are approved by the Council of Higher Education and registered with South African Qualifications Framework, therefore cognizance is taken of portability of qualifications and learning pathways. Articulation is an important facet of curriculum development with regards to student learning progression from undergraduate to postgraduate studies. Curriculum review and the review cycle considers comparability, response to Higher Education Qualifications Framework (HEQF), national and international benchmarks, professional bodies such as the Engineering Council of South Africa (ECSA), Sector Education and Training Authorities (SETA), student

SESSIONS

and employer feedback and market trends. The institution follows a team approach in curriculum development with consultation from all internal and external stakeholders. In view of the theme of the conference which has a focus on technological innovation, a range of resources are provided to create an enabling environment for students to be successful in their studies through open distance learning. Curriculum implementation evaluates the financial viability, alignment to the vision and mission of the institution and market penetration as well as the pedagogy and technology applicable for the qualification. This paper aims to evaluate a curriculum in open distance learning (ODL) in terms of program offering using a case study methodology.

TE-05.3 [R] Lean Utilisation for Streamlining Processes in the Higher Education Sector in South Africa

David J Kruger; University of South Africa, South Africa

The utilization of lean within the manufacturing sector has been well documented. Principally, it has been utilized as an instrument for improvement of processes and the resultant savings achieved. Consequently, lean can be utilized as a process restructuring method for underperforming processes. The main principle of lean is the eradication of waste within a process. Of late, lean found fertile ground in the services sector too. It is especially true in the health care industry. The South African Higher Education sector experiences a shortage of funding from the government. Subsequently, higher education institutions (HEI's) must source funding from elsewhere. Lean implementation is seen as a possible solution. The researched institution has a large cohort of students requiring one or two modules to complete their studies. These modules are usually ones that students struggle passing. The university plans to institute a process where students would be afforded an extra examination opportunity to pass outstanding modules. The researcher was tasked to develop the process. Lean has not been utilized in these circumstances. The paper investigates the applicability of lean in HEI's. In particular, the methodologies of critical to quality (CTQ), voice of the customer (VOC), Ishikawa diagram, 5S and kaizen will be examined developing the new process.

TE-06 Sustainability Management 2

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Waikiki Salon 2

Chair(s) Prescott C Ensign; Wilfrid Laurier University

TE-06.1 [R] Patterns for Sustainable Technological Innovation in Higher Education Institutions and Regional Sustainable Development

Jin Wu; University of Twente, Netherlands

Liqin Brouwers-Ren; University of Twente, Netherlands

Aard Groen; University of Twente, Netherlands

This paper presents the relationship between sustainable technological innovation in higher education institutions and regional sustainable development in the new normal of Chinese economy, by taking into account the variable of sustainable consumption. Although the role of sustainable technological innovation and commercialization of higher education institutions has been recognized as a significant contributor to the social development, the formation process of the sustainable technological innovation of higher education institutions, especially in a country in rapid economic transition, is not yet well reported in literature. After conducting an extensive literature review and interviews of leading research groups in southern Chinese higher education institutions, the authors developed a sustainable technological innovation (STI) model to provide guidelines for innovation in higher education institutions and regional sustainable development, with a focus on sustainable consumption. This model is also applicable for other emerging economies that are seeking sustainable technological innovation in order to maintain sustainable consumption.

TE-06.2 [R] Sustainability Requirements for Concrete Block Elements Based on Recycled CDW: A Case Study for Supporting Social Production in Southern Brazil

Morgane Bigolin; UFRGS - Federal University of Rio Grande do Sul, Brazil

Angela de Moura Ferreira Danilevicz; UFRGS - Federal University of Rio Grande do Sul, Brazil

Luiz Carlos P Silva Filho; UFRGS - Federal University of Rio Grande do Sul, Brazil

Although increasingly criticized and challenged, linear production models, in which goods are manufactured from raw materials to be sold, used and discarded as waste, still dominate the global economy. A deep change is necessary to provide more sustainable production models, based on the concepts of circular economy. In the construction industry, a promising alternative involves recycling construction and demolition waste (CDW) for concrete production, reducing the need for natural aggregates. However, to be successful, CDW products must attend all normative and quality requirements. This paper describes a model created to analyze how different requirements interact and influence the definition of elements to produce using CDW. The case study has special meaning because the results were used to help implement a cooperative production process on a picker's cooperative of southern Brazil, a social technology initiative that helps people overcome poverty barriers while benefiting the environment and respecting strict material standards. To this end, the model was constructed considering customer expectations, environmental and technical requirements, and became a key tool to decide that initial production should focus on concrete blocks. The model can be extended to other situations, helping critical decision-making regarding trade-offs between the different value dimensions considered in the study.

TE-06.3 [R] An Assessment of LEED Certification's Impact on Net Rental Rates for Commercial Office Space in Toronto, Ontario

Shawn Roy; General Dynamics Mission Systems, Canada

Prescott C Ensign; Wilfrid Laurier University, Canada

Tom Brzustowski; University of Waterloo, Canada

With the impact that buildings have on the environment, it is important to understand what barriers are preventing or slowing investment in socially and environmentally responsible property. The present study was conducted to determine whether LEED certification has a significant impact on the market value of office buildings in Toronto, Ontario - value determined by the average net asking rent for each building. For some 68 subject and control buildings, we matched information on the net asking rent for 16 LEED certified (subject) buildings to 52 otherwise comparable properties (control buildings). Using ordinary least squares (OLS) analysis, we looked to find what relationship exists between net asking rent and the LEED label. Controlling for other variables historically shown to have an impact on property value, we expected the results of this study to determine whether there is a business case for LEED certification in the downtown Toronto office market.

TE-07 Innovation Management 6

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Waikiki Salon 3

Chair(s) Joanne Scillitoe; New York Institute of Technology

TE-07.1 [R] Venture Technological Innovation, Social Value and Economic Value: The Influence of Customer-Beneficiary Alignment

Joanne Scillitoe; New York Institute of Technology, United States

Latha Poonamallee; Michigan Technological University, United States

Simy Joy; University of East Anglia, United Kingdom

The technological innovation literature has widely considered the process and outcomes of market driven firms. However, research on the innovation process and outcomes of socially driven firms, particularly socio-technological entrepreneurial ventures, is very limited. In particular, the influence of the alignment of customer versus beneficiary needs has not been addressed within this literature yet is an important consideration for socio-technological venture development and subsequent innovation impact. As a result, in this paper we present a conceptual model explaining how technological innovation impact is influenced by venture orientation, organizational structure, and customer/beneficiary alignment. Unlike a market oriented venture that typically selects a for-profit structure, a socially oriented

SESSIONS

venture may select from a choice of for-profit, nonprofit, or hybrid structures, influenced by founder experience. We also posit that customer-beneficiary alignment can influence the relationship between structure and innovation impact. When customer and beneficiary preferences are less aligned, a non-profit structure offers the greatest innovation impact for social value with minimal impact on economic value while a hybrid structure offers greater innovation impact for both social and economic value, and a for-profit structure offers greater impact for economic value. However, when customer and beneficiary preferences are more aligned, a for-profit structure offers the greatest innovation impact for both social and economic value.

TE-07.2 [R] How can We Promote Development of New Drugs from Academic Knowledge?: Focusing on Corporate Perspective on Contribution of Basic Research to Innovation

*Koichi Sumikura; National Graduate Institute for Policy Studies, Japan
Hiromi Saito; Chiba University, Japan*

It is well understood that academic knowledge generated from basic research at universities contributes to innovation in the industrial sector. In order to demonstrate the degree to which academic knowledge contributes to innovation, we conducted multiple surveys on private corporations. Based on the results of our surveys, we have found the existence of a recognition gap between inventors and business managers with respect to contribution of academic knowledge to innovation. The reason for this gap is the potential disconnect in information between inventors and business managers concerning the application of academic knowledge.

TE-07.3 [R] An Alternative Resource for Technology Innovation: Do Industrial Designers Create Superior Invention?

*Tohru Yoshioka-Kobayashi; Hitotsubashi University, Japan
Toshiya Watanabe; The University of Tokyo, Japan*

Recent design studies have advocated how design practices enhance innovation in various fields. Indeed, the latest case study discovered that industrial designers can contribute even in natural science research. On the other hand, the majority of R&D management scholars and practitioners have long overlooked the value of collaboration between R&D engineers and industrial designers. To fill the gap, in this study, we test the link between an enrollment of industrial designers in inventing activities and their impacts on inventing outcomes using patent applications to Japan Patent Office from a Japanese electronics manufacturer. By connecting each inventor's individual affiliation information collected from the design patent, we constructed 75,932 invention-level data points for inventor affiliations to use in our regression analysis. Our analysis reveals a significant contribution by industrial designers to high-impact inventions. Our estimation result shows that an enrollment of industrial designers increases forward citations of a focal patent application by an average of 17%. We can interpret that these contributions of industrial designers come from their latent demand-oriented thinking, which concurs with recent design studies. This study provides the implication for R&D managers that they should not exclude industrial designers when seeking to develop innovative technologies.

TE-07.4 [A] Design of an Innovation Model for a SME in Monterrey, Mexico

*Carlos E Atoche-Kong; Universidad de Monterrey, Mexico
Margarita Castillo-Carreón; Universidad de Monterrey, Mexico
Angelica Lince-Arias; Universidad de Monterrey, Mexico*

Firms in emerging economies realize the importance of innovation to compete in global arenas. However, small and medium enterprises (SME) struggle to start the innovation practice because they lack support from innovation experts and they don't have enough resources to afford this process. Allity is a small IT company specialized in business intelligence applications located in Monterrey, Mexico, and this paper illustrates the process of designing Allity's innovation model in order to become an innovative firm. It shows the difficult environment that an SME confronts to innovate, such as the absence of institutions that support the practice of innovation and of qualified personnel to conduct innovation

projects. Inside the firm this study identified some inhibitors such as the lack of knowledge of what innovation really is and that employees do not see the real possibilities that innovation can provide to the firm. Therefore, the practice of innovation is seen as a risky initiative that inhibits its practice. An innovation model facilitates this process, as it clarifies the path that the firm should follow to develop innovation projects. In Allity this project also motivated personnel to start innovation projects. A methodology to design innovation models for SME is also proposed.

TE-08 Knowledge Management 2

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Milo I

Chair(s) Schumpeter Tamada; Kwasei Gakuin University

TE-08.1 [R] Using Bibliometric Analysis and Text Mining to Improve the Thai Talent Database

*Alisa Kongthon; National Electronics & Computer Technology Center, Thailand
Choochart Haruechaiyasak; National Electronics & Computer Technology Center, Thailand
Kanokorn Trakultaweekoon; National Electronics & Computer Technology Center, Thailand*

In today's competitive world, "Talentism has become the new capitalism." Knowledge workers are viewed as valuable assets to their organizations and nations. In developing countries such as Thailand in particular, the number of experts in science and technology is quite limited. The mobility of talent between academia, government and industry is therefore essential for knowledge transfer and technology diffusion. In recognition of this fact, the Royal Thai Government developed a National Talent Data Base ("Talent Database") in 2014, in order to facilitate mobilization of necessary talent and skills. However, the current Talent Database only supports keyword searches for potential candidates. Keyword searches alone provide no indication of the associations between researchers that may better allow talent managers to better pinpoint necessary and related skill sets, and to locate all potential candidates for positions. In this paper, we suggest improvements that may make the Talent Database more useful to managers seeking to plan talent mobility for R&D activities in Thailand. As an illustration, we apply "bibliometric analysis" and a "text mining" approach to identify topical emphases and experts' knowledge networks in the field of data science. The results could be used to assist decision makers to better match the demand with the right talents.

TE-08.2 [A] Training Innovators at the Stanford Biodesign Program and Its Implications

*Mariko Yoshihara Yang; Ritsumeikan University, United States
Kiminori Gemba; Hosei University, Japan
Schumpeter Tamada; Kwasei Gakuin University, Japan*

This article presents an in-depth description of Stanford University's Biodesign, the post-graduate program established in 2001 with a mission to train a new generation of leaders in biomedical innovation. We examined the Biodesign's multidisciplinary curriculum in which the competitively selected fellows undergo an intensive 10.5-month training to identify clinical needs, find innovative solutions and plan business strategies for implementation. The strength of the Stanford Biodesign program lies in its unique selection of the applicants where the committee looks for the following "innovation personalities" (Brinton, et. al, 2013) and put them together as a team: (1) the builder (i.e. engineer), (2) the researcher (i.e. scientist), (3) the organizer (i.e. business expert), and (4) the clinician (i.e. medical doctor). The team members collaborate and learn from each other's expertise as they go through the intensive training. The multidisciplinary nature of Biodesign program enables the participants to acquire critical biomedical thinking, entrepreneurial resource, team-building skills and networking opportunities.

TE-08.3 [R] A New Model of Human Needs as the Foundation for Innovation

SESSIONS

Management

Oliver Yu; San Jose State University, United States

Defined as an idea implemented with impact, innovation can be viewed as a process involving the synergistic investments of time, money, effort, and other resources by the key participants: the creator, the core team, the supporter, and the adopter of a new idea, product, or service. A basic requirement for creating synergy in this investment perspective of innovation process is for all participants to perceive sufficient values in their respective investments. Since human needs are the motivators of human behavior and values are generated by fulfillment of these needs, understanding of human needs provides the foundation for effective innovation management by developing motivations for the key participants to perceive sufficient values for their investments in the innovation process. The traditional Maslowian model of human needs, although widely known, is not very applicable in forging this synergy because of its impractical hierarchical structure. This paper presents a new model with applications by classifying human needs into two interactive dimensions: the dimension of physiological vs. psychological needs and the dimension of safety/security vs. stimulation/growth needs. This new classification provides a basis for effective innovation management by pinpointing the specific needs that can be used to for motivating participation and forging synergy in the investments by key participants in the innovation process. Moreover, it can be extended to the classifications of organizational and societal needs to provide the bases for strategies for technology investments, and used to develop effective motivators for all key participants to perceive sufficient value in their respective investments in the innovation process.

TE-08.4 [A] Product Planning and Innovative Developments from the Perspective of Anticipated Market Trends in the Coming Years: An Analytical Approach based on Machine Tools Developed for Auto Manufacturers

Shinichiro Nomoto; JMA Consultants Inc., Japan

Each year Japanese product manufacturers face a growing number of challenges in the field of product planning and development. These challenges include the shrinking domestic market as a result of the aging population and declining birth rates, as well as intensifying cost competition from emerging economies. There are a number of potential initiatives for arriving at solutions to overcome these challenges. Reinforcing capabilities to provide value-added products and services to customers is one. Other initiatives include planning and developing highly competitive products, and enhancing cost competitiveness to keep pace with emerging economies. In this paper, the author discusses one industrial approach for planning and developing competitive products, as well as how to intensify capabilities for making proactive proposals to customers. The discussion of this approach will be based on case studies regarding machine tools developed for the auto industry in Japan.

TE-09 Entrepreneurship/Intrapreneurship 3

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Milo II

Chair(s) Charles M Weber; Portland State University

TE-09.1 [R] A Study for the Regional Industrial Regeneration Entrepreneur's Capabilities and Qualifications

Takao Nomakuchi; Wakayama University, Japan

Masakazu Takahashi; Yamaguchi University, Japan

Regional industries of Japan are stalled with no way out, since their direction and position have not been clarified. However, the regeneration of regional industries should be proposed to dispel the sense of stagnation that exists throughout Japan. Regional regeneration has been discussed based on a wide variety of approaches including sociology, urban design theory, and community theory. Yet only a few attempts have been made so far at regional industrial regeneration taken by entrepreneurs. Therefore, this article attempts to compare and consider various cases of regional industrial regeneration entrepreneur's capabilities and qualifications. With respect to regional industrial regeneration entrepreneurs as innovator, this article proposes his/her essential capabilities and qualifications. From

the consideration, it was suggested that regional industry regeneration entrepreneur must have capabilities and qualifications to generate a disruptive innovation. From the comparative analysis of the four president as regional industry regeneration entrepreneur, "transfer output," "circulation force," "being a stranger," "events that pull the trigger," "associating," "questioning," "observing," "networking," "experimenting," "entrepreneurial courage" and "risk-taking" are suggested to be essential for the regional industrial regeneration entrepreneur as a hypothesis. In addition, it has also been suggested that the regional industrial regeneration is one of the disruptive innovations.

TE-09.2 [A] Equity Crowdfunding: A New Social Innovation - A Regulatory Cross-nation Study

Rui-Teng Hsueh; National Chiao Tung University, Taiwan

Kuan-Chung Lin; National Chiao Tung University, Taiwan

Joseph Z Shyu; National Chiao Tung University, Taiwan

Kuang-Pin Li; National Chiao Tung University, Taiwan

In recent years, crowdfunding has experienced accelerated growth around the world, and it has become a new form of social and financial innovation for new business ideas that might be unable to get traditional financing. As a social capital for innovations, crowdfunding has led to the creation of new funding models and business logic for startups. Currently, the major types of crowdfunding models encompass rewards, donation, equity, and debt/leading models. The boom of crowdfunding could be attributed to the emergence of the collaborative economy. Despite its popularity in practice, crowdfunding needs further academic research to fill its research gap. Hence, this paper conducts a cross-national comparison of the equity crowdfunding mechanisms and focuses on regulatory environments by analyzing several equity crowdfunding platforms respectively in the U.S., the U.K., Israel, China, and Taiwan. Through secondary qualitative study, the result reveals that three of the five countries we study (the U.K., Israel, and Taiwan) authenticate the equity crowdfunding to the general public, whereas this type of investment is still limited only to accredited investors in the U.S. and China. It is concluded that equity crowdfunding is an alternative capital raising model that will grow and is beneficial for social innovation in the future.

TE-09.3 [A] Technology Readiness, Market Readiness and the Triple Bottom Line: An Empirical Analysis of Innovating Startups in an Incubator

Rainer Hasenauer; Vienna HITECH and WU Wien, Austria

Andreas Gschoepf; INITS, Austria

Charles M Weber; Portland State University, United States

This paper shares the experiences of INITS, a business incubator located in Vienna, Austria, which consults with startup firms in Austria and (with partners) in Europe. INITS has investigated the technology readiness levels and market readiness levels of 57 startup firms in a variety of industries who are engaged in social or environmental entrepreneurship, where the impact motive prevails over the profit motive. Thus, INITS provides 57 longitudinal case studies of social and environmental innovation in startup firms that have gone through the complete incubation process. Thirteen of these cases underwent an "open incubation" process developed by INITS. INITS has learned a few important lessons from these endeavors. The open incubation method is more focused and streamlined than traditional methods. A formalized Web-based application process, as well as prolonged interaction with fellow startup firms and external experts, identify errors early, which accelerates incubation. Open incubation also achieves higher technology readiness levels and delivers lower technology risk, especially in the life sciences. Finally, open incubation is not restricted to startups that follow the triple bottom line. Applications for startups in multiple domains are possible.

TE-10 Intellectual Property 5

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Milo III

Chair(s) Timothy R Anderson; Portland State University

TE-10.1 [R] The Technology Diffusion in Patent Transaction Network: An

SESSIONS

Example of TFT-LCD Industry

Hung-Chun Huang; National Chi Nan University, Taiwan

Hsin-Yu Shih; National Chi Nan University, Taiwan

Tsung-Han Ke; National Chi Nan University, Taiwan

This study investigates several distinctive features of a patent transaction market. Through social network analysis, a patent transaction market can reveal the relationship between portfolio clusters, the position of key market players, as well as the behaviors of patent practicing entities (PEs) and non-practicing entities (NPEs). This study's findings show: first, a mature period for a patent transaction market exhibits clusterization and a small-world structure whereby a limited number of players maintain large technological or patent monetization portfolios. Second, the network evolution of a technology market is asynchronous to technology development. Third, technology diffusion in patent transactions will demonstrate a pattern of cooperation, and the typology of a technological transaction chain. The result not only reveals the IPR strategy of leading technology firms but also demonstrates the social structure of their competitive advantage. This analysis provides insights into patent transaction networks, and also addresses management implications for firms interested in acquiring market competition or market governance.

TE-10.2 [R] Processes Proposal for the Intellectual Property Commercialization Management in a Technology Licensing Office from a Brazilian Scientific and Technological Institution

Herlandi S Andrade; ITA - Instituto Tecnológico de Aeronáutica, Brazil

Ligia Maria S Urbina; ITA - Instituto Tecnológico de Aeronáutica, Brazil

Andrea O Follador; ITA - Instituto Tecnológico de Aeronáutica, Brazil

Roberto C Follador; ITA - Instituto Tecnológico de Aeronáutica, Brazil

Considering the quantity and the quality of filing applications for protection requests (i.e., patents), it is possible to conclude that Brazil has an important and high technological production level, although some deeper analysis is very limited about how questions of protected commercialized technologies are done (i.e., licensing). The technology commercialization can be defined as a negotiation process, which involves technical and commercial aspects in order to allow that the developed technology done by a scientific and technological institution (STI) can be transferred to another company that will use it and, by consequence, promote its innovation. The Technological Licensing Office (TLO) is responsible for commercializing technologies in a STI, so when the functioning of the TLO is analyzed, it is possible to realize that they still need to develop their organizational skills in order to achieve their goals, mainly about the commercialization of technology strategies. In this article, a model of process is presented, which allows one to view and examine the specifications of the technology developed and protected by a STI, and thus be able to define strategies for its commercialization. Such a model was applied in a TLO of a military STI with positive results.

TE-10.3 [R] Evaluating the Use of Patent Family for Understanding Globalized Industrial Innovation

Wei-Ting Shen; National Chung Hsing University, Taiwan

Hsin-Ning Su; National Chung Hsing University, Taiwan

Industrial innovation based on intellectual property is a key process for creating competitive advantage in this globalized environment of the knowledge economy. IP as a way of protecting innovation is becoming essential for both commercial and strategic objectives. Therefore, it is of importance to understand the global patent family portfolio which has been barely investigated systematically. The objective of this study is to measure the degree of IP globalization based on different types of patent families defined in the literature. Also, it is observed that areas with extensive patent family coverages are consistent with industries or countries where IP is rigorously practiced for commercial or strategic purposes. Management implications are discussed in this paper to suggest a systematic way of how patent family can be analyzed to understand the globalized industrial innovation.

TE-10.4 [R] How to Design a Competing System: Creating a Looping-out

Knowledge Cycle Model of the US Pharmaceutical Industry

ChingWen Chang; The University of Tokyo, Taiwan

Takayuki Yamanaka; The University of Tokyo, Japan

Shingo Kano; The University of Tokyo, Japan

Governments across the globe establish systems to maintain diversity in specific industries and avoid the formation of oligopolistic market structures. The U.S. government has made special provisions for the country's pharmaceutical industry; namely, the Orange Book, Abbreviated New Drug Application (ANDA), and the Bolar Act. These three provisions combine into a special competing system that offers "product-patent linkage" (PPL), accelerating generic products, and research and development free space to establish a level playing field between generic and brand drug companies. We construct a looping-out knowledge cycle model to examine the relationship between knowledge resources, competing system and oligopoly, and find that the "knowledge conversion" point determines if knowledge can loop away from private proprietary and avoid oligopolistic tendencies. We believe that a competing system should be designed to enable the formation of the knowledge conversion point, which prompts knowledge flow from private proprietary into the public domain. On the other hand, the importance of accelerating imitation and free space for research and development is also important for designing a competing system.

TE-11 Technology Assessment & Eval. 1

Tuesday, 9/6/2016, 16:00 - 17:30

Room: Milo IV

Chair(s) Tugrul U Daim; Portland State University

TE-11.1 [R] A Systematic Method for Technology Assessment: Illustrated for 'Big Data'

Jianhua Liu; Chinese Academy of Science, China

Ying Guo; Beijing Institute of Technology, China

Alan L Porter; Georgia Institute of Technology, United States

Ying Huang; Beijing Institute of Technology, China

Technology assessment is a systematic examination of the effects on or of new developments such as technologies, processes, policies, organizations, and so on. In this paper, we present a systematic method for technology assessment as a part of the suite of tools for forecasting innovation pathways (FIP). We explore means to combine tech mining tools with human intelligence in several idea exchange rounds to uncover potential secondary effects, and array them in terms of likelihood and magnitude. Big data is studied as the case study. This is on-going research. We are currently on the second round of stage 2. Technology assessment is a necessary component of FIP. It identifies areas in which significant impacts may occur, their likelihood, and their significance. The forecaster must evaluate these impacts, consider measures to enhance or inhibit them, and factor them into the planning process for developing the technology.

TE-11.2 [R] A Hierarchical Decision Model (HDM) for Exploring the Adoption of Electronic Health Records

Caroline Mudavadi; Portland State University, United States

Liliya Hogaboam; Portland State University, United States

Tugrul U Daim; Portland State University, United States

Information systems have been making a noticeable entrance in healthcare, although their adoption has been slow. This paper examines the factors influencing the electronic health-care records (EHR) adoption by modeling behavioral intention of physicians towards EHR adoption. Three main criteria: perceived usefulness, perceived ease of use and external factors along with the sub-criteria, are studied by the authors. The analytical hierarchical process (AHP) model is tested through the expert judgment quantification of physicians in the Portland metro area. The results showed high importance of the perceived ease of use criteria on the behavioral intentions of physicians towards EHR adoption. Search ability and user interface - sub-criteria of perceived ease of use - had some of the highest values. Another important sub-criterion in the analysis under external factors criteria was

SESSIONS

cost. None of the criteria evaluated could be considered unimportant, i.e., having really low values after the analysis. The results indicate that EHR should be mandatory in terms of reducing the time spent and errors, improving the outcomes and productivity and in terms of optimum patient treatment.

TE-11.3 [R] A Measurement System for Science and Engineering Research Center Performance Evaluation

Elizabeth Gibson; Portland State University, United States

Tugrul U Daim; Portland State University, United States

This research is focused on gaining deeper insights into US National Science Foundation (NSF) science and engineering research center challenges and motivated to develop a method that effectively measures the performance of these organizations. While research has addressed organizational performance at the micro, or single-actor level for universities or companies and at the regional or national macro level, the middle level where the NSF centers reside is largely missing. The bulk of the cooperative research center studies use either case-based methods or bibliometric data to measure traditional research outputs. Many are excellent studies; however, they only focus on a piece of the performance measurement problem. There is a need for more research to understand how to measure performance and compare performance of cooperative research centers formed in a triple-helix type partnership involving government, industry and academia. This research begins to fill these gaps by examining outputs from a balanced perspective and introducing a hierarchical decision model that uses both quantitative and qualitative metrics for a holistic study. The proposed outcome of this research is a performance measurement scoring system that can be used for science and engineering focused research centers. The method is demonstrated using the NSF IUCRC model.

WA-00 PLENARY - 3

DATE: WEDNESDAY, 9/7/2016
TIME: 08:30 - 10:00
ROOM: KONA MOKU BALLROOM
CHAIR: TIMOTHY R ANDERSON; PORTLAND STATE UNIVERSITY

WA-00.1 [K] Recent Advances of Predictive Big Data Analytics and Industry 4.0 for Future Manufacturing and Service Innovation

Jay Lee; University of Cincinnati, United States

In today's competitive business environment, companies are facing challenges in dealing with big data issues for rapid decision making for improved productivity. Many manufacturing systems are not ready to manage big data due to the lack of smart analytics tools. The U.S. has been driving the Cyber Physical Systems (CPS), Industrial Internet, and Advanced Manufacturing Partnership (AMP) Program to advance future manufacturing. Germany is leading a transformation toward the 4th Generation Industrial Revolution (Industry 4.0) based on the Cyber-Physical Production System (CPPS). China has just launched 2025 Plan and Internet Plus to focus on strengthening manufacturing and accelerate service innovation. It is clear that as more predictive analytics software and embedded IoT are integrated in industrial products and systems, predictive technologies can further intertwine intelligent algorithms with electronics and tether-free intelligence to predict product performance degradation and autonomously manage and optimize product service needs. The presentation will address the trends of predictive big data analytics and industrial 4.0 as well as the readiness of smart predictive tools to manage industrial big data to achieve productivity and resilient product life cycle management with improved service value. First, industrial competitiveness among the U.S., Germany, China, and Japan are examined. Second, Cyber-Physical System (CPS) enabled product manufacturing and services will be introduced. Third, advanced predictive analytics technologies for smart maintenance and

manufacturing systems with case studies will be presented. Finally, Dominant Innovation[®] for smart service design will be introduced with case studies.

WA-00.2 [K] Forecasting Innovation Pathways: The Case of Big Data

Alan Porter; Georgia Institute of Technology, United States

PICMET's primary mission is to advance analyses of changing technologies to inform technology management. That reflects balancing expert and empirical components to provide effective intelligence. Are managers ready for that? Doubts remain. Dr. Porter will share an example of his group's efforts to "Forecast Innovation Pathways" (FIP) for the case of "Big Data." In tackling such a challenge, we strive to understand the target technology and its attendant "technology delivery system" (i.e., contextual factors affecting development of novel applications). We then perform "tech mining" - text analyses of research publication, patent, and contextual abstract records on the topic, retrieved from databases. One aspect of special interest is detecting "emergence." Our process engages various experts and stakeholders to interpret the story of technology development to date. We then work to anticipate promising paths to diverse applications, and attendant issues, potential impacts, and policy/management leverage points. "Big Data" offers an intriguing case. The explosive growth in R&D, business, and diverse popular interests, concurrently, fuels generation of challenging scenarios for technology managers.

WB-01 TM in Health 4

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Kona Moku Salon A

Chair(s) Cory Hallam; University of Texas at San Antonio

WB-01.1 [R] Digital Health and Social Needs: An Empirical Study of Intentions and Behaviors

Gianluca Zanella; University of Texas at San Antonio, United States

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

Nasim Talebi; University of Texas at San Antonio, United States

The convergence of wearable sensor technology and personalized predictive analytics has the potential to help researchers with early detection and treatment of medical problems. We anticipate that the clinical analysis of the flow of data coming from the individual's continuous monitoring will drive new discoveries and treatments. Moreover, the development of personalized predictive models will drive the healthcare industry to shift from a reactive model to a proactive model, helping healthcare providers optimize care costs and offer a better customized service to patients. However, amidst the excitement for this new healthcare scenario, the amount of personal and sensitive data flowing from wearable devices to the cloud raises concerns about data security and customer privacy. While cyber-security experts and lawmakers are already working on securing the infrastructure, privacy issues are emerging from the individuals' social habits. The convergence of social media with new wearable device features raises potential issues related to the online disclosure of sensitive medical data. Furthermore, the longitudinal collection of wearable data may lend itself to the development of new medical information, what we coin "emergent medical records." Data from an exploratory study shows how user intent to avoid potential privacy issues disclosing sensitive medical information collides with the individual's social propensity to share wearable information, generating a potentially regrettable behavior.

WB-01.2 [A] The Pre-adoption Process of a New Technology: A Percolation Study of Artificial Skin for Medical Diabetes Treatment

Miriam Falcone; Bocconi University, Italy

Rainer P Hasenauer; WU-Wien, Austria

Current economic models are likely to analyze the market scenario from the moment when the new product (or the new technology) is entering it. This study aim is to report that there is room for improvements dealing with market variables in the pre-market phase. Through the study of one of the most revolutionary technologies under development of recent years, applied to one of the most common medical issues of the actual society, using a very recent

SESSIONS

diffusion model, this study aims at pointing out the relevance of further research in this direction. The artificial skin technology, applied to the diabetes case, is thus analyzed in the light of the percolation model. A specific individual adoption function has been identified. It has been consequently used for the modelling of the collective percolated behavior and for the definition of ex-ante marketing technics tailored to the specific market.

WB-01.3 [A] Network Service to Enhance Self-Improvement Activities for Health: A Challenge to Change Passive Social Model to Active Health Creation and Disease Prevention

Seiichi Watanabe; Health Improvement Net Service LLC, Japan

Yoji Tani; Health Improvement Net Service LLC, Japan

Masayuki Ono; Japan Techno-Economics Society, Japan

Redirection of the literacy of the general public as well as the public policies and industry strategies to change the passive social model depending on medicines and surgery after disease are found to active health creation and disease prevention was proposed by JATES, an industrial society, based on its Sensor Network Study Project on Health and Medical Care. Application and management of the sensor network technology and associated services were urged for the purpose. Social experiments to explore the feasibility of the proposal followed founding of the start-up, Health Improvement Net Service, LLC, to realize the proposals as business has offered promising prospects for the ultimate change of the social model. Although the challenge is at an early stage, there have been encouraging findings for the bottom up, emergency approach utilizing the sensor network and associated services. The bottom up, emergency approach will hopefully generate convinced clients to become opinion leaders and influence a large portion of the population. Based on the accumulated evidence on the effectiveness of the service, collaborations with health insurance associations as well as large organizations are pursued to acquire the scale required for influential platforms to ultimately change the passive social model.

WB-03 S & T Policy 4

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Kona Moku Salon C

Chair(s) Humberto Merritt; Instituto Politecnico Nacional (IPN)

WB-03.1 [R] Research Resources and Scientific Outputs in China: Based on a Survey Data

Dasheng Deng; National Academy of Innovation Strategy, CAST, China

Hui Shi; National Academy of Innovation Strategy of CAST, China

Linjia Zhao; National Academy of Innovation Strategy, CAST, China

Based on a nationwide survey data on Chinese research personnel, this paper analyzes the status of research resource acquisition and the influential factors of the number of papers published. The statistic results show that the research personnel, with doctoral degree and senior professional title, have obvious advantages to acquire research resources. Moreover, possession of more resources significantly increases the total number of published papers, while age, gender, and administrative post are not statistically significant in the regression model.

WB-03.2 [R] The Evolving Role of Public Policy in Promoting Information Technologies: The Case of Mexico

Humberto Merritt; Instituto Politecnico Nacional (IPN), Mexico

Over the years, information technologies (ITs) have greatly stimulated economic growth and development. Because the Internet is one of the most prominent IT technologies, its contribution to the advancement of education, learning and knowledge is of enormous importance. It is hardly surprising, therefore, that the commitment to the diffusion of the Internet has become a top issue for many developing nations. In the case of Mexico, Internet penetration has undergone a number of setbacks, mainly due to a misinterpretation of the factors causing the so-called digital divide. Hence, this paper aims to analyze the role that

public policy plays in encouraging the diffusion of the Internet. Available data shows that Internet diffusion remains relatively low in spite of recent governmental initiatives devised to encourage connectivity. The main challenge for policy-makers is then to encourage the private investment in IT infrastructure in order to increase Internet diffusion.

WB-03.3 [R] Governmental Funded Research Programs and Their Determinant: Focus on Matching Fund of Private Sector in Korea

Seungchul Baek; Korea Institute of Industrial Technology, Korea, South

Dongsuk Kang; Korea Advanced Institute of Scienc and Technology, Korea, South

Dongkyu Park; Korea Institute of Industrial Technology, Korea, South

This research analyzes the performance factors of industrial R&D programs in the relationship between R&D input variables (i.e., budget size and time, firm size, R&D commitment, technology characteristics) and output variables (i.e., patent, paper and technology transfer and realty income). Our results indicate that firm size has positive impact on R&D performances. Technology characteristics is insignificant to all R&D performance factors. However, matching fund ratio is partially significant to most of the R&D performance factors, but no moderating effects except firm size.

WB-04 Collaborations for TM 5

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Honolulu

Chair(s) James K.C. Chen; Asia University

WB-04.1 [R] The Innovative Methodology of Recognition the Most Appropriate Places with a Great Potential for Tourist Satisfaction

Melita Rozman Cafuta; University of Maribor, Slovenia

Bostjan Brumen; University of Maribor, Slovenia

Many countries and regions have appropriate and necessary conditions for the development of tourism. For infrequently visited places, it is essential to seek new opportunities in social innovation. The focus of our research is an evaluation methodology for determining the social characteristics of an urban environment to reveal appropriate places with a great potential for tourist satisfaction and to identify the important areas that should be included in an urban tourist offer. A method was designed for using it in the comparative analysis of concrete locations. An instrument (questionnaire) was developed to support the evaluation methodology. The applicability of the methodology was demonstrated in several tourist attractions, once during the daytime and once during the night. A response from 200 persons (long-term tourists) was analyzed. The obtained research results provide useful information of the current spatial situation needed for a successful development strategy in tourism. The presented methodology is only one segment of the entire technological management used in tourism. In our case the technology management is the selection process of suitable locations involved in sightseeing tours.

WB-04.2 [R] Exploring the Influence Factors for Creation One Knowledge Hub of Science Park: Comparison between Silicon Valley and Hsinchu Science Park

James K Chen; Asia University, Taiwan

Benson S Sun; Asia University, Taiwan

Amrita Batchuluun; Asia University, Mongolia

The industrial economy has been changing due to globalization such that the science park has become a key factor for national economic competitiveness. The science park plays an important role for new technological innovation development and high-tech industrial development. It relates the whole national economic growth and industry's innovative capabilities. This study, through a literature review, AHP and expert method, draws out these influence factors and conceptual framework. The main influence domain factors include technology knowledge (TK), knowledge spillover (KS), learning environment (LE), innovation performance (IP), absorptive capacity (AC), and regional development (RD). This research,

SESSIONS

through expert's questionnaire and AHP method, outlines which factors have direct impact and which factors have indirect effects on the knowledge hub of a science park. The results are that IP is the most important factor in the main-factor domain, which is a very important factor for creating a knowledge hub of a science park. Under the TK domain, the respondents of Silicon Valley and Hsinchu Science Park have by consensus selected "organization trust" as the most important sub-factor for this domain. "Market orientation" was also evaluated as the most important sub-factor in the IP main factor domain. In "regional development" the main factor shows that "localized competition" was the most important sub-factor for building up the knowledge hub of a science park. The experts of Silicon Valley and Hsinchu Science Park have a more consensus viewpoint on creating one high-tech knowledge hub of a science park.

WB-04.3 [R] Co-create Innovative Business Model: A Case Study of Social Enterprise in Taiwan

Huan Wei Liang; National Chengchi University, Taiwan

The co-creation model has become an increasingly crucial and innovative source of competitive advantage for firms as discussed in recent studies. Most of the literature has focused on co-creation between firms and customers. Nevertheless, multi-stakeholders play more influence on the business activities; social enterprises provide good examples themselves for social innovation to co-create with stakeholders by providing services and solving social problems through innovative business ways. Thus, this paper analyzes one social enterprise, "iHealth Express Group" (hereafter "iHealth"), which developed a mobile medical care online to offline infrastructure and extended the service to long-term care in Taiwan to express how it co-create new business with multi-stakeholders by qualitative study. iHealth built several innovative platforms and identified itself as decentralized service platforms, and it also won the third prize of "DBS-NUS Social Venture Challenge Asia" in Singapore in 2015. The findings illuminate several co-creation features of iHealth and propose six propositions for new business service co-creation of social enterprises. This paper argues social mission and positiveness of innovation playing an imperative role in co-creation activities; furthermore, we build a framework relating the effects social enterprises co-creation for discussing the implications of academics and managing the relationship with stakeholders.

WB-04.4 [R] How Much Social Innovation is Behind the Online Platforms of the Sharing Economy?: An Exploratory Investigation and Educing of Clusters in the German Context

Anja Herrmann-Fankhaenel; Technische Universitaet Chemnitz, Germany
Stefan Huesig; Technische Universitaet Chemnitz, Germany

The paper aims to generate insight about conceptualization of the sharing economy. With a field research of 76 online platforms associated with the German sharing economy (SE), a generalized conceptualization is formed. With the inferred attributes and developed categories, clusters are built. The German sharing economy is outlined as a conglomerate of business models that are effecting classical consumption by online platform-using business organizations, peer-to-peer consumption without business intermediates, and hybrid forms between commercial and non-commercial users. Within these and their frequency, conclusions about possibilities for alternative consumption and social innovations are discussed. A minority can be directly linked to alternative consumption that acts without business intermediates or without monetary reward. Seldom can cases be interpreted as social innovations, because improvements in social concerns are enabled through online platform technology. The frame of the German economic system for the sharing economy is considered briefly to underpin assumed developments and effects, which led to the actual status and will influence the sharing economy's future. The study is theoretically based on the resource-dependence approach and on related fields. Concluding hypotheses are derived from our results for further research on SE.

WB-05 ICT Management 1

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Waikiki Salon 1

Chair(s) Deok S Yim; Science and Technology Policy Institute

WB-05.1 [A] The Strategy of Technology Park for the Development of IT Industry in Pakistan

Deok S Yim; Science and Technology Policy Institute, Korea, South
Hwang H Cho; Science and Technology Policy Institute, Korea, South
ChiUng Song; Science and Technology Policy Institute, Korea, South
Jaewon Lee; Science and Technology Policy Institute, Korea, South
Seona Lee; Science and Technology Policy Institute, Korea, South
Sinae Park; Science and Technology Policy Institute, Korea, South

Pakistan has been experiencing slow but steady economic growth in recent years, and the software industry is booming thanks to an abundant young population who works for programming with good English skills. Recognizing the development potential of the software industry, the Pakistan government has been promoting its development by providing various supports. However, it seems that the technological ecosystem is not fully developed, the university industry collaboration is weak and technological development is not advanced. In this context, the Pakistani government is trying to introduce a new advanced technology park initiative to promote the industry as well as to provide the required work space. Nowadays, technology parks established by the government are supporting the development of various industries. In this context, the research was done to evaluate whether the technology park initiative for the IT industry would also be effective in Pakistan. In the research, the conceptual review was conducted for the technology park, and SWOT analysis was done for the current Pakistan software industry. It is argued that the technology park can play an important role in developing Pakistan's software industry when the right policy and management can be assured at the government level.

WB-05.2 [R] Improvement of Regional Information Policy Mechanisms in the Process of Civil Service Modernization in the Republic of Tatarstan

G M Ibragimova; Kazan (Volga region) Federal University, Russia
E M Razumovskaya; Kazan (Volga region) Federal University, Russia
V V Tsalkova; Kazan (Volga region) Federal University, Russia
L A Leto; Kazan (Volga region) Federal University, Russia
Ruslan G Zakirov; Kazan (Volga region) Federal University, Russia

The current informatization policy of the Republic of Tatarstan is primarily aimed at building up the modern information and telecommunications infrastructure, rendering high quality services on its basis and providing a high level of general availability of information and technologies. Thanks to the current policy, the Republic of Tatarstan has become the only "digital" territorial entity of the Russian Federation, where 100% digitalization of information infrastructure is provided.

WB-05.3 [A] Method to Identify Quality Ideas for New Product Development

Khairul Ridwan B Mohd Ibrahim; PETRONAS Chemicals Group Berhad, Malaysia
Ross F Gilmour; PETRONAS Chemicals Group Berhad, Malaysia

Success rates of ideas launched to the market in new product development (NPD) are low. It is estimated that there are only three successful lunches from 1000 ideas. This means that standard practices in launching products in organizations are highly inefficient. To improve the efficiency, we developed practical tools and processes to better manage the fuzzy front end of innovation in NPD. The process developed involves tools such as challenge framing, online idea management, modified Delphi ideation and review sessions, and a semi-quantitative opportunity/feasibility matrix for prioritization. In a case study discussed in this paper, 43 ideas were gathered and later prioritized to six ideas by highly engaged participants. This was enabled by the practical and straight-forward approaches applied. Being able to better manage the fuzzy front end, high quality ideas were able to be identified. The systematized approach delivered a significant improvement in its efficiency leading to more successful product launches.

SESSIONS

WB-06 Productivity Management

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Waikiki Salon 2

Chair(s) Timothy R Anderson; Portland State University

WB-06.1 [R] Application of Auxiliary Equipment in Productivity Improvement

Ngaka N Mosia; University of South Africa, South Africa

Production engineering is facing challenges as a result of stiff competition in today's market because manufacturers are under pressure to respond to customer demands and quality. These conditions put an insurmountable pressure on the production process and productivity improvement becomes the required leverage for an organization. When conventional productivity improvement tools and techniques do not yield the required results, engineering has to resort to measures that can alleviate the circumstance by introducing productivity support auxiliary equipment. Achieving responsiveness in productivity improvement is an ever-challenging task in the production industry. The scope for productivity improvement always exists and therefore there are alternative ways and means to achieve further productivity improvement, such as the application of auxiliary equipment in productivity improvement initiatives. Preliminary qualitative research supports the use of auxiliary production support equipment such as fixtures, jigs and spindles to increase the responsiveness of production to productivity improvement requirements. This paper presents a comprehensive example that illustrates the application of auxiliary production support equipment in productivity improvement initiatives. A comparison of results achieved with and without the application of auxiliary equipment is used as supporting evidence that auxiliary equipment has a huge impact on productivity improvement when applied in the production industry.

WB-06.2 [A] Return on Investment for Technology Supported by Business Process Management

*Kazuo Hatakeyama; UNISOCIESC, Brazil
Luiz G Oliveira; UNISOCIESC, Brazil*

Regarding the actual experiences, although interest in return on investment (ROI) methodology and its use has increased, people from the business area argue that the use of this approach for technology application is difficult, which constitutes one paradigm to be broken. On the other hand, the benefits obtained with the use of technology in business process management (BPM) have been increasing in many companies of various sectors. The results from those earning opportunities are generating increased demand for technology application to automated process. However, in the most of the cases the gain evaluation is qualitative and subjective. This paper aims to present some factors to leave the exercise more clear using the BPM approach and use it to prove losses reduction based on date and facts using ROI methodology, speaking the sponsor's language and avoiding long speeches. The suggested ROI approach was planned to be tested in the manufacturing enterprise of household appliances to improve the present practice.

WB-06.3 [R] Impacts to Productivity in Metal Stud Framing, and the Hanging and Finishing of Gypsum Drywall

*Gerald H Williams, Jr.; Construction Research, LLC, United States
Timothy R Anderson; Portland State University, United States*

Metal stud framing, drywall, and tape and finishing trade-work is a major component of every building project. Labor productivity is the largest single variable affecting the framing and drywall contractors' cost of performance. In spite of these facts, no major study of labor productivity in this major construction trade has previously been done. This study was undertaken to fill this gap in the literature; specifically, to investigate external impacts to labor productivity in this construction sector. The study measured the impact of 38 variables on 226 separate projects. The study found that poor quality design documents, unexpected labor congestion, fragmentation, and overtime and added shift work negatively impacted labor productivity.

WB-07 Innovation Management 7

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Waikiki Salon 3

Chair(s) Manabu Sawaguchi; Waseda University

WB-07.1 [R] Framing Patent Indicators for Innovation Study

*Peng-I Lee; Institute of Technology Management, NCHU, Taiwan
Hsin-Ning Su; Institute of Technology Management, NCHU, Taiwan*

Patent indicators are increasingly used to assess competitive advantage or technology development trends for innovation studies. There are a number of patent indicators proposed in the literature to access such technology-based innovativeness. However, most of the studies arbitrarily select patent indicators for their investigations without optimizing the choice of indicators. Only a limited number of researchers attempt to classify patent indicators to assist in the selection of indicators for diverse research objectives. In this paper, a novel framework structure is provided to frame patent indicators accepted in scientific literature after extensive review on patent-related journal papers. The framework provides insights on comprehensive correlations as well as management implications of obtainable patent indicators. It is expected that this framework can serve as a channel for innovation studies to uncover much wider and systematic insights from the application of patent indicators.

WB-07.2 [R] How Does Japanese 'Kaizen-Activities' Collaborate with 'Jugaad Innovation'?

Manabu Sawaguchi; Waseda University, Japan

Japanese "Kaizen activities" with the power of skilled workers at actual work sites are considered to be "Japanese style grass-roots innovation (Js-GRI)." Js-GRI comes into existence from collaboration with R&D division. Moreover, "Karakuri technology" and MOT techniques (like IE, QC, VE and so on) sophisticate Js-GRI. In particular, "Karakuri technology" has been considered the backbone of Js-GRI. In the second half, bandwagon effects between Js-GRI and "Jugaad innovation" will be discussed from the aspects of Js-GRI. "Jugaad" is a colloquial Hindi word that means an innovative solution. More specifically, "Jugaad" innovation is creative solutions like the unique products rising out of the necessity of the local communities in India. Therefore, "Jugaad innovation" has the same in meaning as "Indian style grass-roots innovation." Moreover, the features regarding "Jugaad innovation" are seen not only in India but also other developing countries like China, Brazil and so on. Given this situation, the study treats "Jugaad innovation" as "Developing countries' GRI (Dc-GRI). Through the field studies and questionnaire surveys, it might be provided the fact that Js-GRI is helpful for improving Dc-GRI's value" from the results of these studies. Finally, further analyses of the surveys will show clearly the challenges for facilitating the collaboration between Js-GRI and Dc-GRI.

WB-07.3 [R] Strengthening the Teaching of Science Subjects at the Level of High School in Madagascar

*Diamondra Helinoro Razaivaovoloniana; University of Antananarivo, Madagascar
Elise Raveloson; University of Antananarivo, Madagascar
Saholiana Rahelariholaso; University of Antananarivo, Madagascar
Olivier Herindrainy Rakotomalala; University of Antananarivo, Brazil
Jules Bosco Bezaka; University of Antananarivo, Madagascar*

Madagascar is a developing country where the rate of enrolment and quality of education are still weak. At the college level, these problems are still very sensitive since some teachers, especially those of science subjects, have difficulty passing their courses. The situation is worsening in rural areas where teachers lack academic skills and do not have adequate educational materials to better explain and engage the attention of students. To address these gaps, the use of electronic media for the course is a real solution. This pedagogical innovation allows modernizing learning through visualization of content and limiting the possible misinterpretations of examples issued by teachers who lack preparation or have not

SESSIONS

mastered the lesson. This method consists of filming scientific courses undertaken by experienced teachers and disseminating the VCD to institutions in rural areas where science teachers are insufficient or low-skilled. Using this method helps the academic performance tremendously and improves the quality of education, especially in rural areas.

WB-08 Knowledge Management 3

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Milo I

Chair(s) TaiJung Choi; Korea Institute of S&T Evaluation and Planning

WB-08.1 [R] Towards an Efficient R&D Theme Prediction with Machine Learning

Masashi Shibata; Yamaguchi University, Japan

Koichi Inoue; Yamaguchi University, Japan

Yuichi Ohtsuka; Yamaguchi University, Japan

Kazuhiro Fukuyo; Yamaguchi University, Japan

Masakazu Takahashi; Yamaguchi University, Japan

This paper proposes an efficient method for R&D theme selection. There are various methods for the R&D theme selection such as patent analysis, paper survey and Delphi investigation and so on. Patents and peer reviewed papers are easy to obtain, and are frequently used as materials for the selection method. In addition, making use of the national projects such as the social infrastructures feasibility project is one of the efficient theme selection methods. A survey shows that the R&D theme selection is one of the biggest challenges for the private company. Generally, short-term R&D theme selection is aiming at implementation within two years such as commercialization and sales expansion. Long-term theme is used for the R&D investment budget plan. On the other hand, medium-term R&D theme is often aimed implementation within five years such as an exploratory technology theme. Since it relies on the heuristics knowledge for the theme selection with technology trends, an efficient selection method of the medium-term theme is required. Many technological analyses with the intellectual properties are performed so far. In this paper we propose a method of selecting the R&D theme using a machine learning based on public information.

WB-08.2 [R] Mining and Modelling Web User Engagement: A Survey on Academic Sites for Framework Establishment

Tarmo Robal; Tallinn University of Technology, Estonia

Ahto Kalja; Tallinn University of Technology, Estonia

The rapid development of information and communication technologies has made the Internet to become the main source of information, not to say a platform to share knowledge and information on a daily basis, consumed on various devices and platforms. This information consumption on the other hand produces data that can be used to measure user engagement into content and has been used for various purposes, e.g., for advertising and web personalization. The most common metric used has been click through rate. However, a simple click does not necessarily mean user engagement, although it can be one of the metrics applied. In this paper we focus on user engagement aspects and propose a framework to evaluate user engagement towards sites and provided web content. To demonstrate and prove the framework, we have conducted an extensive study on several websites in the academic domain.

WB-08.3 [A] Mission-oriented Evaluation System of Government-Funded Research Institutes in Korea

TaiJung Choi; Korea Institute of S&T Evaluation and Planning, Korea, South

The importance of the performance evaluation of government-funded research institutes (GRI) has been emphasized in Korea for the reason that the investment in GRIs is constantly increasing and accounts for 45 percent of the national R&D budget in 2012. For measuring excellence of R&D performances, the continuous improvements for the evaluation system for GRIs have been made over several decades. Nevertheless, incessant needs for developing more compatible and adaptive methods to review its own mission effectively have been

increasing. This study is introducing a newly designed evaluation system of GRI, which is named as "mission-based approach" in GRI evaluation. It has several features. First, the original characteristics and mission of each institute are fully reflected from the plan review to the final evaluation. Second, it is composed of two levels of evaluations in order to enhance the accuracy of the results. Lastly, the evaluation result is linked to the R&D budget based on the evaluation grade. It is expected that this method can provide insight for more effectively assessing research performance of GRIs.

WB-09 Emerging Tech 4

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Milo II

Chair(s) Eric Rebertisch; Massachusetts Institute of Technology (MIT)

WB-09.1 [R] Modeling the Benefits of Frontloading and Knowledge Reuse in Lean Product Development

Endris Kerga; Massachusetts Institute of Technology, United States

Roland Schmid; Massachusetts Institute of Technology, United States

Eric Rebertisch; Massachusetts Institute of Technology, United States

Sergio Terzi; Politecnico di Milano, Italy

This paper uses system dynamics (SD) approach to model the lean product development strategy of set-based design (SBD) and the traditional product development strategy of point-based design (PBD). Using the Vensim System Dynamics (SD) tool, the paper investigates the performance outcomes of adopting the strategies within a new product development (NPD) context. The model simulates the development of five hypothetical projects. The model uses a classical SD project view as a rework cycle. It includes elements of both PBD and SBD which can be switched on/off to assess their impact on performance. Multiple projects are modeled so that the knowledge reuse issues are explored for differentiating PBD and SBD. In particular, we address the question of "what are the effects of frontloading in SBD on project durations, total project costs, and return on investment (ROI)?" From initial simulation results, it is found that in a typical PD, SBD can bring up to 25% reduction in average project durations, 40% reduction in total project costs and improves ROI significantly.

WB-09.2 [A] Barriers to Introduction of Autonomous Cars in US and Developing Countries

Apeksha Gupta; Portland State University, United States

Ritu Chaturvedi; Portland State University, United States

The introduction of autonomous vehicles does not seem to be a distant future anymore. Vehicle manufacturers predict that self-driven cars will be a reality on the roads of the United States by the year 2020. With the autonomous cars, the stress of everyday driving could be reduced and that time could be very well spent in some productive work. Disabled and elderly people can also benefit from this technology and become self-reliant. These are just a couple of several societal impacts this technology can bring to our lives. This work is aimed at studying the influence of this innovative technology on the society as a whole. A lot of market research data for this technology is available from the US and other developed European countries. However, there is only limited data available from developing countries. There is a significant scope for acceptance and growth of this technology in developing countries as well. The implementation of autonomous cars relies heavily on the underlying factors like infrastructure, traffic regulations and legislature. Such parameters in developing countries like India, China, Brazil, etc. are contrastingly different from that in the US. This work, in particular, focuses on the barriers to implementation and the societal impact of autonomous cars in developing countries. PESTEL analysis framework is used in this work to analyze the barriers to introduction of autonomous cars. A survey is conducted to understand the willingness to accept autonomous cars and its impact in developing countries. Interviews of industry professionals will also be conducted to understand the challenges faced by vehicle manufacturers to bring this vision to reality.

WB-09.3 [R] Divergence or Submission?: The Extremals of Global Wireless

SESSIONS

Technology

*Oludare Olorunniwo; Obafemi Awolowo University, Nigeria
Lawrence O Kehinde; Obafemi Awolowo University, Nigeria*

Real-time location applications with the aid of wireless sensor networks (WSNs) have climaxed at indoor navigation. However, the predictions and estimations of descriptors of such WSNs have defined the isoperimetric problems and degeneration of patterns under circumstances of symmetry. Further, points of discontinuity and weak variations of signals of ubiquitous positioning necessitate the characterization of vulnerabilities and susceptibilities of various business models. Therefore, on the horizon of emerging technologies, this paper presents (1) the L1 band ensembles of an indoor scenario of A-GPS+GLONASS, (2) the spectral analysis of the observables, and (3) the transitions, vicissitudes and techno-economic implications of the developments in global WSN industries. Evidences of improved measurements and performance metrics of drifting signals are crucial initiatives toward sustainable management of the innovative WSN technology age.

WB-10 Intellectual Property 6

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Milo III

Chair(s) Edward van der Merwe, Stellenbosch University

WB-10.1 [R] Strategy of Intellectual Property Right for the Internet of Things: How IPRs Strategy Adds Value?

*Yi-juen Chen; National Chung Hsing University, Taiwan
Ta-jung Lu; National Chung Hsing University, Taiwan*

The Internet of Things (IoT) is thought to be the third wave of IT-driven competition, which is expected to be a much bigger revolution than the past two waves, computer and the Internet. As IoT involves multiple technologies, and intellectual property rights (IPRs) are especially important for industries involving multiple technologies, firms shall develop a proper IPRs strategy to gain the rent that a firm deserves. This research aims to analyze the IPRs strategy for value creation of the IoT industry. Patent strategy based on theories of Granstrand, Fisher III & Oberholzer-Gee and Reitzig are integrated, with the possibilities of securing freedom to operate or to share/license the IPRs. A questionnaire is used and interviews are carried out with IoT firms to evaluate and formulate practical IPRs strategies. This paper identifies IoT competition as between alliances and standards, and that a proper IPRs strategy needs to be tailored according to such competition and each individual firm's condition.

WB-10.2 [R] Evaluating Inclusive Innovative Performance: The Case of the e-Health System of the Western Cape Region, South Africa

*Edward van der Merwe; Stellenbosch University, South Africa
Sara S Grobbelaar; Stellenbosch University, South Africa*

This paper presents a theoretical framework for determining the inclusive innovative performance of the eHealth innovation system in the Western Cape region in South Africa. The authors critically reflect on exclusion and inclusion as a process and draw on the innovation systems approach towards developing a possible set of inclusive innovation performance indicators. The inclusive innovation system literature is still in its infancy with most of the contributions being theoretical and conceptual with a lack of empirical work. Apart from being unclear of what such a system would actually look like in reality, there is also a lack of clear methodologies for the analysis of inclusive innovation systems. The analysis method of the technological innovation systems literature was found to be the most appropriate and was adapted in this research. This entails the nature of innovations required; actors involved and the relations among each other; the type of learning they take on; and the institutional environment they are operating in. From the literature, an eight-step framework was developed as follows: 1) define the inclusive innovation system in focus; 2) identify structural components; 3) identify functions; 4) system failure approach; 5) inducement and blocking mechanisms; 6) phase of development; 7) assessing functionality and setting process goals; and 8) addressing key policy issues. The framework summarizes and sets

out the theoretical underpinning for the empirical stage, on which this framework will be applied, to improve the general understanding of the innovative performance of the eHealth innovation system in the Western Cape region in South Africa.

WB-10.3 [R] Challenges to Scaling Inclusive Innovations: Four Case Studies from the Healthcare Sector in the Western Cape Province of South Africa

*Sylvester Chatukuta; Stellenbosch University, South Africa
Sara S Grobbelaar; Stellenbosch University, South Africa*

Inclusive innovation has been suggested to provide some solutions to societal problems such as access to clean water, healthcare, financial services, electrical power, modern communications, and education to marginalized communities. Through inclusive innovation the underserved may become a dynamic consumer market or a diverse source of supply. We consider various growth strategies and enterprise development strategies to promote scaling of inclusive innovations in the healthcare sector in South Africa. By applying the case study method, we consider four cases, each focused on a specific delivery channel, namely: 1) primary healthcare; 2) secondary and tertiary healthcare; 3) devices; and 4) networked products. Through the case study method we uncover and map typological elements for considering inclusive innovation business models in the healthcare sector. In line with the study objective, we ascertain the implications of our findings to the existing perspectives on constraints to inclusive businesses and strategies that can be employed to scale such projects. Limitations as well as opportunities for further research are noted and integrated in a suggested research agenda framework.

WB-11 Supply Chain Management 2

Wednesday, 9/7/2016, 10:30 - 12:00

Room: Milo IV

Chair(s) Kunio Shirahada; Japan Advanced Institute of Science and Technology

WB-11.1 [R] Design of a Case-Based Multi-Agent Wave Picking Decision Support System for Handling E-Commerce Shipments

*K.H. Leung; The Hong Kong Polytechnic University, Hong Kong
King-lun T Choy; The Hong Kong Polytechnic University, Hong Kong
Migar M.C. Tam; CAS Logistics Limited, Hong Kong
Stephen W.Y. Cheng; The Hong Kong Polytechnic University, Hong Kong
C.H.Y. Lam; The Hong Kong Polytechnic University, Hong Kong
Jason C.H. Lee; The Hong Kong Polytechnic University, Hong Kong
G.K.H. Pang; The University of Hong Kong, Hong Kong*

The emerging trend of e-commerce business poses serious challenges in the field of logistics. To handle e-commerce shipments, warehouses must be able to efficiently handle a large number of stock-keeping units (SKUs), pick and pack small volume orders, and deliver them on time in small parcel shipments to consumers. In this sense, traditional order fulfillment, which encompasses receiving, put-away, picking, and transport through the warehouse, might not be able to fully fulfill the requirements of e-commerce. Considering the fact that order picking in warehouses is one of the most costly activities amongst the logistics operating categories, there is a crucial need to adopt a wave picking strategy to handle e-commerce shipments, an order picking approach that groups the orders for picking at the same time to minimize repeated visits to nearby storage locations. To apply the wave picking strategy properly, decision support for establishing the timing of each wave and the quantity of items to be picked is essential. Therefore, in this paper, a case-based multi-agent wave picking decision support system is proposed to help decision-makers in generating wave picking sequences in order to handle e-commerce shipments, through the integration of case-based reasoning and multi-agent technique. After a pilot study of the proposed system in a third-party logistics service provider, the order-processing efficiency was greatly enhanced.

WB-11.2 [R] Analysis of Thailand's Industrial Competitiveness in ASEAN

SESSIONS

Economic Community Era: The Case of Automotive Industry

Nitipon Tansakul; Japan Advanced Institute of Science and Technology, Japan
Kunio Shirahada; Japan Advanced Institute of Science and Technology, Japan

The ASEAN Economic Community (AEC) concept was espoused at the end of 2015 to create an integrated economy in ASEAN countries, which will promote interregional trade and affect competitive advantage of countries. Since Thailand has a competitive advantage in the manufacturing industry, especially automotive production, the government needs to be concerned about the changing business situation in Thailand to maintain the competitiveness of the economic sector. The purpose of this paper is to identify the potentials of social and economic change in Thailand's automotive industry with respect to AEC development through expert interviews to clarify the situation in Thailand's automotive industry. The results of this study are presented in the development plans for maintaining the leading position and increasing the competitiveness of Thai's automotive industry. Furthermore, policies and strategies are prepared to create value in the automotive industry.

WB-11.3 [R] Mobilizing Scarce Resource through Social Networks: Exploring Mechanism that Accelerated the Growth of the Chinese PV Industry

Yaichi Aoshima; Hitotsubashi University, Japan
Wen Wang; Hitotsubashi University, Japan
Jinwei Zhu; Jiangnan University, China

This paper explores how the Chinese photovoltaic (PV) industry has grown extremely fast from the middle of 2000s, and successfully dominated the world PV product market, by conducting a detailed field study on the industry cluster of Wuxi area in Jiangsu Province, which involves interviews of more than 42 persons and a questionnaire survey. Whereas prior research has tended to emphasize roles of the central government and entrepreneurial activities of major PV firms, we rather focus on processes that enabled PV firms, including small and medium ones, to get access to the resources such as technology, management know-how, and skilled labor, which were critical for their growth but rare in China. Our study particularly indicates that social networks based on informal and personal relations had taken very important roles for Chinese PV firms to overcome problems derived from scarcity of such critical resources. But it also implies that this process has induced homogeneity of firms and driven intense price competition in the market. The study sheds a light on both positive and negative roles of socially embedded relations on the industrial growth in developing countries.

WD-01 Technology Roadmapping 1

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Kona Moku Salon A

Chair(s) Kunio Shirahada; Japan Advanced Institute of Science and Technology

WD-01.1 [R] Leveraging and Challenging Factors in the Use of Technology Road Maps in the Context of Public Research Institutions

Liljan R Laraia; University of Sao Paulo, Brazil
Willy H Sousa; University of Sao Paulo, Brazil

Technology plans (TP) can represent a significant challenge to the planning efforts of organizations. The most common problems are flaws in project forecasting, whether they are new products, services or processes. To perform this study, a unit analysis was selected for the survey and a data collection protocol was developed. The research - divided into phase 1 and phase 2 - was carried out in order to identify the factors that can influence the technology planning process. The first phase of the construction methodology of the current TP, which basically consisted of periodic meetings, was investigated. The second phase, the T-Plan methodology, was considered and applied to the construction of a new technology plan, which resulted in a 10-year technology map. The factors investigated in both phases were organized in dimensions (planning, development and implementation) that have been segmented into search variables (viability, commitment, communication, drivers, prioritization, monitoring guidelines, learning, revalidation, application and replication). The

process of elaboration of the TP was analyzed considering two perspectives - quality and satisfaction - according to the perception of the respondents, and depending on the interview results, they were classified as leveraging or challenging. The unit analysis was the Center for Hydrogen Fuel Cell - CCCH, a department of The Energy and Nuclear Research Institute (IPEN) located in Brazil. This study allowed us to conclude that by applying the T-Plan methodology, there is a significant change from challenging to leveraging factors when changing from the traditional methodology to the T-Plan methodology. These results allow us to conclude from the investigated case that the application of the T-Plan methodology is both viable and even recommended in the context of technology plans for research units of public research institutions.

WD-01.2 [R] The Development of Shared-Question Based Technology Roadmapping for IT Engineers

Tsunayoshi Egawa; Japan Advanced Institute of Science and Technology, Japan
Kunio Shirahada; Japan Advanced Institute of Science and Technology, Japan

In the IT Industry, it is important for technology-based companies to make a flexible plan of technology development. Technology roadmapping, which promotes thinking of both technology push and market pull, is one of the strategic tools for it. However, the following two engineer-specific sets of values make it difficult to practice: (i) a set of values to avoid forecasting technology based on doubtful (high uncertainty) assumptions as illogical in terms of technology push and (ii) a set of values to have interests in verifications and validations of information for rationality in terms of market pull. To overcome it, there is a need to incorporate organizational management insight into technology roadmapping, thereby creating a new methodology for technology roadmapping in the IT industry. In this study, we propose a Shared-Questions-Based Technology Roadmapping consisting of future-oriented questions, a situation-based three-layer structure, and rising shape. By doing an action research in a Japanese IT service company, we found the methodology is effective for enhancing the cooperation behavior to achieve the future.

WD-01.3 [R] A Seamless Value Co-creation Service Roadmap of Assistive Technologies for the Elderly

Pornprom Ateetanan; Thammasat University, Thailand
Kunio Shirahada; Japan Advanced Institute of Science and Technology, Japan

The global population of the elderly is growing. Assistive technologies (ATs), e.g., monitoring health & safety, information sharing & telecare, communication support, independent living and long-term care, can be important enablers for the elderly care services' responses to the elderly quality of life. A service roadmap is an integrated technological service planning tool, focusing on the design of service systems and emphasizing macro-level planning for a certain future period. Although essential technology roadmaps of ATs exist, there is little focus on service roadmap, which is necessary for elderly care service providers and stakeholders to propose appropriate value offerings in the current and future market. This study proposes the framework to promote the encapsulation of service-dominant logic (S-D logic) and open innovation into an integrated service roadmap. The open innovation and S-D logic approach in the roadmap facilitates value co-creation platform. Based on the value co-creation concept, co-created values in the service roadmap are proposed and value co-creation is embedded into the service roadmap. The proposed seamless roadmap architecture is deployed for an R&D firm as a case example. Multi-stakeholder, e.g., government, investors, social entrepreneurs/providers and innovation networks, firms may adopt this roadmap to their strategic planning and initiate the social innovation with impact.

WD-02 Enterprise Management 1

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Kona Moku Salon B

Chair(s) Edmund Pawlowski; Poznan University of Technology

WD-02.1 [R] Flexibility of Organizational Structure in a Context of Organizational Innovations and Modern Concepts of Enterprise Management

SESSIONS

Edmund Pawlowski; Poznan University of Technology, Poland

Flexibility of the organizational structure of enterprises depends on, among others, the organizational strategy of the enterprise's management. Contemporary concepts of the management of knowledge-based enterprises are: learning, intelligent, virtual and agile, and assume high level of organizational structure flexibility. The literature analysis indicates, however, that theoretical postulates are only partially confirmed by empirical studies and case studies. The analysis of particular dimensions of organizational structure shows important differences between theoretical postulates and empirical studies. As much as the results of comparison of configuration and centralization dimensions' flexibility are consistent, the comparison of dimensions specialization, standardization and formalization brings inconsistent conclusions. The author's own research on the organizational structure of Polish enterprises is based on two large empirical research projects undertaken at the Faculty of Engineering Management of Poznan University of Technology, the first project conducted in 2012, called "Adjustment of enterprises' management systems to knowledge-based economy," and the second one in 2014 called "Determinants of implementing modern methods and technics of management in Polish enterprises." Both of these empirical studies included surveys of 150 enterprises representing the Polish economy. The results of these studies confirm the low level of organizational structure flexibility with regard to dimensions of specialization, standardization and formalization. Moreover, it was proven that for all dimensions of organizational structure, the level of flexibility depends on the functional area of the enterprise (marketing and sales, research and development, operational activity, administration).

WD-02.2 [A] Technology Management through Architecture Reference Models: A Smart Metering Case

Matus Korman; KTH Royal Institute of Technology, Sweden
Robert Lagerstrom; KTH Royal Institute of Technology, Sweden
Margus Valja; KTH Royal Institute of Technology, Sweden
Mathias Ekstedt; KTH Royal Institute of Technology, Sweden
Rikard Blom; KTH Royal Institute of Technology, Sweden

Enterprise architecture (EA) has become an essential part of managing technology in large enterprises. These days, automated analysis of EA is gaining increased attention. That is, using models of business and technology combined in order to analyze aspects such as cyber security, complexity, cost, performance, and availability. However, gathering all information needed and creating models for such analysis is a demanding and costly task. To lower the efforts needed, a number of approaches have been proposed; the most common are automatic data collection and reference models. However, these approaches are all still very immature and not efficient enough for the discipline, especially when it comes to using the models for analysis and not only for documentation and communication purposes. In this paper we propose a format for representing reference models focusing on analysis. The format is tested with a case in a large European project focusing on security in advanced metering infrastructure. Thus we have, based on the format, created a reference model for smart metering architecture and cyber security analysis. On a theoretical level we discuss the potential impact such a reference model can have.

WD-02.3 [R] Using Technology Summer Camp to Stimulate the Interest of Female High School Students in Technology Careers

Evelyn R Sowell; North Carolina A&T State University, United States
Lewis Waller; North Carolina A&T State University, United States
Andrea Ofori-Boadu; North Carolina A&T State University, United States
Gina Bullock; North Carolina A&T State University, United States

Increasing the pool of qualified workers in the science, technology, engineering and mathematics (STEM) areas has become one of the nation's key priorities, as those professions are the backbone of innovation and critical to our country's economic future. The 2015 Females in Technology (FIT) Summer Boot Camp project was a summer residential technology boot camp for low income rising high school junior and senior girls. The objective of the 2015 Summer FIT boot camp was to increase the number of low income female

students who pursue degrees in technology disciplines at the collegiate level and who are prepared for a technologically rich workforce. As a recruitment tool, we anticipate increasing the enrollment of female students in the School of Technology. The methodology for the FIT Boot Camp was a short-term intensive hands-on experience which was the first of its kind at NCA&T. The preliminary results have been more than promising. The pre- and post-test surveys indicate a positive trend in terms of knowledge gained, interest, and attitude towards technology. Not only did this program stimulate interest in the technology profession, it also introduced female students to new and innovative technology concepts while reinforcing and improving technology and leadership skills.

WD-03 Project Management 4

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Kona Moku Salon C

Chair(s) James K.C. Chen; Asia University

WD-03.1 [R] Ranking the Social-impact Factors for Major Security Emergency of Oil and Gas Pipelines in Urban

Fu-Jun Tian; Fujian Agriculture and Forestry University, China
James K.C. Chen; Asia University, Taiwan

Oil and gas pipelines are the lifeline of the national economy. However, statistical data shows that oil and gas pipelines have high potentiality of dangers in urban areas, which usually bring disastrous consequences to the city. People should not only take measures to reduce the possibility of major security emergencies from occurring, but also should try to improve the controllability of the social impact of security emergencies. Hence, the purpose of this study is to explore the social-impact factors of oil and gas pipeline security emergencies in urban areas. By employing the analytic hierarchy process (AHP) approach, this study ranks the relevant factors and then puts forward the control strategies to reduce the social impact. The result shows that the factors have different weights. Factors ranking can improve the speed and quality of decision-making, thereby strengthening emergency management by providing quicker feedback to the security control center, thus reducing the social-impact diffusion and potential disaster losses. In addition, it can provide a reference for the construction of the control mechanism or integrated information platform of security emergency for public administration departments, oil and gas production enterprises and other social organizations.

WD-03.2 [R] Improving Monitoring and Evaluation System for Community Development Project: SSECALINA Project Case

Diamondra Helinoro Razaivaovoloniana; University of Antananarivo, Madagascar
Pierre A Ratsimbazafy; University of Antananarivo, Madagascar
Elise Raveloson; University of Antananarivo, Madagascar
Olivier Herindrainy Rakotomalala; University of Antananarivo, Brazil
Jules Bosco Bezaka; University of Antananarivo, Madagascar

The SSECALINA project encounters problems during the implementation of various activities throughout their respective phases of execution. Gaps are stated between the actual and the desired situation. This is commonly observed during project monitoring and evaluation execution. To increase the efficiency of the monitoring and evaluation system, a comprehensive analysis framework will be used in the light of which solutions would be proposed. To remedy the defective state, two factors will be studied in this thesis including human or social factor and technical factor. The model proposed will help monitoring and evaluation staff in development programs to better invest in improving their work for the performance of the program.

WD-03.3 [A] Effectiveness of Electronic Media in Project Communication

Phathiswa Fotoyi; University of Pretoria, South Africa
Dongdong Jiang; University of Pretoria, South Africa

Electronic media was assessed to identify the most effective means to communicate project information during the Transnet (South African parastatal responsible for rail, port and pipe-

SESSIONS

lines) Capital Projects lifecycle. A quantitative study, in the form of a survey questionnaire targeting transnet executives, senior managers, specialists and operational staff based in four different locations (Johannesburg, Vryhur, Ermelo and Richards Bay), was applied as a data collection instrument. The stratified random sampling technique was used to ensure that respondents were fairly selected across positions and geographical locations. Old ways of communication that included email and telephone facilities were perceived to be highly effective in communicating project information to management at Transnet Capital Projects. On the other hand, intranet, video-conferencing, online notice board and facsimile were perceived to be poor in communicating project information to management. Similarly, the email and telephone electronic channels of communication were perceived to be highly effective in sharing project information among project teams. Likewise, the email and telephone electronic modes of communication were also perceived to be highly effective in communicating project information with clients and suppliers. Facsimile was ranked third after the email and telephone when communicating project information with clients and suppliers, though its effectiveness was still perceived to be low. Therefore, in order to effectively communicate Transnet Capital Project information with stakeholders, Transnet leadership should ensure that all its sites (both remote and accessible) have adequate infrastructure to support email and telephone facilities, which are perceived to be relevant and cost effective.

WD-04 TM in Energy 1

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Honolulu

Chair(s) Kees Rietsema; Embry-Riddle Aeronautical University

WD-04.1 [R] The Simulation and Management of Adaptive Smart Grid Oriented Power Mix Based on Evolutionary Dynamic Mechanism under High Percentage of Renewable Energy Policy

Shao-Pin Hung; National Taipei University, Taiwan

Ssu-Li Chang; National Taipei University, Taiwan

On the basis of evolutionary economics and adaptive control theory, this study develops an integrated energy resource portfolio, applying the concept of smart grid to provide the following functions: (1) accommodating supply-side, demand-side and regulating resources, (2) dynamically balancing supply and demand, and (3) coping with the challenge of climate change. To perform dynamic multi-agent system (MAS) empirical simulations, we further accommodate the following variables: (1) state variables, (2) measurement variables, (3) performance variables and (4) control variables, and the mutual relationship and interactions of the variables from the feedback mechanism. The results of the simulation under various scenarios are: (1) adaptive electricity demand, (2) adaptive self-organized non-linear path dependence for smart grid energy resources portfolio, (3) adaptive reserve capacity for evolutionary power resource planning and assets management, and (4) adaptive electricity prices, which can serve as references for decision-making for the planning and management of the electric power system.

WD-04.2 [R] Antecedents or Digressions?: The Socio-Economic Impacts of Renewable Energy

Oludare Olorunniwo; Obafemi Awolowo University, Nigeria

Moses A Olorunniwo; Obafemi Awolowo University, Nigeria

The global energy future - availability of energy supplies, energy security, environmental sustainability and strength of energy demand amidst competitive market forces and global economic crisis - is underpinned with aggressive visions of cost-effective technology management, strategic business portfolio, and integrated climate policies. However, the undisputed potential of renewable energy emphasizes its emergence and role in the diverse portfolio of the global energy mix. Therefore, as part of the central theme of affordable clean energy, this paper (1) reviewed the developments of renewables compared to natural gas, (2) analyzed the momentums in large-scale renewable energy technologies driven toward the global economy, and (3) evaluated the socio-economic motives of the transition toward low-carbon futures along with climate change issues. The indices of capacity growths in

the renewable energy sector are crucial toward the achievement of energy sustainability.

WD-04.3 [R] The Development of a New Approach to the Energy Management System Formation and the Estimation of Its Efficiency on the Basis of the Consumer Quality Theory

Tatiana Anisimova; Kazan (Volga region) Federal University, Russia

Ruslan G Zakirov; Kazan (Volga region) Federal University, Russia

The energy management system that is used in enterprises of different countries of the world is directed to solve such tasks as to increase the energy efficiency of output and production processes to economize energy resources in general economic activities of an enterprise. As it was stated in the process of studying a wide range of international publications, the majority of these tasks relate to the level of operative tasks of an enterprise. However, the solution of strategic tasks in the energy management system is often limited by the development of perspective energy saving plans, which in their turn are partly or even not connected with the plans of strategic development of an enterprise. In the current research we offer the mechanism of formation of connection between the activity planning in the energy management system and the strategic development of an enterprise. Such methods as Voice of Customer and House of Quality are offered to realize this mechanism. It should be noted that the given mechanism can be used most efficiently in the enterprises which seek the mutual increase of energy efficiency of the production and the energy efficiency of the final output. The mechanism that is suggested in the given research will promote the integration of aims and goals of the energy management system into the system of strategic management of an enterprise activity. The novelty of this approach lies, firstly, in the identification of a possibility to apply the instruments of the theory of productive quality (Voice of Customer and House of Quality) to solve a range of tasks that are not typical for these instruments; and secondly, in the application of a strategy-oriented approach to solve the tasks concerning the management of energy resources of an enterprise.

WD-05 ICT Management 2

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Waikiki Salon 1

Chair(s) Louwrence D Erasmus; University of Pretoria

WD-05.1 [R] The Acceptance of Infographics for Business Performance and Optimization

John Francis Agwa-Ejon; University of Johannesburg, South Africa

Fraser Batchelor Vaughan; University of Johannesburg, South Africa

This study explores the acceptance of Infographics by employees as a tool for the improvement of Business Performance and Optimization. Infographics present visual information data or knowledge very quickly and clearly resulting in an improved cognition of employees by utilizing graphics to enhance their human visual systems. The current trend in employee societal development requires a new set of skills that allows workers to engage with large datasets of information. A qualitative survey was conducted at eight banks in Johannesburg, South Africa, involving 72 employees with the assistance of the Human Resources division over a period of three months. All respondents had used infographics as a viable tool in their workplace to improve business related processes. The data obtained was analyzed using SPSS version 22.0 and the results obtained indicated a positive relationship between ease of use and usefulness of infographics that translated into a general acceptance. Infographics forms part of the breaking point in the revolution and rapid adaption of digital tools and technology which is driving the democratization of information and exposure to vast amounts of information in complex streams of data. It is therefore of paramount importance that senior managers and policy makers linked to business organizations are made aware of Infographics as an innovative tool able to optimize their organizational business performance.

WD-05.2 [A] Social Media Service Innovation in South African Retail Banking: A Case Study

Francis M Masuabi; University of Pretoria, South Africa

SESSIONS

Lowrence D Erasmus; University of Pretoria, South Africa

Social media usage has exponentially increased with over 2 billion active accounts. Thus, the retail sector is utilizing the platform to develop innovative services, build stronger brands and market their services and products. This has led to an increase of innovative start-ups that are beginning to encroach on the financial services sector. Consequently, banks are facing an imminent threat where they are not only competing with each other, but also with pioneering small medium enterprises. Social media has received a lot of attention lately, but from a branding and marketing perspective. This study took a different approach by applying competitive advantage theories to the application of social media in the retail banking sphere. The pentagon of sustained competitive advantage was proposed to understand how firms can attain a sustained competitive advantage. Results indicated that banks are operating in a volatile operating environment; customers prefer social media to complain about unsatisfactory service and favor digital channels for service provisioning. SA banks are benefiting from social media through brand awareness, customer engagement and customer feedback. Lastly, the study indicates that social media can be used to gain a competitive advantage in the SA banking sector.

WD-05.3 [A] Narrative Enquiry into Service Excellence in Uncertainty: Contributions of Business and Information Technology Strategic Alignment in Zimbabwe

Tichawona Muzira; University of Pretoria, South Africa
Lowrence D Erasmus; University of Pretoria, South Africa

Due to the evolution of knowledge, running a business in the 21st century has significantly changed. Companies are now forced to become more competitive and creative within a context of uncertainty. Despite these challenges, these companies must still thrive and successfully deliver their products and services to their target and future customers. Zimbabwe experienced two periods of economic crisis that threatened the survival of businesses that were operating in the country. Yet when some businesses collapsed, others survived. Through a narrative enquiry research study method, the author sought to identify if the strategic alignment of business and IT strategies helped Zimbabwean companies gain a strategic advantage in this context of uncertainty, thereby helping them overcome the two periods of uncertainty. Ten one-on-one interviews were conducted to gather the views of business leaders in Zimbabwe. Numerous aspects of the respondents' narratives were revealed as the interviews were done. The respondents mentioned that a strategic alignment of IT and business strategies would help their companies overcome the current period of uncertainty. The findings also found that other factors would need to be accommodated and implemented to complement strategic alignment.

WD-06 Technology & Knowledge Transfer 1

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Waikiki Salon 2

Chair(s) Man Hang Yip; University of Cambridge

WD-06.1 [R] A Framework for Technology Transfer Potential Assessment

Judith Estep; Bonneville Power Administration, United States
Tugrul U Daim; Portland State University, United States

This paper is motivated by a need to move research into application, specifically in the utility industry. There are many challenges facing the industry: an aging infrastructure, a growing population, and aggressive energy efficiency targets are just a few examples. Many technologies exist or are in development but the rate at which they are being adopted is slow. Despite a clear need to apply research results to the utility industry, a cursory review of how research proposals are evaluated within the utility industry confirms that technology transfer is only peripherally addressed. In addition, there is no mechanism to quantitatively assess the technology transfer potential of a research proposal. The goal of this paper is to develop an assessment model that can be used to identify the technology transfer potential of a research proposal. By doing so, an organization can select the proposals whose research outcomes are more likely to move into application.

WD-06.2 [R] Innovative Solution through Bifocal Thinking: A Case Study of Tacit Knowledge Creation to Optimize Contradictory Performances Between Designs and Production Engineering

Yoshihisa Segawa; Japan Advanced Institute of Science and Technology, Japan
Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan
Yasuo Ikawa; Japan Advanced Institute of Science and Technology, Japan

This paper examines knowledge creation through transfer of contradictory viewpoints between designs & production engineering (PE) to achieve quick turn activities from design of products to volume productions with significant upgrade of contradictory performances. Through activities of prototyping for design review, the firm finds problems in future volume productions and transfers contradictory viewpoints of designs & PE in the form of suggestions to the design team of customers and subsidiary plants of the overseas firm. The recipients lead incomplete solutions through knowledge sharing in the initial stage and gradually generate bifocal viewpoints through acquisition of the contradictory viewpoints in contexts of suggestions from the firm in the process of application for their own activities. The innovative solutions can be generated by tacit knowledge creation through bifocal thinking to optimize contradictory performances between designs & PE.

WD-06.3 [R] Translating Technology Management Research into Practice: System Design Characterization as an Example

Man Hang Yip; University of Cambridge, United Kingdom
Imoh M Ilevbare; University of Cambridge, United Kingdom
Robert Phaal; University of Cambridge, United Kingdom
David Probert; University of Cambridge, United Kingdom

The importance of translating research into practice is well established. Research has shown that management consultancies and other intermediaries provide a key mechanism to disseminate academic knowledge to industry. This paper presents a process for, and lessons learned from, translating a research output into a business improvement tool. System Design Characterization (SDC) was developed based on the theory of technical systems to support new product, service and system design. With the aim of clarifying design specifications, SDC encourages development teams to consider new factors, including environmental sustainability issues and stakeholder interests, in the engineering design process. The design specification is clarified through iterative examination of the interrelationships between existing and to-be-created elements of the new design, and their relative importance to the end customers. SDC was initially created and stabilized as a research instrument, but was thereafter improved into a business tool. This paper first presents the theoretical basis and the original instrument developed for research. The methodology of procedural action research applied in creating the beta version for industry is then outlined. Feedback gathered in the course of developing the improved SDC is summarized to provide practical guidance to academics interested in a similar approach to disseminating research output.

WD-07 Innovation Management 8

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Waikiki Salon 3

Chair(s) Li Zhang; National Academy of Innovation Strategy, CAST

WD-07.1 [R] Investigating the Value Chain of Modern Artisanal Innovation

Bharat Rao; New York University, United States
Ashwin G Gopi; NYU Tandon School of Engineering, United States

Handmade and custom artisanal goods have seen a global resurgence across several niche market segments, especially over the last decade. However, the study of modern artisanal production and the economy around it has largely been ignored. Besides accounting for only a small scale of production and consumption, artisanal goods are perceived as not conforming to contemporary development and production processes. We argue that current artisanal production has moved away from purely traditional methods and has evolved to incorporate innovative practices. In fact, due to their willingness to experiment, they are

SESSIONS

quicker to integrate new solutions into their products and processes. Similar themes can also be seen in the practices and perception of their consumers. This provides a niche phenomenon that is ripe for analysis from a technology and innovation perspective. In this paper, we will analyze artisanal value propositions and techniques for design, production, and the effect of branding on such niche products. Through interviews with key decision makers, enablers, funders, and consumers of artisanal projects, we investigate their motivations, methods of design and production, and use of creative design, branding, and technological tools. We then describe implications for researchers, policy makers and practitioners in the manufacturing industry, artisanal or otherwise.

WD-07.2 [R] Catching Up in a Bidirectional Way: Evidence from Chinese Electric Automotive Industry Leader BYD

Bowen Zhang; Tsinghua University, China
Xianjun Li; Tsinghua University, China
Donghui Meng; Tsinghua University, China
Lewis Liu; Tsinghua University, China

To catch up with leaders, whether latecomers should follow an "imitation to innovation" path or an "innovating to leapfrog" path is still not quite clear. To shine some light on this issue, we focus on the case of BYD, a latecomer growing from nobody to the pioneer of the Chinese electric automotive industry and the champion in world electric vehicle sales in a dozen years. We find that BYD catches up in a bidirectional way by which it has kept doing imitation and innovation from the start and made them well balanced to achieve the best of cost performance. This is different from the unidirectional view that latecomers' catching-up either starts from a reverse innovation way like "from imitation to innovation," or from a leapfrogging way that requires "science-technology-innovation." Evidence is also found that technology accumulation affects BYD's selection between imitation and innovation. This paper helps latecomers to make a better decision for their catching-up.

WD-07.3 [R] Regional Innovation Ecosystem Building: Cases Study from China

Hui Luo; National Academy of Innovation Strategy, CAST, China
Li Zhang; National Academy of Innovation Strategy, CAST, China
Lei Shi; National Academy of Innovation Strategy, CAST, China
Cao Ruan; National Academy of Innovation Strategy, CAST, China

This article discusses how to build a regional innovation ecosystem in China. Based on a literature review, it puts forward a theoretical framework to analyze the crucial elements involved in the innovation process, including the position and roles of central and local government, public actors and individual enterprises in developing innovation activities, and the dynamic interactions among different stakeholders. The framework also highlights how the rules and policies influence actors' behaviors and the innovation environment. Both quantitative and qualitative research methods are used in this article. The authors conducted several national surveys to collect data. Besides, they choose Beijing Zhong Guancun and Shenzhen Special Economic Zone as two cases to deeply elaborate on how a region develops itself into an innovation ecosystem. The article also presents some comparative findings from cases in China and the Silicon Valley and Route 128. The article concludes that changes of rules are crucial for innovation ecosystem building, and interaction among stakeholders contributes a lot to rules changing. The article also gives suggestions on how to support innovation and manage this change towards an innovation ecosystem through more systematic and tangible rules and policy, adequate inclusion and interaction with different stakeholders, as well as more public understanding and engagement.

WD-08 Knowledge Management 4

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Milo I

Chair(s) Stefani C Paula; Rio Grande do Sul Federal University

WD-08.1 [A] Value Creation in Open-Source Hardware Communities: Case

Study of Open Source Ecology

Manuel Moritz; Helmut-Schmidt-University, Germany
Tobias Redlich; Helmut-Schmidt-University, Germany
Patrick P Grames; Helmut-Schmidt-University, Germany
Jens P. Wulfsberg; Helmut-Schmidt-University, Germany

Technical progress in production technology, the advancement and spread of information and communication technologies (ICT) as well as the spill-over of the highly efficient and innovative open source principles to the world of physical products represent a new set of tools and concepts to address the challenges of sustainable economic development. Correspondingly, we can observe (new) modes of value creation that put into question traditional economic strategies and assumptions by stressing collaboration instead of competition and knowledge sharing instead of black box engineering. Open Source Ecology (OSE) is a famous example of a non-profit organization which fosters worldwide participation and collaboration to jointly develop open source hardware for operation in both developing and industrialized countries. Based on the concepts of open source appropriate technology (OSAT), the community aims at the free access to the knowledge and know-how of low-cost and easy-to-build products to empower people to build and run a civilization. This case study describes and analyzes the value creation processes of OSE and derives new opportunities for business models based on openness.

WD-08.2 [R] Survey of Value Assessment Programs within Transportation Construction Projects in U.S

Rafaa I Khalifa; Portland State University, United States
Robert Stewart; Value Management Strategies, Inc., United States

In order to deliver a transportation project on time and within budget, project planners and decision makers need to understand the desirable outcomes of projects or programs to make intelligent decisions. In addition, they also need effective tools and techniques to guide those decisions. In development of a guide that identifies available tools and techniques to foster useable and improved practices for key stakeholders of transportation projects, this paper as a preliminary study assessed current utilization of project delivery value improvement programs such as value engineering (VE), risk analysis/management (RA/RM) and constructability reviews (CR) for transportation projects. To determine whether states have adapted any of these programs or other innovative project delivery techniques, state DOT initiatives were studied through a review of past research and reports; also, the collection of documents relevant to DOT practices that have been used as a literature review to identify and design the survey questions. Value management strategic (VMS), academic advisors at Portland State University (PSU), and project delivery experts were consulted to advise and validate the survey questions before and after the distribution stage. Then, three surveys of VE, RA, and CR were carried out with state DOT staff. Finally, the survey results were discussed in-depth in this paper to address the main issues of these programs and the level of its conducting within the project delivery processes related to transportation construction projects.

WD-08.3 [R] Multivariate Statistical Analysis in NPD: The Contribution of CHAID for Market Targeting and Customization of a Sustainable Product

Istefani C Paula; Rio Grande do Sul Federal University, Brazil
Marcia Elisa S Echeveste; Rio Grande do Sul Federal University, Brazil
Manoel M Silveira; Rio Grande do Sul Federal University, Brazil
Carla S Caten; Rio Grande do Sul Federal University, Brazil

In the services and new product development (S-NPD) contexts, the understanding of customers' demands leads to the development of projects with higher success chances. Multivariate statistical techniques are valuable tools for identifying and valuing the requirements derived from these demands, mainly in complex contexts such as the sustainable NPD in which customers' needs vary considerably. The aim of this paper is to present an approach to identify clusters of consumers using CHAID (Chi-squared Automatic Interaction Detector). Based on the clusters formed, it is possible to find different segments and to associate requirements demanded by them, which allows the customization by means

SESSIONS

of product derivation. The proposed method contributes to the requirements management research area comprising four steps, illustrated in the development of an eco-friendly new household cleaning product: (i) collection and organization of product requirements; (ii) identification of priority category requirements; (iii) identification of market segments based on the characteristics valued by the target groups; and (iv) examination of associations between product requirements and certain characteristics of the target group. The main contributions provided by this method are the deeper understanding of sustainable market groups and the knowledge of how to offer a choice menu to the customer.

WD-09 Emerging Tech 5

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Milo II

Chair(s) Kazuo Hatakeyama; UNISOCIESC

WD-09.1 [R] Storage of Regenerative Breaking Energy in Electrical Vehicles

Umutcan Dogan; Istanbul Technical University, Turkey

Gulgun Kayakutlu; Istanbul Technical University, Turkey

Irem Duzdar; Duzce University, Turkey

Electrical vehicles are the really important innovation for saving energy in the world. Electrical vehicles have electric motors, and regenerative braking is used thanks to the electric motor's generator/motor transition. In generator mode, regenerative braking energy storage can be used in motor mode. However, it includes much of the hardware inside the battery pack. The battery pack has a significant role for getting distance and it should be used carefully. Therefore, it is necessary to use an additional device for recovering the battery from high energy flow. When supercapacitor technology is used with the battery, energy will be used more efficiently, and the overall battery life is increased. If the driver needs to have high energy, supercapacitor which is connected with battery in shunt, this connection type can enable this situation. Because high energy means high current and supercapacitor structure is available to ensure this situation instead of battery thanks to low resistance without high temperature. There are some cases and scenarios about this connection. Therefore, the case-based reasoning method is used in application. Simulation was created in Matlab/Simulink. Increasing battery life and driving distance are essential goals in this project.

WD-09.2 [R] Exploring Technology Evolution Pathways to Facilitate Technology Management: A Study of Dye-Sensitized Solar Cells (DSSCs)

Ying Huang; Beijing Institute of Technology, China

Fujin Zhu; Beijing Institute of Technology, China

Ying Guo; Beijing Institute of Technology, China

Alan L. Porter; Georgia Institute of Technology, United States

Yi Zhang; University of Technology Sydney, Australia

Donghua Zhu; Beijing Institute of Technology, China

Market competition drives attention to the prospects of new and emerging science & technologies (NESTs), which are fast changing and, so far, have relatively limited applications. Technology evolution pathways, as a powerful representation of the development of technology, have caught researchers' interest as a tool to trace historical progression, explore knowledge diffusion, and forecast future NEST trends. Citation analysis approaches are actively applied to structure a large number of patents, map patent distribution, and capture knowledge transfer and change in technologies or industries. This paper (1) introduces the indicator of connectivity and modularity in the interior citation network to identify the technology development stage; (2) takes family patent information into the process of building a comprehensive patent citation network; and (3) extracts technological trajectories by applying integrated approaches of main path analyses, namely global main path analysis and global key-route main analysis, among different technological stages. We illustrate this approach with dye-sensitized solar cells (DSSCs) as an example of a promising NEST, contributing to the remarkable growth in the renewable energy industry. The results show how our method can trace the main development trajectory of a research field and discern

the technology focus to help decision-makers facilitate technology management.

WD-09.3 [A] Reference Model for Innovative Product Development in Construction: A Stages Proposal Based on Comparative Analysis

Gustavo L Nascimento; UNISOCIESC, Brazil

Kazuo Hatakeyama; UNISOCIESC, Brazil

The houses for the low income residential construction sector are one of the most prominent niches in the building construction sector in Brazil. However, the construction process continues to handcraft, which creates many errors and quality problems. To reach greater efficiency, it is necessary to have large-scale production with repeatability, standardization, high productivity and an accurate management system. The final product of the construction is a unique building, not in serial production. What makes it a project management model widely used nowadays is its unique product through a specific design. However, these management models are generic, for all kinds of activities and sectors, and it does not refer to innovation and industrial environment. Meanwhile, the construction industry needs a model for developing its innovative approaches for the best project management practices, relevant management and the peculiarities of the industry. The reference models suggest that the product can develop by dividing it into stages. That division is a way to deal with the complex process of development and aims, and in addition, to establish control points to ensure increased design efficiency. The purpose of this article is to generate, from the comparison of the models mentioned, a preliminary proposal phase for a new reference model for innovation in construction.

WD-10 Intellectual Property 7

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Milo III

Chair(s) Supachart lamratanakul; Kasetsart University

WD-10.1 [R] Trends in and Factors Influencing PCT Applications by Japanese Universities

Yoshikazu Yamaguchi; Chiba Institute of Technology, Japan

Jun Fujimoto; Chiba Institute of Technology, Japan

Akira Yamazaki; Chiba Institute of Technology, Japan

Takehiko Koshiyama; Chiba Institute of Technology, Japan

To promote the creation of innovations, it is imperative that new technologies by universities are patented and transferred to private companies. This study aims to reveal the trends in and factors influencing PCT applications by Japanese universities. Data on 4,158 applications for 2008-2012 were collected from the J-PlatPat database, and those for university performance, research activities, and industry-academia collaboration were compiled from documents of universities and the Japanese government. The results revealed that PCT applications are mainly filed in the engineering and medicine fields, of which 45.4% are joint applications with private companies. In addition, we perform a multiple regression analysis to obtain the number of PCT applications per professor using five explanatory variables ($R^2 = 70.7\%$). The results elucidated that PCT applications were influenced by industry-academia collaboration and faculty structure. In conclusion, it is conceivable that PCT applications by Japanese universities have the potentialities for technology transfers from universities to private companies.

WD-10.2 [R] Evaluating Research and Patenting Performance Using Elites: A Preliminary Classification Scheme

Chung-Huei Kuan; National Taiwan Univ. of Science and Technology, Taiwan

Ta-Chan Chiang; National Taiwan Univ. of Science and Technology, Taiwan

Using a set of elite publications as representatives of an entity's research output is a common practice in bibliometrics. There are, however, few studies using such a concept of elites for patenting performance evaluation. This paper gathered a number of elite-based bibliometric approaches and organized them into a simple classification scheme so as to observe the various approaches in a systematic manner. According to the scheme, the

SESSIONS

various elite-based methods can be categorized into those using individual entities' elite sets and those using a combined elite set. These two major categories can be further divided into those using fixed, variable, and h-type thresholds, and those calculating size-, citation-, and contribution-based indices for assessment. This classification scheme provides us hints about possible directions for designing elite-based research and patenting performance evaluation methods.

WD-10.3 [R] Identifying Influential Factors that Impact the Level of Organizational Improvement Resulting from the Use of Lean Practices on NPD Processes

*Supachart lamratanakul; Kasetsart University, Thailand
Woraruthai Choothian; Silpakorn University, Thailand*

The study of the application of lean practices on new product development (NPD) processes could create fluctuation in the level of organizational improvement. However, some studies in the past have shown that there are few studies that identified the influential factors impacting the level of organizational improvement. To further understand how the influential factors impact the level of organizational improvement, additional studies are needed. This research was designed to find the results for this understanding. The objectives of this research are (1) to identify the influential factors impacting the level of organizational improvement, (2) to determine the relationships between the influential factors and organizational improvement, and (3) to determine the relative importance of the influential factors impacting organizational improvement. The findings of this research can provide valuable insights for organizations seeking to improve the NPD process and organization management. Also, the organizations implementing lean gain the important information from the study of the relationships among lean factors. The rankings of the relative importance of influential factors also provide the better outcome for allocating resources for lean implementation.

WD-11 Technology Assessment & Eval. 2

Wednesday, 9/7/2016, 14:00 - 15:30

Room: Milo IV

Chair(s) Cory Hallam; University of Texas at San Antonio

WD-11.1 [A] Academic Performance Management Policy for Changing Roles of Universities in Innovation Systems

*Sercan Ozcan; Bahcesehir University, Turkey
M. Sadettin Ozyazici; Bahcesehir University, Turkey
Baris M Ozerdem; Izmir University of Economics, Turkey*

The purpose of this study is to establish a new performance measurement method for academic actors for their changing roles in innovation systems. The widely accepted triple helix and systems of innovation models show changing and overlapping roles of academic, industrial and governmental actors. In previous innovation systems, universities were not focused on applied research and technology transfer as much as they are now. Current literature shows a changing role of universities and importance of their involvement in innovation systems. Although academic organizations' roles have changed in innovation systems, academic performance measurement systems (APMS) are not adapted to examine innovation related performance factors. Many APMS focus on key performance indicators (KPIs) such as publications, research projects and patents. However, the new APMS needs to assess the activities and processes that are related to innovation, such as technology transfer processes, collaborative innovation activities, consultancies and academic spin-offs. For this study a new APMS is applied according to the needs of universities by using a synthetic data based on an engineering department's KPIs. APMS scores are calculated based on the cumulative metric of all research and innovation activities and weighted according to the needs and considerations of the university. The results of this study show that many of those academicians who have great performance in publications and academic research do not necessarily have high-level performance in innovative activities. In fact, the results show that those who had high points in some measurements have very low performance in others. For the management point of view, it may be more effective to position academi-

cians for different roles and assess their performance accordingly as innovation-targeted, teaching-targeted and research-targeted academicians.

WD-11.2 [A] How University Technology Transfer Offices at US Medical Schools Value Innovation

*Cory Hallam; University of Texas at San Antonio, United States
J. Michael Munson; University of Santa Clara, United States
W. Austin Spivey; University of Texas at San Antonio, United States
Bernd Wurth; University of Strathclyde, United Kingdom*

Commercializing innovations remains essential to meeting societal goals. The licensing of university discoveries offers important benefits; in 2014, academic research in the US led to \$28 billion in product sales and 965 new products from licensed university work (AUTM). Each of the top 15 institutions collected at least \$100 million; some over \$400 million. Valuation strategies used in the licensing process have important implications for universities and their prospective licensing partners. A school's financial and IP-related objectives color the innovation portfolio, as well as the willingness of external enterprises to license innovations. Medical schools offer particular opportunities to improve the world's standard of living, and this study focuses on methods used to establish a priori value for their university-sponsored research. Technology licensing offices in US institutions were interviewed. Overall, about one-third of the respondents' technology is licensed; respondents represent about 40% of all licensing revenue reported by AUTM. Generally, about one-half of the medical institutions estimate the value of their IP prior to licensing, primarily via comparison with comparable technologies. About 50% consider non-financial metrics in the process: noting both the value to society and the nature of the technology, per se. Implications and lessons learned are discussed.

WD-11.3 [A] Implementation of Synchronization Process to Coordinate R&D and Product Planning Using Technology Roadmapping Tool

Yoichiro Igarashi; Fujitsu Laboratories Ltd., Japan

This paper discusses product planning processes in manufacturing companies that coordinate workflows between fundamental research and product planning activities that are conducted on different timescales and have different roles and motivations. The author's research group developed a reference model called "Synchronization Process (SP)" in 2014. The paper presented at PICMET '15 demonstrated how the SP model worked and also presented a specific case in step-by-step sequences using a technology roadmapping tool to enable discussion in a visual form. The objective of this paper is to discuss how the SP model can be implemented in organizations that accommodate a wide range of technologies and potential applications. This paper introduces shared knowledge pools called a "Gap Table" and an "Awareness Map" in order to systematize the SP model and enable a combination of technologies and expected applications to be identified. These pools indicate the potential solutions and classify them by difficulty or uncertainty based on the current business position of the company. The design of these pools is based on the actual product development history of mobile phones for elderly customers. The contribution of this paper is to introduce a scheme to match technologies and applications in large-scale companies.

WE-01 TM in Health 5

Wednesday, 9/7/2016, 16:00 - 17:30

Room: Kona Moku Salon A

Chair(s) Charles M Weber; Portland State University

WE-01.1 [R] An Inductive Ethnographic Study in Elderly Woman Technology Adoption and the Role of Her Children

*Noshad Rahimi; Portland State University, United States
Antonie Jetter; Portland State University, United States
Charles M Weber; Portland State University, United States*

The elderly woman strives to have a streamlined life surrounded by ease and familiarity.

SESSIONS

As she is aging, her desire for simplicity grows, her self-efficacy weakens, her prudence intensifies and her overall inclination toward status quo strengthens. As a result, she delays, or refuses, making any decision that might bring complexity and disrupt the continuity in her life, particularly new and unfamiliar technologies (which often bring complexity, before providing ease). Consequently, her technology adoption has a much lower rate than that of other demographics. To open the black box of the elderly woman technology adoption process, this study focuses on the role of the most significant population of “gatekeeping” group, children, to examine how this potential influence plays out in the elderly woman adoption process of technology. Using the grounded theory approach and case study, it investigates how the process of technology adoption by the elderly woman develops and what is the role of the “gatekeeping” children in the adoption. This qualitative research uses ethnographic interview and fuzzy cognitive mapping in addition to the traditional qualitative analysis coding. It validates the current technology adoption theories, particularly Unified Theory of Acceptance and Use of Technology (UTAUT), in the context of elderly technology adoption. However, it shows the importance of expanding such theories and unpacking the abstract constructs in the context studied to facilitate the emergence of empirical insight that can lead to implementable strategies. Two key findings emerged from this research: 1) Domestication is a key process in the successful adoption as it allows the elderly woman to try and become familiar and hence find the technology easy to use and then useful. 2) Caregiving children play a critical role in influencing the elderly woman technology adoption. This critical role is materialized in suggesting, modeling, providing facilitating conditions, and intervening in the adoption.

WE-01.2 [R] Drug Development Abandonment Stage for Japanese Pharmaceutical Companies

*Hiromi Saito; Chiba University, Japan
Koichi Sumikura; GRIPS, Japan*

With a focus on Japan, this paper empirically examines the stage in which drug development is abandoned. The time-consuming approval process for new drugs involves many stages and has low certainty. Based on pipeline data, we examine the stage in which drug development is completely abandoned or is “dead.” Using pipeline data on Japanese pharmaceutical companies, we investigate whether the abandonment of drug development depends on the drugs’ characteristics. Through a review of the data, we find differences in the timing of drug development abandonment and the number of such abandonment by the disease and technology.

WE-01.3 [R] The New Wave of Privacy Concerns in the Wearable Devices Era

*Nasim Talebi; University of Texas at San Antonio, United States
Cory Hallam; University of Texas at San Antonio, United States
Gianluca Zanella; University of Texas at San Antonio, United States*

The pervasiveness of mobile devices such as smart phones, apps, remote monitoring devices, and wearable sensors is enabling growth of patient generated health data (PGHD) through which people are capturing their vital signs outside the clinical settings. Tracking fitness, helping with personal health issues, tracking diet and nutrition, tracking sleeping conditions, along with managing stress and mental health are touted as potential benefits of using wearable device services. However, following the trend of growth in electronic data breaches over the last few years, information privacy intrusion has become a major potential threat associated with collecting, tracking, storing, and sharing personal information. Drawing upon literature concerning privacy conceptualization, operationalization, and perception, we aim to explain the antecedents and outcomes of privacy concerns in the context of wearables to gain more insight about users’ decisions on disclosing their personal health information. We may be on the cusp of a golden age for personalized collaborative care through PGHD, yet we need to consider if we are doing so by trading-off privacy.

WE-01.4 [A] Technology Development Roadmap for Medical Robotics in Thailand

Tichakorn Wongpiromsarn; Thailand Center of Excellence for Life Sciences, Thailand

*Nares Damrongchai; Thailand Center of Excellence for Life Sciences, Thailand
Ronald Vatananan-Thesenvitz; Bangkok University, Thailand*

Medical robotics plays an increasingly important role in healthcare as it has clear potential for improving diagnostics and therapeutic capabilities, lowering the number of medical errors and improving the overall quality and cost effectiveness of Thailand’s health care delivery system. It has been predicted that in 2025, the size of the robot market will reach US\$ 66.4 billion. Thailand’s advancement in medical robotics is critical for improving the capabilities and competitiveness of the country’s healthcare system. As a result, the Thailand Center of Excellence for Life Sciences (TCELS) and the Ministry of Science and Technology have established the advanced medical robotics program, under the flagship policy of the Ministry of Science and Technology, to improve the strength and competitiveness of the country both economically and socially. This paper outlines the development of a technology roadmap (TRM) for the Center of Advanced Medical Robotics with the aim of developing medical robotics and services, enhancing product standards and developing human resources.

WE-02 Enterprise Management 2

Wednesday, 9/7/2016, 16:00 - 17:30

Room: Kona Moku Salon B

Chair(s) Bostjan Brumen; University of Maribor

WE-02.1 [A] Post-Privatization Reorientation of Employee Relations: A Case Study of Pakistan Telecommunication Company Limited (PTCL)

*Muhammad A Choudhary; NAMAL College, an Associate of Bradford University, Pakistan
Bilal Asghar; University of Engineering & Technology Taxila, Pakistan*

Pakistan Telecommunication Company, Pakistan’s Mother Bell, was privatized in 2005 with 26% shares and management control handed over to Etisalat (a UAE-based telecom company). This research looked at the reorientation of employee relations at privatized PTCL, comparing the pre-privatization (1997-2005) model with the post-privatization (2006-2012) model and efficiency gains in the reorganized telecom market. The new management strives to improve the workplace environment (employer-employee relations) by reorientation of employee relations (ER). This study helps in enhancing the organizational performance of PTCL by comparing the employee relations in the pre- and post- privatization era. A comprehensive questionnaire was designed containing 60 ER sub-factors focusing on factors like ethics, justice and fair treatment, relationship with managers, managers’ capabilities, labor relations and unionization, employee rights, and employee safety and health issues. The respondents in the survey had more than 10 years of experience at PTCL. This study will be helpful for the PTCL and other corporations undergoing the privatization process and intends to improve employee relations at their workplace. Results show ethics, justice and fair treatment, relationship with managers, and safety and health issues need improvement in the post era, whereas the role of management in controlling the union activities is significant in the post era.

WE-02.2 [R] Why Financial Performance of the Technology-based Merger and Acquisition is Counterproductive to Its Market Reaction: A Study Based On the Listed Chinese Pharmaceutical Companies

*Zhaohui Zhu; Zhejiang Gongshang University, China
Wensheng Huang; Zhejiang Gongshang University, China
Wanqing Shen; Zhejiang Gongshang University, China
Yu Ding; Zhejiang Gongshang University, China*

Recently, China’s pharmaceutical industry is entering a period of rapid integration. The intrinsic nature of the pharmaceutical industry determines that technology and innovation is its main reason of merger and acquisition (M&A). Using a sample that includes the listed Chinese pharmaceutical companies undertaking M&A in 2012, the paper finds that most of the companies announce that technology and patent are the main factors for them to acquire other companies. But such technology-based or innovation-based M&A (TM&A) only has a fleeting significant impact on profit growth and does not bring sustainable fi-

SESSIONS

financial performance improvement; while it has a positive market reaction to the acquirers and makes their stock price improved significantly. Besides the factors about companies' operation and strategy, the paper suggests that so-called "market value management" of Chinese companies may be an important reason that financial performance and market reaction of the TM&A shows exactly the opposite.

WE-02.3 [R] A Comparison of Password Management Policies

Bostjan Brumen; University of Maribor, Slovenia
Renato Ivancic; ITPM e.U., Austria
Ivan Rozman; University of Maribor, Slovenia

Managing of passwords in information systems is a very important task, yet nothing seems to be learned from the recent stories. The consequences of bad password management practices have led to the loss of lives, as in the case of suicides after the "Ashley Madison leak." Password security is simply not taken seriously, despite problems being known since 1979 at least. Interestingly, the PICMET conference on-line system itself implements a bad password management policy as all passwords are stored and re-sent upon request by plaintext email. The objective of this paper is to present the underlying mechanisms that lead to bad password management policies. Memorability and memory decay, complexity, simplicity and other factors are presented and analyzed. A novel password management policy "Psychopass" is proposed, where a password can be created, memorized and recalled by thinking of an action sequence (visual representation) instead of a string of characters. In the experiment it was shown that users tend to better remember passwords under the Psychopass policy compared to other password management policies nowadays in effect. The results confirm that a Psychopass policy is an alternative to the existing password management practices and can improve the resilience to the attacks on information systems.

WE-03 Project Management 5

Wednesday, 9/7/2016, 16:00 - 17:30

Room: Kona Moku Salon C

Chair(s) Nathalie Sick; University of Muenster

WE-03.1 [R] A Training Method Proposal for R&D Project Managers

Mamoru Kiyota; Chiba Institute of Technology, Japan
Hiroshi Kubo; Chiba Institute of Technology, Japan

When an R&D technology leads to the development of a product, obstacles occur such as the so-called "Valley of Death" and the "Devil's River." Our earlier study reported on conquering obstacles in applying new project management processes in R&D, depending on the classification level of R&D technology themes. However, in many cases, there is no project manager (PM) in the R&D section and it is necessary to train PMs to handle these processes. A new method is proposed for short-term training of PMs in the R&D section, as per the level of the R&D technology theme, using progressive tool utilization and applying the meeting administration technique. Also the risk management method that is particular to the R&D section is applied for training of PMs. Further, it was demonstrated that a PM in the R&D section - after acquiring project management skills - can be a part of the project team of the product in development and contribute to the formulation of a smooth and effective process from R&D to product development. The result of the training method and the effectiveness in several R&D technology themes were exhibited.

WE-03.2 [R] Comparative Analysis of Categorization Systems for Innovative Projects

Irineu Yassuda; Sao Paulo Federal Inst. of Education, Sci. & Tech, Brazil
Milton Freitas Chagas Junior; National Institute for Space Research, Brazil

Innovation drives economic growth and improved living conditions throughout the world. In essence, innovation projects can be defined as a contribution to human knowledge that address some need. However, when studying the design, construction or creation of a new artifact, the traditional science may have limitations. Therefore, there is the need for a sci-

ence that breaks with the Cartesian barriers. From this disruption, it would be possible to build knowledge from the interaction between the observer and the object of study. In this study a comparative analysis of two studies regarding categorization systems are used to consider four different processes of organizational learning. The first artifact was designed for identification of four different types of projects following a combination of known and unknown goals and methods. The second artifact was designed to categorize the four different types of innovation, considering the domains of problem maturity and solution maturity, as high and low. Other than identify similarities between the types of innovation projects, we argue herein that all kinds of organizational learning presented in the two categorization systems follow an abductive reasoning. In both categorization systems, knowledge creation requires interaction between observer and the object of study.

WE-03.3 [R] Using Management of Technologies to Avoid Social Conflicts around the Area of Large Scale Mining Project in Madagascar

Olivier Herindrainy Rakotomalala; University of Antananarivo, Madagascar
Elise Raveloson; University of Antananarivo, Madagascar
Andrianaivomalala Ravalison; University of Antananarivo, Madagascar
Etienne Rakotomaria; University of Antananarivo, Madagascar

The emergence of large scale mining projects is a lever for economic growth for a country ranked among the poorest in the world as Madagascar. The Government supported by donors like the World Bank has taken steps to encourage the investors in this regard. But local communities in the area of implementation of the project can be a barrier delaying or even halting the project. This paper aims to study the interactions between a large scale mining project and its host environment to better understand the dynamics of this system and find ways to anticipate its future. The mathematical theory of graph was used to model the relational transactions between elements of the system formed by the project and its host community. Then we wrote algorithms and queries on visual basic and python to implement the model on a computer system. We found that this software can be a ground surveillance system for the mining company to anticipate possible social conflicts and adjust the action to be taken in time to avoid it.

WE-05 Technology Adoption

Wednesday, 9/7/2016, 16:00 - 17:30

Room: Waikiki Salon 1

Chair(s) Tugrul U Daim; Portland State University

WE-05.1 [R] The Field of Social Robotics as Means of Technology Selection to Address Country Specific Social Issues

Cristian Andres Mejia Caballero; Tokyo Institute of Technology, Japan
Yuya Kajikawa; Tokyo Institute of Technology, Japan

This paper proposes a methodology to identify plausible robotic technologies to address country-specific social issues. Two stages are described. Firstly, we identify and rank country specific social issues by mining semantic relations in a newspaper database. A collection of news about Japan is analyzed through topic models and the social issues are extracted from the topics obtained. In the second stage those social issues are linked to robotic technologies by exploring the academic landscape of the social robotics, a field that has been serving to bridge the gap between robotics and society. A set of robotic technologies for the input country is shown as result. This methodology can be used by policy makers to identify technologies that best fit the necessities of a selected country.

WE-05.2 [R] Technology Identification of South-South Cooperation on Climate Change of Developing Countries: A Case of the Countries Along OBOR

Yun Liu; Beijing Institute of Technology, China
ZhiYun Ma; Beijing Institute of Technology, China
BingXiu Gui; Beijing Institute of Technology, China
YiJie Cheng; Beijing Institute of Technology, China

SESSIONS

Xu Bai; Beijing Institute of Technology, China

The issue of climate change has become a core concern of humanity. Appropriate technology and partner identification for mitigation and adaptation to climate change is the key to South-South cooperation. There has been an urgently need for technologies in developing countries while lacking of information. This paper presents a scientometric analysis of research work to establish an evaluation index system of science and technology strength on climate change from the two sides of scientific research and technology development through output data in the Science Citation Index Expanded Database (DB SCIE) and European Patent Office Worldwide Patent Statistical Database (DB EPO) from 2003 to 2014. Then we evaluate the scientific strength of key requirements fields of developing countries and get a comprehensive grasp of the status quo distribution of world-class technology, world-class organizations and world-class professionals. We hope the answers can be used to comprehend the scientific research and technology development level on climate change of the world's major countries and China, so as to provide reference for the partner selection of the technology transfer, the technology service and the technology information exchange of developing countries, and to provide the theory foundation for the technology cooperation between China and the countries along the OBOR.

WE-05.3 [A] Integrating Refugees via Suitable Knowledge Transfer for New Jobs: A Qualitative and Applicable Network of Knowledge Transfer Instruments

*Patrick P Grames; Helmut-Schmidt-University Hamburg, Germany
Tobias Redlich; Helmut-Schmidt-University Hamburg, Germany
Jens P Wulfsberg; Helmut-Schmidt-University Hamburg, Germany*

Today we face the largest migration of human beings in the modern era. This situation is full of chances and threats, but definitely the scale of the challenge is epic! Social integration is obviously the goal of all global endeavors, but it has many very different levels. Besides the language, it is a regular job that can be the most suitable instrument to find oneself implemented and accepted as a valuable part of the "new-home" society. It is difficult enough to learn European languages, especially German, and what comes on top are complex in-company procedures everybody has to learn when trying to gain sustainable access to the European employment market. It is our duty to contribute to establishing easier ways of getting access to our everyday manufacturing knowledge for the people who seek asylum. This working paper offers a variety of carefully selected instruments of knowledge transfer that will enable one to learn new jobs quicker and more sustainably. We demonstrate how existing scientific instruments can be arranged to prepare, execute and review a qualitative knowledge transfer session. This knowledge transfer network is being developed and evaluated in the German public sector since early 2015 for real life job changes.

WE-05.4 [R] Exploring the Adoption and Use of the Smartphone Technology in Emerging Regions: Case of Saudi Arabia

*Fahad Aldhaban; Portland State University, United States
Tugrul U Daim; Portland State University, United States
Robert Harmon; Portland State University, United States*

This paper starts with a preliminary theoretical research model which is developed based on the Unified Theory of Acceptance and Use of Technology (UTAUT). A number of qualitative methods, namely brainstorming, focus group and individual interviews, have been conducted to evaluate, select and validate the existing factors, as well as introduce new factors, to identify only the most related factors to be included in the preliminary research model. A survey questionnaire has been developed and validated to survey general users of the smartphone in Saudi Arabia. A web-based survey has been designed and sent through email to 5,000 randomly selected smartphone users in Saudi Arabia. Data has been statistically analyzed using structural equation modeling (SEM). The results indicate that performance expectancy construct, effort expectancy construct, brand influence construct, perceived enjoyment construct and design construct have a positive and significant relationship with users' behavioral intention to adopt and use smartphones in Saudi Arabia. Also, the results indicate that social influence construct has a significant and positive rela-

tionship with use behavior or actual use of smartphones in Saudi Arabia.

WE-07 Innovation Management 9 **Wednesday, 9/7/2016, 16:00 - 17:30** **Room: Waikiki Salon 3** **Chair(s) Naoki Wakabayashi; Kyoto University, Japan**

WE-07.1 [R] Products and Services in New Economic Forms

*Ashwin G Gopi; NYU Tandon School of Engineering, United States
Bharat Rao; New York University, United States*

Prior research in marketing and strategy has noted that products and services have begun to increasingly resemble each other. While it is undeniable that they have always possessed a certain degree of both tangible and intangible characteristics, we see today acceleration in the rate at which products and services are converging. This is especially noticeable in new economic forms such as the access economy and on-demand services. In this paper, we argue that these changes are due to the fact that the exchange of both products and services now occurs primarily on digital platforms. Since the design of these systems stems from the same social, cultural, and technological milieu, the practice enacted by the actors perpetuates similar inherited structure. Using a practice-based lens, we show how products have dematerialized due to an abstraction of ownership and increased value of intangible benefits. We also portray how, on the other hand, the materiality of on-demand services has become more prominent due to the homogenization of experience and tangibility of value. We argue that our conclusions only represent the surface of the complex web of mechanisms underlying contemporary economic activity. We conclude by providing directions for future work, especially in empirical investigations.

WE-07.2 [R] A Study on Regional Innovation Policy under Innovation Paradigm 3.0: A Case of Jiangsu Province in China

*Lei Ma; Nanjing University of Science & Technology, China
Zheng Liu; Xi'an Jiaotong-Liverpool University, China
Min Jiang; Nanjing University of Science & Technology, China
Ke Yu; Nanjing University of Science & Technology, China
Jingxian Gan; Nanjing University of Science & Technology, China*

Jiangsu is one of the economically developed Provinces in Yangtze River Delta of China, and it ranks first all the time in regional innovation ability of China since 2009. With some insights of the case study, this paper compares Jiangsu's innovation policies of scientific talents, patent, R&D and so on from 1988 to 2015. Based on the evolution of the innovation paradigm perspective, the paper analyzes the characteristics of innovation policy tools mix from innovation 1.0 to 3.0. The purpose is to establish an analysis framework for Jiangsu's innovation policy from the innovation paradigm perspective and contribute to providing help for the governance of innovative policies in developing countries.

WE-07.3 [R] Institutional Policy and Network Evolution in Industry University Collaborations: Longitudinal Analysis of Joint Patent Networks in a Japanese Biotechnology Cluster during 2000's

*Naoki Wakabayashi; Kyoto University, Japan, Japan
Keigo Takai; Kyoto University, Japan*

There are growing research interests in how institutional policy affects growth of university-industry collaboration for regional economic development of biotechnology clusters. Yet, many previous studies have mainly focused on the best individual practices influenced by policy. However, when we examine the effects of policy, we have to pay much more attention to their impacts on the dynamics of the whole network of university-industry collaboration, using longitudinal social network analysis of it. This paper aims to investigate how new institutional policies develop whole inter-organizational networks of university-industry collaborations in a Japanese bioregion during the 2000's, and that major research universities located in central positions there, analyzing a regional case of changes of joint patenting networks in Kansai Biocluster, a major biotechnology cluster in Japan. We retain

SESSIONS

the following main results. First, institutional policy for university-industry collaborations by the Japanese Government certainly enhances new R&D linkages between industry and university. Second, indeed, with increase of R&D linkages with large corporations and research institutes, major research universities take more central positions in a cluster. Third, new linkages of major national universities with other organizations are not highly performing in licensing because these universities may be much embedded in networks with large companies and research institutes.

WE-08 Knowledge Management 5 **Wednesday, 9/7/2016, 16:00 - 17:30**

Room: Milo I

Chair(s) Stefan Trzcielinski; Poznan University of Technology

WE-08.1 [R] Technology Surveillance of the Solar Refrigeration by Absorption/Adsorption

Jose C Alvarez Merino; Universidad Peruana de Ciencias Aplicadas, Peru
Kazuo Hatakeyama; UNISOCIESC, Brazil

In order to establish networks of cooperation looking to not duplicate research and even to make use of existing research in a remote form, it is necessary to identify and classify (around the world) the researchers and laboratories that are researching the topic of solar refrigeration by absorption/adsorption. The methodology consists of: i) the technology's classification, ii) technological trajectory identification, iii) a thematic bibliographic review, and iv) patent analysis. In this way, with the previous determination of keywords, the main authors and their respective institutions will be identified. With the same keywords, the licensed patents are determined (in a certain span of time). In addition, the analysis of publications, patents, and commercial products gives us an opportunity to establish comparisons between prototypes and tests (in several conditions). The larger results implicate the use of actor's network and the remote access to the data and tests for a collaborative research, overcoming the lack of laboratory resources and accelerating the knowledge acquisition.

WE-08.2 [R] Research on Intelligence of Medium Sized Enterprises

Stefan Trzcielinski; Poznan University of Technology, Poland

At the end of the 1990s, the concept of the intelligent organization was introduced to the theory of management as a result of the development of the concept of a learning organization. Numerous studies confirm that improving the intelligence organizations can be achieved when an organization has the ability to learn quickly and accurately. The ability to learn is a necessary condition of intelligence of organization. The company that accumulates knowledge is a learning organization. If, however, it is able to use the resource, which knowledge is, for its own benefit and intentionally develop it to suit the ongoing and anticipated changes in the environment, then it is an intelligent organization. In this paper the result of investigation on the relationship between knowledge based economy (KBE) and changes of enterprises' intelligence is presented. To identify the relationship, the knowledge based methodology (KAM) was used to assess the changes occurring in the environment. They were treated as independent variables. Next, using a questionnaire, the changes of intelligence of enterprises were identified. The changes were interpreted as dependent variables. The correlation between independent and dependent variables has shown that Polish medium-sized enterprises improved their intelligence; however, the improvement was disproportional to the development of KBE. In this paper the drivers and barriers of the development of intelligence are presented.

WE-08.3 [R] A Qualitative Research on the Difference of Expectation to NPD Related to Two Occupational Categories in Japanese Enterprises

Nanami Furue; Hitotsubashi University, Japan
Yuichi Washida; Hitotsubashi University, Japan

Although it has been said that conceiving potential needs and customers is important for realizing innovations, companies have had difficulty in getting through new product devel-

opment (NPD) looking toward the prospective demand because of high risk. Former studies have shown that there are differences in NPD strategies employed by companies depending on whether one aims NPD for potential needs or not. This study focuses not on the differences of NPD strategies in companies but on what each occupation expects for NPD. Several open-end-type questionnaire surveys on employees from Japanese companies who have experienced medium- to long-term perspective idea generating workshops have revealed that occupational categories can be divided into two groups by the differences of expectation to NPD: rapid-fire NPD expectation group and late bloomer NPD expectation group. The former group, which consists of marketing experts and engineering experts, tends to expect just responding to existing needs and gaining profit expeditiously in NPD, and the latter, which is comprised of design experts and research experts, tends to expect realizing future innovations in NPD. This study implies that the confrontation with two occupation groups prevents Japanese enterprises from realizing future innovations.

WE-09 Entrepreneurship/Intrapreneurship 4 **Wednesday, 9/7/2016, 16:00 - 17:30**

Room: Milo II

Chair(s) Pule A Kholopane; University of Johannesburg

WE-09.1 [R] A Framework for the Development of Management Skills for Co-Operative Development in an Agri-Business Value Chain in South Africa

Clement C Mawele; MANCOSA, South Africa
Rene Pellissier; Univesity of Massachusetts, United States

This research investigates the management functions and skills required for co-operative development within the agri-business value chain in South Africa. The study was conducted in Mpumalanga province within South Africa. The province spent close to ZAR50 million through the Comprehensive Rural Development Programme (CRDP) in an endeavor to use the co-operative model as a vehicle to create viable agri-business enterprises capable of alleviating poverty through creation of employment. The purpose of this research is to determine the challenges faced by emerging farmers in co-operatives from advancing within the agri-business value chain in order to perform and sustainably participate in the mainstream economy. A survey methodology was sent to a stratified sample of farmers in two regions (Highveld and Lowveld) of Mpumalanga, measuring how people felt based on their past farming experiences. In the 131 participants surveyed, it was found that there was little difference observed between the two regions with regards to the main challenges being management capabilities and access to markets. However, the following management skills are required to survive in this market, i.e., market research and marketing, financial management as well as processing of products which will allow them to expand along the value chain. This means that the government can employ these outcomes to strengthen the agri-business value chain, thereby possibly decreasing the high unemployment rate in Mpumalanga. Agriculture is a sector that can play a very significant role in improving the socio-economic standards of South Africa; therefore, investing in this sector strengthens the future of the society.

WE-09.2 [R] Boosting Competitive Advantages of Small and Medium Manufactures in South Africa by Applying Continuous Improvement and Operational Strategies

Pule A Kholopane; University of Johannesburg, South Africa

In a highly competitive global business environment, the goal of manufacturing enterprise must be willingness to make strategic adjustments consistent with the demands of its environment. Many companies, especially small and medium manufacturing enterprises (SMME's), face the biggest challenge of staying constant or even better to grow the profit. Competitive advantage based on operations is not a new phenomenon. However, the recent global economic recession has placed renewed emphasis on the importance of continuous improvement and strategic implementation to maximize profit. The vital role played by small businesses and entrepreneurship in stimulating economic activity, job creation, poverty alleviation and the general upliftment of living standards have been recognized both nationally

SESSIONS

and internationally. The SMME's have the following strategies to overcome the challenges: fair pricing, discounts and special offers, offering a variety of services and products, superior customer service and continuously improving quality of service delivery. Owing to the low economic growth, high unemployment and an unsatisfactory level of poverty in South Africa, start-up entrepreneurship emerges as a solution; therefore, a committed support and development of this sector by the government or the society becomes a critical solution to uplift the economic condition of the poor. The research concludes that business success is a consequence of embracing a mix of these strategies.

WE-09.3 [R] An Integrated Innovation Management Model from the Viewpoint Fitting Customer Value: Based on Chinese Cases

Fuji Xie; Shanghai Jiao Tong University, China

Bolin Li; Beijing Dalu Hangxing Quality Certification Center, China

Peng Xie; Georgia Institute of Technology, United States

Based on management situation analysis of local Chinese companies which have weak management foundation and previous studies, we find there are five typical basic management bottlenecks which prevent these companies from achieving innovation performance: strategic management, cultural representation, organizational form, management mechanism, and execution. We track the present one of the fast-growth Chinese companies, Beijing XIAOMI Science and Technology Co. Ltd., and deeply analyze the case, especially XIAOMI's attitude on the five associated core management elements above. XIAOMI has extended definition of their own innovation management through the way that highly fits the external customers' values and expectations, and it reflects an apparent characteristic of management and a unique management style. Therefore, XIAOMI has achieved rapid growth. After further analysis and research, we find that these five elements interact with each other and constitute a fundamental modern innovation management style. Based on this, we construct a theoretical framework, Pentagon Model, an innovation management model, which can be used for reference by local Chinese firms.

WE-10 Intellectual Property 8

Wednesday, 9/7/2016, 16:00 - 17:30

Room: Milo III

Chair(s) Yoshitoshi Tanaka; Tokyo Institute of Technology

WE-10.1 [R] Preliminary Study on Why University Researchers Do Not Utilize Patent Information for Their Academic Research in the Field of Science and Engineering in Japan

Yoshitoshi Tanaka; Tokyo Institute of Technology, Japan

Toshiyuki Inui; IPNJ International Patent Office, Japan

Generally speaking, university researchers in the field of science and engineering do not utilize patent information for their academic research activities, and mostly they depend on academic research publications to insist on their research originality. On the other hand, there is much volume of technical information in the patent publications along with the rapid increase and the absolute big number of patent applications in the world. As a first step of this research, we tried to grasp the researchers' needs for what kind of patent information is requested for their academic research at universities, depending on the research processes in the field of science and engineering. We made preliminary interviews of the limited number of researchers to extract indispensable factors together with providing patent information searching systems, and we tried to understand the academic researcher's thinking in the field of science and engineering at university, for the purpose of designing our future questionnaires as a next step. We positioned this research as a preliminary study before designing the challenging research framework which will be started based on the discussions in this paper. We started this research as a qualitative research to find out academic researcher's thinking, before entering a quantitative research approach in the future.

WE-10.2 [R] Analysis of the Matching between Customer Needs and Patent Application Portfolio about Unmanned Aerial

Yosuke Towata; Tokyo Institute of Technology, Japan

Yoshitoshi Tanaka; Tokyo Institute of Technology, Japan

In recent years, the UAV called "drone" has been getting popular, and more opportunities are to be reported. Also, it has become easily available for consumers, and the deployment of various industrial applications is expected. On the other hand, the legal regulation is requested to be stricter to avoid accidents and problems that occur because of technical aspects. Companies can acquire the patent rights by the results of development. However, they are often conducted by technical aspects without considering customers' needs. In some cases, the patent portfolio does not meet the customer needs. Exclusive rights with weak customer needs do not contribute to increasing the market share; the portfolio matching with customers' needs is essentially expected by the company. Therefore, we analyzed for matching between the patent portfolio and customer needs of the UAV manufacturing companies. We focused on the regulation and its practical data to grasp the customers' needs and analyzed for matching between the patent portfolio and customer needs of the UAV manufacturing companies.

WE-10.3 [R] The Management of Intellectual Property in the Technology License Office in an Open Innovation Environment: The Context of a Scientific and Technological Institution in Brazil

Herlandi S Andrade; ITA - Instituto Tecnológico de Aeronautica, Brazil

Ligia Maria S Urbina; ITA - Instituto Tecnológico de Aeronautica, Brazil

Jefesson Gomes; ITA - Instituto Tecnológico de Aeronautica, Brazil

Andrea O Follador; ITA - Instituto Tecnológico de Aeronautica, Brazil

Vanessa Cristina G Chimendes; Faculdade de Tecnologia de Guaratingueta - FATEC, Brazil

Roberto C Follador; ITA - Instituto Tecnológico de Aeronautica, Brazil

This paper researches issues related to the management of intellectual property (IP) of the results of the R&D developed by the Competence Center for Manufacturing (CCM) of the Technological Institute of Aeronautics (ITA), which is considered a Scientific and Technological Institution (STI) that works in an open innovation (OI) environment, involving interaction among some STI with companies. The OI model is different from the closed model because it encourages innovation, not just with ideas that come from inside of the organization, but also with the ones that are outside. When the subject is R&D, in an OI environment, where there is an intense cooperation, the IP rights division is not an easy work. In such a context, it is important to have an effective management of such IP rights. In order to develop this task, an action-research was done in the technological licensing office (TLO) that supports the CCM of ITA in Brazil. Based on this research, it was possible to suggest to the TLO the development of a process to search and identify technologies created at STI, giving the TLO higher proactivity to design guidelines for the R&D teams in the referred STI.

WE-11 Technology Assessment & Eval. 3

Wednesday, 9/7/2016, 16:00 - 17:30

Room: Milo IV

Chair(s) Fred Y Phillips; Yuan Ze University

WE-11.1 [R] Transparency of the Strategic Platform Ecosystems: Maturity Level Assessment Approach

Pekka Berg; Aalto University, Finland

Jussi Pihlajamaa; Aalto University, Finland

Hani Tarabichi; Aalto University, Syria

Ade Mabogunje; Stanford University, United States

At the moment many industries, academy and policy makers are facing lots of open questions and uncertainties related to the utilization of digitalization and the ways to manage the innovation environment to create growth through platform economy in the society. Internet of Things and Big Data are examples of new developments which create new opportunities, but it is not clear how they should be implemented. The outcome of this study is an innovation ecosystem assessment model. The model produces information on the maturity

SESSIONS

level of the digitalization that has been implemented in a given ecosystem. In addition it produces information about the ecosystem's transformation, when moving from traditional practice towards digitalization. Data is collected by interviews, observations, workshops, and document analysis in four ecosystems in Finland: construction industry, forest industry, healthcare industry, and ICT industry. In order to produce relevant information for strategic decision-making, we identified three relevant research paradigms to tackle the challenging topic: innovation leadership, information management, and design thinking. This paper illustrates the tentative managerial implications of the above-mentioned approach.

WE-11.2 [R] Technology Assessment: A Role for UNESCO and S&T Parks

*Deog-Seong Oh; National Chungnam University, Korea, South
Fred Y Phillips; Yuan Ze University, Taiwan*

Globalization and information/communication technology, as well as new modes of assessment, have opened new prospects for the practice of technology assessment. These prospects hold the potential for realizing the technology assessment role that has long been recommended for UNESCO and other United Nations agencies. They may also solve the problem of research parks that, as "hybrid organizations," have failed to mesh with the cultural values of their surrounding communities. This paper highlights the new prospects for assessment, and identifies the institutional gaps in assessment practice. We propose, as a solution, that assessment become a function of an international network of research parks, with the official recognition and clearinghouse services of an international agency. We find this proposal aligns well with the recent technology assessment literature and its implications, and we put forth the Daejeon/ UNESCO Global Innovation Forum as a possible network platform.

WE-11.3 [A] Evaluation of Electricity Storage Technologies for Renewable Energy Production: A Proposed Model

*Demei Lee; Chang Gung University, Taiwan
Jonathan C Ho; Yuan Ze University, Taiwan*

Growing public awareness of CO₂ emission and depletion of fossil fuel has raised the level of our reliance on wind, sun and other sources of renewable energy. In order to utilize renewable sources of energy efficiently, the share of intermittent electricity produced with renewable energy is increasingly important. This research aims to develop a technology evaluation model to analyze several promising electricity storage technologies. Subject technologies include electrochemical supercapacitors, flow batteries, lithium-ion batteries, superconducting magnetic energy storage (SMES) and kinetic energy storage. In addition to these currently available technologies, some under developing ones are also incorporated in the model. Although energy density and power density are the most prominent criteria used to assess electricity storage technologies, other evaluation criteria such as deep-cycle life and/or charge-discharge cycles, operation costs, safety, and other technological characteristics are also the concerns. A research methodology which combines scenario analysis (SA) and multi-criteria evaluation model (MCEM) is developed. The proposed research process uses an expert panel to identify decision criteria and decision elements in the MCEM by a group of experts who have profound technological knowledge and experiences in the technologies. Next, applying scenario analysis process, decision uncertainties are identified and scenarios are constructed. Under each given scenario, the expert panel utilizes the judgment quantification method to rank the subject technologies in the MCEM. The research result should be able to facilitate decision makers in the industry of renewable energy to streamline investment in developing and/or adopting electricity storage technologies.

HA-00 PLENARY - 4

DATE: THURSDAY, 9/8/2016
TIME: 08:30 - 10:00
ROOM: KONA MOKU BALLROOM

CHAIR: TUGRUL U DAIM; PORTLAND STATE UNIVERSITY

HA-00.1 [K] Challenges in Designing and Implementing Large Systems

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

For centuries, people have developed innovative solutions to satisfy human and societal needs in such fields as energy, electric power generation, food, transportation, healthcare, education, information technology, banking, defense, environment, communications, and materials. Many of these innovations are in the form of systems that are designed to satisfy a specific set of functional requirements (FRs) and constraints (C). We should be able to design all these systems using the same methodology rather than a variety of ad hoc approaches, although the specific nature of the problem, physical principles, data, and acceptable variations are field specific. This presentation addresses the two challenging issues involved in designing and commissioning large systems: cost over-runs and missing the original schedule. Experience with large system design reinforces the view that the coupling of FRs, i.e., coupled designs, is primarily responsible for cost over-runs and missed schedules. It also increases "complexity" of systems. A solution is presented to preventing the creation of a coupled design: System Architect, whose job is to monitor the design process to be certain that it does not inadvertently create functionally coupled designs. An example is provided.

HA-00.2 [K] External Technology Advisory Boards

Adnan Akay; Bilkent University, Turkey

Increasingly, companies look for external advice and viewpoints from a diverse set of experts who may have different degrees of familiarity with the company, but are experts in areas important to the company. There are different reasons for setting up such boards and, accordingly, they have different structures. Some boards are very involved and meet frequently, others receive information and provide high-level feedback. The key points for a successful board, not surprisingly, rest on its membership, but also how the interactions take place and the recipients of the advice. This presentation will describe how to start up a technology advisory board and the means by which to receive the best input from such boards, with anonymous examples.

HB-01 Technology Roadmapping 2

Thursday, 9/8/2016, 10:30 - 12:00

Room: Kona Moku Salon A

Chair(s) Tugrul U Daim; Portland State University

HB-01.1 [R] Here There be Dragons: The TSensors Systems Technology Roadmap

*Yorgos D Marinakis; University of New Mexico, United States
Steven T Walsh; University of New Mexico, United States
Victor Chavez; University of Twente, Netherlands*

Abundance refers to the thesis that four emerging forces, namely exponential technologies, the Do-it-yourself (DIY) innovator, Technophilanthropists, and the Rising Billion, will solve the most significant and intractable world social problems. One such exponentially growing technology is the sensor. It has been estimated that there will be a trillion sensors, or "TSensors," by 2020. These TSensors will comprise a portion of the so-called proposed Internet of Things. In the present article we construct a technology forecast for that portion of the Internet of Things that is required to support the manufacture and operation of the TSensors. We utilize the technology roadmap framework, in which we highlight the importance of consortia and provide Technology Readiness Levels for component technologies.

HB-01.2 [R] Technology Planning for Emerging Business Model and Regulatory Integration: The Case of Electric Vehicle Smart Charging

SESSIONS

Kelly Cowan; Portland State University, United States

Tugrul U Daim; Portland State University, United States

Smart grid has been described as the Energy Internet: where energy technology meets information technology. The incorporation of such technology into vast existing utility infrastructures offers many advantages, including possibilities for new smart appliances, energy management systems, better integration of renewable energy, value added services, and new business models, both for supply- and demand-side management. This paper proposes to build upon existing roadmapping processes by considering an integrated set of factors, including policy issues, that are specifically tuned to the needs of smart grid and have not generally been considered in other types of roadmapping efforts. It will also incorporate expert judgment quantification to prioritize factors, show the pathways for overcoming barriers and achieving benefits, as well as discussing the most promising strategies for achieving these goals.

HB-01.3 [R] A Combined Seasonal ARIMA and ANN Model for Improved Results in Electricity Spot Price Forecasting: Case Study in Turkey

Avni Ozozen; Istanbul Technical University, Turkey

Gulgun Kayakutlu; Istanbul Technical University, Turkey

Marcel Ketteree; Borusan EMBW, Turkey

Ozgur M Kayalica; Istanbul Technical University, Turkey

Developing countries are trying to improve the competitiveness of the energy markets with continuous liberalization. This makes the market highly sensitive. Every player in the market has a greater need to know about the smallest change in the market. Hence, ability to see what is ahead is a valuable advantage to make the right move. A time series forecasting with the smallest errors would be a powerful tool for the energy producers. This paper proposes combined methodology in time series forecasting. Generally accepted and widely used ARIMA and ANN with backpropagation learning are combined. The methodology is implemented for the day-ahead Turkish power market. It is observed that the proposed methodology gives results with reduced errors. The achievements are compared with conventional use of both ARIMA and ANN.

HB-02 Technology Forecasting 1

Thursday, 9/8/2016, 10:30 - 12:00

Room: Kona Moku Salon B

Chair(s) Marthinus W Pretorius; University of Pretoria

HB-02.1 [R] Extracting Knowledge from Technological Research Papers in Application of IoT

Rishabh Gyanendra; Hosei University, Japan

Akihiro Fujii; Hosei University, Japan

In this paper, we have extracted knowledge about IoT based on semantic analysis of corpus data which is constructed from IoT IEEE survey papers that were published recently. For the basic understanding of the research tendency, common biblio-metric approach such as tf-idf is introduced. Since 2009, the number of publications of survey papers related to IoT has increased dramatically, and there are about six to seven application areas where IoT would introduce an innovative usage of network and information technologies. Upon this basic understanding, we try to construct a method to extract "knowledge" from those documents. We have introduced inference rules to the semantic relationship in sentences. Each sentence and consisting words are indexed as RDF primary nodes and are stored in triple-data store. We have added several inference rules by looking at meaningful words and sentences. In this sense, the method is not fully machine-oriented; we applied heuristic knowledge by reading sentences and discourses about the technological issues of those survey papers. The result shows deeper understanding of an issue described in large amounts of documents in a short period of time. It is possible to apply this method for different areas of expertise. This analysis has been pursued in a context of foresight activity in science and technology policy.

HB-02.2 [A] Demand Forecasting and Development of Diffusion Model for Carbon Dioxide Capture and Storage Technology

Jungwoo Shin; Korea Environment Institute, Korea, South

Due to the increased interest in climate change, many countries have made an agreement for reducing greenhouse gas (GHG) emissions. The Korean government also made a goal to reduce GHG emissions by 37% from business-as-usual levels until 2030, and submitted their target of reducing GHG emissions to the United Nations framework convention on climate change in June, 2015. However, current renewable energy policies and demand-side management in Korea are not enough to accomplish the GHG reduction target. Moreover, if the Korean government focuses on the GHG reduction target, it is hard to achieve the economic growth target. Under the current circumstances, the carbon dioxide capture and sequestration (CCS) technologies are considered as possible alternatives which could achieve both economic growth and the GHG reduction target. Some previous research forecasted demand of CCS technologies with a simple assumption, but it did not consider the competitive situation in the renewable energy market. Because CCS technologies could compete with existing renewable energies, this study considers the competitive situation and forecasts future demand of CCS technologies in a competitive market. In addition, this study proposes a new diffusion model which includes the competitive market situation and measures technological competitiveness of CCS technologies. Based on the results of this study, we can provide the policy directions for CCS technologies.

HB-02.3 [R] Technology Forecasting Using Structural Equation Modeling Based Data Fusion: Analysis of Strengths and Weaknesses Using a National Research and Education Network Example

Leon Staphorst; Council for Scientific and Industrial Research, South Africa

Leon Pretorius; University of Pretoria, South Africa

Marthinus W Pretorius; University of Pretoria, South Africa

This paper considers strengths and weaknesses of the framework for technology forecasting using structural equation modeling based context sensitive data fusion, which was first presented by Staphorst et al. in 2013. The framework is an exploratory technology forecasting technique that employs a partial least squares based structural equation modeling implementation of context sensitive data fusion in order to model complex multi-layered interrelationships between technology inputs, outputs and context related exogenous factors. Strengths and weaknesses considered for this framework, emanating from the extensive bodies of knowledge on data fusion and structural equation modeling, include its ability to incorporate contextual information in its forecasting calculations and high sensitivity to structural model misspecification, respectively. An example model instantiation of the framework for the National Research and Education Network technology domain is used to quantitatively analyze the impact of these strengths and weaknesses. This example model instantiation, which is a significantly improved version of the one originally presented by Staphorst et al. in 2014, was constructed using knowledge gained through action research in the South African National Research Network, hypotheses from peer-reviewed literature, and insights from the Trans-European Research and Education Network Association's annual compendiums for National Research and Education Network infrastructure and services trends.

HB-05 Quality Management

Thursday, 9/8/2016, 10:30 - 12:00

Room: Waikiki Salon 1

Chair(s) Kem Ramdass; University of South Africa

HB-05.1 [R] Improved Productivity and Customer Satisfaction in Manufacturing through a Sustainable Quality System

Seun Mokwalo Monareng; University of Johannesburg, South Africa

Antoine F Mulaba-Bafubandi; University of Johannesburg, South Africa

John Agwa-Ejon; University of Johannesburg, South Africa

This work is based on a case study of a manufacturing company in Johannesburg, South

SESSIONS

Africa. The paper presents a set of findings based on an investigation into quality management system (QMS) implementation at a company located in the northern part of Johannesburg. The paper discusses challenges experienced in QMS implementation, successes achieved and failures, and proposes recommendations on how to improve QMS implementation and maintain a sustainable management system. Observations, unstructured interviews and structured questionnaires were used. Triangulation was concluded on 20% of respondents using unstructured interviews. Questionnaires were distributed to 114 respondents divided into three segments: customers, top management and employees. Sixty two percent of the responses were received back properly completed. The results revealed that the customers involved in the study preferred to do business with companies where QMS has been implemented. The responses from management showed that QMS implementation is of importance to them and is an empowerment tool for their employees.

HB-05.2 [R] Reflection as a Means of Improvement: A Higher Education Perspective

Kem Ramdass; University of South Africa, South Africa

Institutions of higher learning in South Africa are being plagued with changes on a regular basis. Notwithstanding internal changes, institutions are faced with issues of public funding, changing student demographics and profiles, and student unemployment. The caliber of students produced in the education system and the agenda for higher education is questionable. Public trust in higher education is decreasing as more graduates are unemployed. In view of these challenges, universities are required to adapt and be open to change in order to meet the demands of stakeholders that "govern" them. In order to reduce the impact of these changes, service quality is considered as a means of improving teaching and learning in the university. Attention to "service quality" can help an organization to differentiate itself from other organizations and through it gain a lasting competitive advantage. Thus, the support departments at the university were tasked with re-evaluating their processes in terms of value-add through reflection. The aim of this paper is to demonstrate that best reflective methodology as a means of continuous improvement in education is imperative in order to enhance the student experience, and this is achieved through a case study analysis.

HB-05.3 [R] A Technology Transfer Model from Public to Private Sector in Biopharmaceutical Industry

Luciana A Teixeira; Instituto Butantan, Brazil

Paulo T Nascimento; Universidade de Sao Paulo, Brazil

Abraham S Yu; Universidade de Sao Paulo, Brazil

Ana C Tavassi; Instituto Butantan, Brazil

This paper describes a new model implemented by Butantan Institute - a centenary Brazilian public research institute - to develop a new molecule as a therapeutic agent with public and private funding. Different from the creation of a new technology-based enterprise, this model proposes to internalize the scale-up process in the research institute in order to develop the trials, and then transfer all the technology of the process and the related knowledge to the private sector to begin the production. It seems a reasonable and feasible model for Brazilian biopharmaceutical companies, as most of them do not have research and activity-development backgrounds, nor cross-disciplinary teams or even equipment that are crucial for the development stages of innovative pharmaceutical products. In contrast, some Brazilian public institutions, such as research institutions, have some worldwide known researchers in different fields of knowledge, and also a lot of world-class equipment. The main aim of this proposal of a new technology transfer model is to enable the production of new biopharmaceutical products, thus driving innovation in the biopharmaceutical sector.

HB-06 Innovation Management 10

Thursday, 9/8/2016, 10:30 - 12:00

Room: Waikiki Salon 2

Chair(s) Charles M Weber; Portland State University

HB-06.1 [A] User Driven Service Innovations in Telecom Industry: Indian Experience

Dharmesh B Gupta; Indian Institute of Technology, Bombay, India

Ruchita Gupta; National Institute of Industrial Engineering, India

Karuna Jain; National Institute of Industrial Engineering, India

Technological advancement has been the main driver for development of telecom services. Convergence of telecom and internet played a significant role in the growth of user-driven services in terms of variety, number and revenue. Open access platforms and technological capabilities have empowered small entrepreneurs in India to develop services collaboratively that are benefiting to society. A new ecosystem has emerged (shift from value chain to value web) around telecom operators with multiple stakeholders - content and application providers, technology enablers and platform providers. This new ecosystem with user participation has potential to bridge the digital divide and foster inclusive growth. The primary objective of the study is to understand the nature of interplay between technology development, technological innovation and service innovation. The secondary objective is to study how needs of users are imbibed into technology development. We also investigate the role of technology management and its implication for telecom operators in changing the face of the digital economy. Qualitative case-based research method is used. Cases are selected from one of the key Indian telecom operators. The findings of the study provide interesting insights to effectively manage new technologies to create user-driven services.

HB-06.2 [A] Non-R&D-based Innovation and the Growth of SMEs in China: A Case Study of Hangzhou FC Company

Qingqing Zheng; Zhejiang University, China

Yanting Guo; Zhejiang University, China

Mingtianzi Lei; Zhejiang University, China

Gang Zheng; Zhejiang University, China

Recently, a growing number of academic research shows that this R&D-focused view of innovation ignores the other popular innovation activities in SMEs, which cannot explain that some SMEs with weak R&D capability still be innovative. Further, relevant studies have indicated that absorptive capacity is closely related to the degree of benefit SMEs can get from non-R&D-based innovation. Non-R&D-based innovation provides newly innovative ideas for the enterprise, while absorptive capacity helps enterprises to adapt to the diverse actual situations, which further improves the innovation performance. Therefore, this paper is trying to reveal the pervasive non-R&D-based innovation practices in Chinese SMEs basing on a case study of Fashion in China (FC in short). It shows that non-R&D-based innovation activities, namely technology adoption, imitation and reverse engineering, design, innovative implication of existing knowledge, etc., have positive effects on innovative performance, and the enterprise's absorptive capacity also has a positive moderating effect on the relationship between non-R&D-based innovation activities and innovation performance. This research argues that, non-R&D-based innovation activities are very effective and popular for SMEs' survival and growth and the continuous investment in absorptive capacity can help to further enhance the effects of non-R&D-based innovation.

HB-06.3 [R] Research on the Innovation Mechanism and Process of China's Automotive Industry

Xingda Qi; Tsinghua University, China

Xianjun Li; Tsinghua University, China

Siyu Yan; Tsinghua University, China

Shijin Shuai; Tsinghua University, China

This paper launches a study on the innovation mechanism and process of China's automotive industry based on the theory of sectoral system of innovation (SSI). To explore the influence of the innovation mechanism and process on the industrial innovation capability, a theory model is proposed in which the innovation mechanism is divided into three parts consisting of forcing mechanism, management mechanism and learning mechanism, and the innovation process being divided into three phases including accumulation process, transformation process and diffusion process. The innovation capability is evaluated from

SESSIONS

input, output and collaboration side. Further, empirical tests are conducted to support the analytical model, adopting the method of questionnaire survey and structural equation modeling (SEM). The findings show that the forcing mechanism plays the dominant role in stimulating innovation input, the management mechanism mainly supports the industry innovation for China's automotive industry, and the learning mechanism is a long-term process which could promote innovation inputs fundamentally. Innovation process considered, the accumulating process contributes most to the effective organizing and collaborating of the automotive industry, the transforming process is the core element of industry innovation, which is the necessary condition for high quality innovation input and output. Taking into account the conclusions above, some policy recommendations from the sight of innovation mechanism and process are put forward in the end.

HB-06.4 [R] Market Value of Innovation: An Empirical Analysis on China's Stock Market

Yueyan Zhang; Tsinghua University, China

Xianjun Lee; Tsinghua University, China

Xianhua Wei; University of Chinese Academy Sciences, China

Xiangying Meng; University of Chinese Academy Sciences, China

Donghui Meng; Tsinghua University, China

In China, there is growing attention about innovation from both government and industry level, and the authorities also commit and emphasize the support of capital markets to industrial innovation. However, it is not clear whether China's capital markets have positive responses to enterprises' innovation input. Such issues have been studied a lot based on US and European databases; nevertheless, few researchers investigate the market value of Chinese firms' R&D. In this paper, we use a constructed panel dataset from three representative stock markets in China and then use intangible assets increment as the innovation input indicator to examine the innovation performance in both manufacturing and service industries. By comparing the results of different stock markets, we find that the effect of R&D investment and increasing R&D input to market value is insignificant in all three markets, which may result from the weak protection for minority investors and loose regulation of information disclosure. Different constructions of intangible assets of listed firms on the Main Board Market and Growth Enterprise Market account for the market's relatively low efficiency to reflect real value of R&D investment. On the industry level, we conclude that R&D investment in both the service and manufacturing sector contributes positively to market performance, and R&D investment in the service industry shows stronger and more significant linkage to market value than the manufacturing industry.

HB-07 Innovation Management 11

Thursday, 9/8/2016, 10:30 - 12:00

Room: Waikiki Salon 3

Chair(s) Harm-Jan Steenhuis; Hawaii Pacific University

HB-07.1 [R] Antecedents and Effects of Innovative Activities on Innovative Behaviours of Individuals: A Case of a South African Company

Michael Blackman; University of Pretoria, South Africa

Kai-Ying Chan; University of Pretoria, South Africa

This case study focuses on the antecedents that are linked to individual innovative behavior as well as the innovative activities mentioned in the innovation surveys that lead to innovation. A literature review was performed in order to determine the most recognized antecedents to innovative behavior as well as to understand innovative activities of companies, based on innovation surveys performed by individuals within the company. A survey was developed to collect data from a population of 263 employees, from which hierarchical multiple regression was used to analyze the relationships between the variables. It was determined that the significant antecedents to innovative behavior of individuals were self-efficacy; challenging the status quo and having external work contacts. Similarly, the activities that were determined to lead to innovative behavior of individuals were: intramural (in-house) R&D; acquisition of external knowledge and other preparations for product and

process innovations. Although the results of this study are only representative of the company that was studied, and hence not generalizable, the results put forward in this case study provide a framework that is useful to other companies that are interested in nurturing innovation.

HB-07.2 [R] Special Aspects of Modern Production Systems Organization

V P Kuznetsov; Kozma Minin Nizhny Novgorod State Pedagogical Univ, Russia

E P Garina; Kozma Minin Nizhny Novgorod State Pedagogical Univ, Russia

E A Semakhin; Kozma Minin Nizhny Novgorod State Pedagogical Univ, Russia

A P Garin; Kozma Minin Nizhny Novgorod State Pedagogical Univ, Russia

G S Klychova; Kazan (Volga region) Federal University, Russia

Ruslan G Zakirov; Kazan (Volga region) Federal University, Russia

We conducted analysis of content and key elements of the production systems of Toyota, Ford and "GAZ Group" companies. It was determined that general principles of the production system buildup and its philosophy are established at this stage of development. However, when replicating the experience of the industry leaders, the system in its pure form cannot be "transferred" to another economic environment. Therefore, in the context of domestic practice, the experience in building up production systems requires further development and adaptation to the existing environment.

HB-07.3 [A] Evolutionary Evaluation of Energy and Nanotechnology Relationship

Serhat Burmaoglu; Izmir Katip Celebi University, Turkey

Sercan Ozcan; Bahcesehir University, Turkey

As a result of changing conditions in the world due to increasing population, scarce natural resources and climate change, there are increasing numbers of research activities in the areas of food, water and energy, which are critical for humanity. With the growing threat of pollution, global warming, and energy crises caused by countries' strong dependence on the dwindling supply of nonrenewable fossil fuels, the search for clean, sustainable and renewable alternative energy resources is one of the most urgent challenges to the sustainable development of human civilization. According to Jones (2009), these challenges can be overcome by applying nanoscience and technology to the energy field. Nanomaterials can be produced in a variety of material classes such as carbon-based nanomaterials, nanocomposites, metals and alloys, and these classes can be produced with different shapes and properties. One of the interesting properties of such nanomaterials is their very high surface area per unit volume that leads to much higher surface activity than in the bulk material. This has potential for speeding up chemical reactions and catalysis and thus improving the efficiency of many processes. There are many applications of nanotechnologies in energy systems that have been identified in various reviews as: 1) energy conversion, 2) energy storage, 3) energy transmission, and 4) energy use. The aim of the study is to analyze the relationship of energy and nanotechnology fields by using scientometric methods. For this study, the Web of Science database was used with the help of lexical search query strategy. Nanotechnology and the keyword set that is applied by [5, 6] is used to gather data in related journals. To determine the energy journals experts in the energy field are further consulted and then the whole collection downloaded for last 10-year period. The collected data is analyzed by using text-mining techniques to understand the relationship and convergence between nanotechnology and energy fields. Finally, future collaboration opportunities are extracted and interpreted for this field.

HB-07.4 [R] The Inclusiveness of Internet-based Agri-business Innovation System: A Case Study on Alibaba

Zihan Zhang; Zhejiang University, China

Xiaobo Wu; Zhejiang University, China

Compared to the economic effect, the social effect brought by innovation remains ignored by scholars. Inclusive innovation, which emphasizes the diversity of the stakeholders related to innovations, especially BOPs (the bottom of the pyramid), has been acknowledged as a possible solution to a series of social problems such as imbalanced development

SESSIONS

and poverty. However, how an innovation system achieves inclusiveness is still not clearly explained in existing research. From 2013, "Taobao villages," where many farmers from rural areas are enabled to get free from poverty by doing agri-business online, have become prevailing under the development of ICT infrastructure and the Alibaba group's rural e-business strategy. Such internet-based businesses, catalyzed by Alibaba's innovation on an e-business platform, lower the entry barrier for transaction, more easily connect farmers to huge markets, and provide them opportunity to participate in value creation activity. As a result, such groups benefit from this way of sharing the value with other participators. We develop our research on case studies of several Taobao villages in China. We attempt to draw implications from the performance of the innovation system, which includes multiple innovators for the mechanism that reduces social exclusions and enables farmers to participate in value creation activity.

HB-10 Intellectual Property 9

Thursday, 9/8/2016, 10:30 - 12:00

Room: Milo III

Chair(s) Cory Hallam; University of Texas at San Antonio

HB-10.1 [R] How Individual Inventors and SMEs Exploit Intellectual Property Rights: The Case of Finland

Juhani Talvela; *Kyminlaakso University of Applied Sciences, Finland*
Matti Karvonen; *Lappeenranta University of Technology, Finland*
Tuomo Kassi; *Lappeenranta University of Technology, Finland*
Ville Ojanen; *Lappeenranta University of Technology, Finland*

Inventions have long been recognized key drivers for wealth creation of nations. As intellectual property (IP) rights are costly and difficult to acquire and enforce, it is often argued that SMEs are disadvantaged in their ability to utilize IP rights. Against the background of the patent upsurge, we first conduct a literature review of the role of patenting and alternative instruments to protect intellectual property. Secondly, the patent frequencies are analyzed based on statistics, and thirdly semi-structured interviews are used to provide an understanding of private inventors and SMEs' IP rights utilization. The results of the study show that actions to support patenting in Finland and registering of other types IPR remain low. As propensity to patent using different routes, national first filings are declining for small countries like Finland as companies increasingly use PCT and other alternative routes. Interviews with private inventors and SMEs show that the general knowledge of the global patent system, and capabilities to operate with IPRs, are quite modest. This leads to unjustified high expectations of economic benefits of patenting, and eventually, disappointment with IPRs. Reasons for this development, and challenges to the Finnish national patenting support environment, are discussed. We derive some possible challenges for future patent policies from these insights.

HB-10.2 [R] Patent Analysis for Guiding Technology Transfer from EU/EEA to China: The Case of CO2 Compressor in CCUS Cooperation

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Carbon capture, utilization and storage (CCUS) technology is believed to be an effective

approach to control and reduce CO2 emissions in China. We take CO2 compressor in CCUS as the object of research and technological backgrounds to build up a patent analysis model in both statistics and bibliometrics approaches for guiding patent technology transfer. Patent bibliometrics analysis is more progressive compared with statistics analysis and goes further from the shallower to the deeper depth in technology analysis. We find patent analysis and technology transfer have internal theoretical relations and realistic relevance since patent analysis can play a non-substitutable role in the preliminary stage of technology transfer in identifying IP ownership, technology gap, sources, distributions, characteristics and application domains. We compare these aspects on CO2 compressor in CCUS between EU/EEA and China from the patent analysis view and define the necessities for technology transfer in a clean energy context. Finally, we summarize IP policy implications and suggest patent technology transfer mechanisms based on the patent analysis model so as to ensure substantial achievements in future mutually beneficial cross-border clean energy technology transfer.

HB-10.3 [R] Processes Proposal for the Intellectual Property Protection Management in a Technology Licensing Office from a Brazilian Scientific and Technological Institution

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In Brazil in recent years the intellectual property (IP) rights and cooperation between Scientific and Technological Institution (STI) and company have intensified interest, despite the process of knowledge generation and transformation of this knowledge into innovation and wealth being in an embryonic stage. The IP concerns the branch of law, which deals with the legal protection granted to all human mind creations such as inventions, for example. Legal protection technologies according to IP rights, as well as the management of these protected technologies in an STI, is the responsibility of the Technological Licensing Office (TLO). One of the challenges encountered by TLO is concerning the management of IP to use multiple mechanisms to shape decisions for the protection of new technologies, considering the TLO innovation strategy. From this perspective, to define the organizational processes that will enable the protection of generated creations under the TLO, it is essential to ensure efficiency and effectiveness in the IP management. Thus, the aim of this paper is to present a process model for the technologies protection based on IP, contained in the a TLO portfolio, as a way of leveraging technologies transferred, invented or developed by STI to a receiving organization.

HD-01 PICMET '17 & '18 PLANNING SESSION

Thursday, 9/8/2016, 16:00 - 17:30

Room: Kona Moku Salon A

Chair(s) Dundar F Kocaoglu; Portland State University

This session will provide an opportunity to give feedback on PICMET '16 and to get involved in the planning for PICMET '17 and '18 conferences. PICMET '17 will be held July 9-13, 2017, at the Portland Marriott Downtown Waterfront, Portland, Oregon, USA.



PICMET

AUTHOR INDEX

A

Abbas, Mustafa S.; MB-05.3
Abe, Hitoshi; TD-02.3
Addibpour, Mattin; TD-11.2
Agdas, Duzgun; ME-11.1
Agwa-Ejon, John; HB-05.1
Agwa-Ejon, John Francis; ME-11.2;
WD-05.1
Ajila, Samuel A.; TD-11.1
Akay, Adnan; HA-00.2
Akhter, Tanzila; TB-09.2
AL-Ali, Maytha; TB-09.1
Alaraje, Nasser; MD-04.1
Aldhaban, Fahad; WE-05.4
Alp, Neslihan; ME-01.4; ME-01
Alvarez Merino, Jose C.; WE-08.1
Amadi-Echendu, Anthea; TD-04.1
Amadi-Echendu, Joe; MB-01; MD-11.2;
TD-04; TD-04.1
Amancio-Vieira, Saulo F.; TD-06.3
Amato, Joao; TD-07.4
An, Yuan; MB-06.3
Anderson, Timothy R.; MB-05; MB-05.2;
TE-10; WA-00; WB-06; WB-06.3
Andrade, Herlandi S.; TE-10.2;
WE-10.3; HB-10.3
Anisimova, Tatiana; WD-04.3
Ansal, Hacer; TD-02.1
Anthony, Jamie; MB-08.1
Antoniol, Rodrigo L.; MD-09.4
Aoshima, Yaichi; WB-11.3
Arsentyeva, L I.; TB-06.3
Asghar, Bilal; WE-02.1
Atalay, Bulent; TA-00.1
Ateetanan, Pornprom; WD-01.3
Atoche-Kong, Carlos E.; TE-07.4

B

Baek, Seungchul; WB-03.3
Bai, Xu; MD-09.2; WE-05.2
Barczak, Gloria; MB-01
Barg, Sebastian J.; ME-12.2
Barham, Husam; TB-09.2
Basoglu, Nuri; TD-01.2; TE-01.1
Batchuluun, Amrita; WB-04.2

Behncke, Florian; TD-05.1
Bekius, Femke; MB-06.2
Beltaif, Nader; TB-09.2
Berg, Pekka; WE-11.1; TB-03.3
Berkol, Ali; TD-05.2
Betz, Frederick; ME-06.1
Bezaka, Jules Bosco; WB-07.3; WD-03.2
Bichetti, Roberto; TD-06.1
Bierrenbach de Souza Santos, Suzana;
ME-10.3
Bigolin, Morgane; TE-06.2
Blackman, Michael; HB-07.1
Blom, Rikard; WD-02.2
Blum, Matthias; TB-11.1
Borgstedt, Philipp; MD-05.1
Brennan, Louis; MB-11.3
Bresler, Julia; ME-02.1
Brouwers-Ren, Liqin; TE-06.1
Brumen, Bostjan; WB-04.1; WE-02;
WE-02.3
Brzustowski, Tom; TE-06.3
Bullinger, Hans-Joerg; MA-00.2;
MD-08.1
Bullock, Gina; WD-02.3
Bulnina, I S.; TB-06.3
Burmaoglu, Serhat; HB-07.3

C

Cai, Shun; MD-12.2
Cai, Zong; TB-10.2; TB-10.1
Cardenas, Jose Manuel M.; MB-02.3
Carvalhinha, Marilia; TD-07.4
Castanon, Rosario; ME-03.1
Castillo-Carreon, Margarita; TE-07.4
Caten, Carla S.; WD-08.3
Cetindamar, Dilek; MB-01; TA-00;
TB-02.3
Cha, Min-Seok; MB-09.1; MB-09
Chan, Kai-Ying; TD-07.1; TE-03.2;
HB-07.1
Chang, Ching-Hsun; MB-03.2
Chang, ChingWen; TE-10.4
Chang, Han yun; MB-10.2; MB-10.3
Chang, Hebron C.; ME-05.1
Chang, Jing; MB-06.3
Chang, Ke-Chiun; MD-10.2; ME-05.3

Chang, Shih Chieh; TE-01.3
Chang, Ssu-Li; WD-04.1
Chang, Tai-Wei; MB-02.1
Chang, Yu-Hsin; MB-10.2; MB-10.3
Chang, Yu-Yu; ME-09.3
Chang Junior, Joao; MD-05.3; ME-10.3
Chatukuta, Sylvester; WB-10.3
Chaturvedi, Ritu; WB-09.2
Chavez, Victor; HB-01.1
Chen, Chihchang; MD-10.2; ME-05.3
Chen, Cong; ME-09.2
Chen, Dar-Zen; MD-01.2
Chen, James K.; TE-01; TE-01.2; WB-04;
WB-04.2; WD-03; WD-03.1
Chen, Jun-Lang; TD-10.2
Chen, Shujing; MB-07.1
Chen, Song; MD-04.2; MD-04.3
Chen, Xiao; MD-07.3
Chen, Yi-juen; WB-10.1
Chen, Yu-Shan; MB-02; MB-02.1;
MB-02.4
Cheng, Stephen W.Y.; TB-05.1; TD-05.3;
WB-11.1
Cheng, Yijie; TB-04.2; WE-05.2
Chiang, Ta-Chan; WD-10.2
Chih, Hsiang-Lin; MB-09.4
Chimendes, Vanessa Cristina G.;
WE-10.3
Cho, Hwang H.; WB-05.1
Choi, Byungchul; MD-08.2; MD-08
Choi, TaiJung; WB-08.3; WB-08
Choothian, Woraruthai; WD-10.3
Chou, Chia-Chen; ME-01.3
Choudhary, Muhammad Abbas;
ME-05.2; WE-02.1
Choy, King-lun T.; TB-05.1; TD-05.3;
WB-11.1
Chu, Neil; MB-10.1
Chucholowski, Nepomuk; TD-03.1
Chung, Do Bum; TE-04.3
Cillie, Maria; TD-08.3
Coelho, Alexandre; MD-05.3
Contreras, Carolina; MD-11.3
Cowan, Kelly; HB-01.2
Crutchfield, John; TB-05.2
Cunningham, Scott; MB-06.2

D

AUTHOR INDEX

- Dabic, Marina; MB-01; MD-04; TD-01; TD-01.2
- Daim, Tugrul U.; MB-01; TE-11; TE-11.2; TE-11.3; WD-06.1; WE-05; WE-05.4; HA-00; HB-01; HB-01.2
- Damiani, Jose Henrique S.; ME-01.2
- Damrongchai, Nares; WE-01.4
- Dang, Xiaojie; TB-04.2
- Danilevicz, Angela de Moura Ferreira; TE-06.2
- Dasher, Richard; MB-04.3
- de Bruijn, Hans; MB-06.2
- de Carvalho, Talles N.; ME-10.3
- Deng, Dasheng; WB-03.1
- Deng, Quwen; MD-03.3
- Diaz-Perez, Claudia C.; ME-04.4
- Ding, Yu; WE-02.2
- Djassemi, Manocher; MD-11.1; MD-11
- Dogan, Umutcan; WD-09.1
- Dolle, Christian; MD-06.3
- Dong, Huei-Ru; ME-10.2
- Duzdar, Irem; TD-01.1; WD-09.1
- E**
- Echeveste, Marcia Elisa S.; WD-08.3
- Egawa, Tsunayoshi; WD-01.2
- Ekstedt, Mathias; TE-02.1; WD-02.2
- Elsesser, Luisa; ME-07.2
- Ensign, Prescott C.; ME-09; ME-09.1; TE-06; TE-06.3
- Erasmus, Louwrence D.; TD-08; TD-08.3; WD-05; WD-05.2; WD-05.3
- Estep, Judith; TB-01.3; WD-06.1
- Eto, Manabu; TD-09.2
- F**
- Fakhrutdinova, E V.; TB-06.2
- Falcone, Miriam; WB-01.2
- Farazi, Mohammad Saleh; TB-07.2
- Farlow, Steve; ME-09.1
- Fernandes, Alfredo; ME-10.3
- Fischer, Dietmar; MD-08.1
- Fleury, Afonso; ME-01.1
- Follador, Andrea O.; TE-10.2; WE-10.3; HB-10.3
- Follador, Roberto C.; TE-10.2; WE-10.3; HB-10.3
- Fotoyi, Phathiswa; WD-03.3
- Franke, Ulrik; MB-06.1; TE-02.1
- Freitas Chagas Junior, Milton; WE-03.2
- Fujii, Akihiro; HB-02.1
- Fujii, Nobuzumi; MD-02.1
- Fujimoto, Jun; WD-10.1
- Fukuyo, Kazuhiro; WB-08.1
- Funashima, Hiroki; TB-11.3
- Furue, Nanami; WE-08.3
- G**
- Gan, Jingxian; WE-07.2
- Gao, Yuhan; MB-06.3
- Garces, Edwin; MB-08.1
- Garin, A P.; HB-07.2
- Garina, E P.; HB-07.2
- Gemba, Kiminori; TE-08.2
- Gerdsri, Nathasit; ME-04.1; ME-04
- Gibson, Elizabeth; TE-11.3
- Gilmour, Ross F.; MD-12.3; WB-05.3
- Godoy Lima, Marissa Y.; TD-06.3
- Goken, Muge; TD-01.2
- Gomes, Beatriz Maffini; TD-06.1
- Gomes, Clandia M.; TD-06.1
- Gomes, Jefesson; WE-10.3
- Gopalakrishnan, Shanthi; TB-07; TB-07.2; TE-04.2
- Gopi, Ashwin G.; WD-07.1; WE-07.1
- Goto, Satoru; TB-02.2
- Grames, Patrick P.; WD-08.1; WE-05.3
- Gregory, M.; TD-09.1
- Grizzi, Robert; TB-01.3
- Grobbelaar, Sara S.; MB-03.3; WB-10.2; WB-10.3
- Grochowski, Eva M.; MB-04.3
- Groen, Aard; TE-06.1
- Gschoepf, Andreas; TE-09.3
- Gui, BingXiu; WE-05.2
- Guilbault, Melodi; TE-04.2
- Gunther, Markus; MD-01.1; MD-01
- Guo, Yanting; MD-07.3; HB-06.2
- Guo, Ying; TE-11.1; WD-09.2
- Gupta, Apeksha; WB-09.2
- Gupta, Dharmesh B.; HB-06.1
- Gupta, Ruchita; HB-06.1
- Gyanendra, Rishabh; HB-02.1
- H**
- Hallam, Cory R. A.; MD-11.3; TD-02; TD-02.2; WB-01; WB-01.1; WD-11; WD-11.2; WE-01.3; HB-10
- Hamdan, Amer; MB-11.1
- Hamdan, Maysaa M.; MB-11.1
- Hameedaldeen, S. A.; TD-09.1
- Han, Shifeng; ME-06.2; TB-04.2
- Haque, Iffat T.; TD-08.2
- Hara, Tadayoshi; TB-09.3; TE-02.3
- Harmon, Robert; WE-05.4
- Haruechaiyasak, Choochart; TE-08.1
- Hasenauer, Rainer P.; TE-09.3; WB-01.2
- Hata, David; MD-04.1
- Hatakeyama, Kazuo; WB-06.2; WD-09; WD-09.3; WE-08.1
- Hayakawa, Kazuya; ME-10.1
- Hayashi, Chihiro; TB-11.2
- Hayashida, Hideki; TB-11.3; TB-11
- Heiser, Franz; TD-11.2
- Henriques Gehlen, Karina R.; TD-06.3
- Heo, Yoseob; MB-11.2
- Hernandez, Jose Luis Sampedro; ME-04.4
- Herrmann-Fankhaenel, Anja; WB-04.4
- Hillegas-Elting, James; MB-08.1
- Hirai, Yuri; MD-06.1
- Hirano, Makoto; TB-07.1; TB-07.3
- Hirata, Sadayo; TB-07.1
- Ho, G.T.S.; TB-05.1
- Ho, Jonathan C.; WE-11.3
- Hogaboam, Liliya; TE-11.2
- Hollauer, Christoph; TD-03.2
- Holle, Maik; ME-07.2
- Hong, Sungwha; MB-11.2
- Hsu, Chiung-Wen; TD-07.2
- Hsu, Mu-Yen; MB-02.2
- Hsueh, Rui-Teng; TB-01.1; TE-09.2
- Hu, Jing; MB-07.1; TB-05.3; TE-02.2
- Hu, Wang; TD-04.3
- Huang, Cui; ME-03.2
- Huang, Dujuan; MD-04.2; MD-04.3
- Huang, Hung-Chun; TE-10.1

AUTHOR INDEX

Huang, Lucheng; TB-02.1
Huang, Mu-Hsuan; ME-10.2
Huang, Wensheng; WE-02.2
Huang, Ying; TE-11.1; WD-09.2
Huesig, Stefan; ME-02; ME-02.1;
WB-04.4
Hung, Shao-Pin; WD-04.1
Huo, Guoqing; MD-07.1

I

Iamratanakul, Supachart; WD-10.3;
WD-10
Ibragimova, G M.; WB-05.2
Igarashi, Yoichiro; WD-11.3
Ikawa, Yasuo; TB-10.3; WD-06.2
Ilevbare, Imoh M.; WD-06.3
Inoue, Keisuke; MD-02.2
Inoue, Koichi; WB-08.1
Intumu, L. M.; TD-09.1
Inui, Toshiyuki; MD-10.3; WE-10.1
Ishiki, Yoshinao; TD-02.3
Ishimatsu, Hirokazu; MD-02.2
Islam, Nazrul; MB-01; MD-09; MD-09.3;
TB-04; TB-04.1
Ito, Yasunobu; ME-10.1
Ivancic, Renato; WE-02.3
Iwami, Shino; MB-09.2
Iwamoto, Takashi; MD-02.3
Iwata, Shinjiro; MA-00.1

J

Jahromi, Shabnam R.; MB-05.2
Jain, Karuna; ME-07.4; HB-06.1
Jetter, Antonie J.; MB-12.3; TB-08.2;
WE-01.1
Jia, Ruiqian; MD-04.3
Jiang, Dongdong; WD-03.3
Jiang, Min; WE-07.2
Jiang, Wei; MD-12.2
Jin, Tiecheng; MD-09.1
Joy, Simy; TE-07.1
Jung, Euy-Young; MD-12.1

K

Kaadoor, Amani; TB-09.2
Kabasheva, I A.; TB-06.3
Kajikawa, Yuya; MD-09.1; ME-02.3;
TB-08.3; WE-05.1
Kalja, Ahto; WB-08.2
Kang, Dongsuk; WB-03.3
Kang, Jongseok; MB-11.2
Kano, Shingo; MD-08.3; TE-10.4
Kara, Gozde; TD-05.2
Karvonen, Matti; HB-10.1
Kassi, Tuomo; HB-10.1
Kataoka, Rieko; TB-10.3
Katayama-Yoshida, Hiroshi; TB-11.3
Kato, Seiichi; TB-08.1
Kattner, Niklas; TD-03.2
Kayakutlu, Gulgun; TD-01.1; WD-09.1;
HB-01.3
Kayalica, Ozgur M.; HB-01.3
Ke, Tsung-Han; TE-10.1
Kehinde, Lawrence O.; WB-09.3
Kerga, Endris; WB-09.1
Ketteree, Marcel; HB-01.3
Khalifa, Rafaa I.; WD-08.2
Khammuang, Monticha; MB-05.1
Khanam, Iiza; TD-04.3
Kholopane, Pule A.; TD-06; TD-06.2;
WE-09.2; WE-09
Kiang, Yen-Jo; MD-10.2; ME-05.3
Kief, Craig; MD-04.1
Kim, Byungil; TE-04.3
Kim, Seong-Jin; MD-12.1; MD-12
Kimura, Megumi; ME-12.3
Kirschke, Florian; MD-05.1
Kiyota, Mamoru; WE-03.1
Kloppel, Manfred; TD-05.1
Klychova, G S.; HB-07.2
Kneipp, Jordana M.; TD-06.1
Kocaoglu, Dundar F.; MB-05.1; MB-05.3
Kohda, Youji; TD-08.2
Kongthon, Alisa; MD-07.2; TE-08.1
Korman, Matus; MB-06.1; TE-02.1;
WD-02.2
Korostyshevskaya, E M.; TB-06.2
Kosaka, Michitaka; MD-05.2
Koshiyama, Takehiko; WD-10.1
Kruger, David J.; TE-05; TE-05.1;
TE-05.3

Kruglianskas, Isak; TD-06.1
Kuan, Chung-Huei; WD-10.2
Kubo, Hiroshi; WE-03.1
Kumagai, Satoshi; TB-11.2
Kurashige, Mitsuhiro; TB-07.1; TB-07.3
Kuroda, Tatsuya; MB-09.2
Kuznetsov, V P.; HB-07.2

L

Lagerstrom, Robert; MB-06; MB-06.1;
TD-11; TD-11.2; TE-02; TE-02.1;
WD-02.2
Lai, Kuei Kuei; MB-10.2; MB-10.3
Lai, Pi-Yu; MB-02.1
Lam, C.H.Y.; TB-05.1; TD-05.3; WB-11.1
Langer, Sarah; ME-02.1
Laraia, Lilian R.; WD-01.1
Lau, Felix; MB-12.2; MB-12.4; MD-06.4
Laubmann, Jonas; TD-05.1
Lee, Albert C. T.; TD-06.4
Lee, Demei; WE-11.3
Lee, Jaewon; WB-05.1
Lee, Jason C.H.; WB-11.1
Lee, Jay; WA-00.1
Lee, Jeong-Dong; MD-12.1
Lee, Jungwon; ME-03.3; ME-03
Lee, Peng-I; WB-07.1
Lee, Seona; WB-05.1
Lee, Xianjun; HB-06.4
Lee, Yih-Jiun; ME-01.3
Lee, Yu-I; MB-02.4
Lee Chang, Shujen; TE-01.2
Lei, Mingtianzi; HB-06.2
Leker, Jens; ME-07.1; TE-04.1
Leto, L A.; WB-05.2
Leung, K.H.; WB-11.1
Li, Bolin; WE-09.3
Li, Huan; TB-05.2
Li, Huicong; MD-07.1
Li, Jing; MD-03.1
Li, Jizhen; ME-09.2
Li, Kuang-Pin; TE-09.2
Li, Xianjun; MD-07.4; WD-07.2; HB-06.3
Li, Xueshan; MB-06.3
Liang, Huan Wei; WB-04.3

AUTHOR INDEX

Lien, Kai-Wen; ME-01.3
Lima, Fabio; MD-09.4
Lin, Chien Yu; MB-10.2; MB-10.3
Lin, Hai-Chen; TD-06.4
Lin, Kuan-Chung; TB-01.1; TE-09.2
Lin, Mei-Chen; MB-09.4
Lin, Yanan; TD-04.2
Lince-Arias, Angelica; TE-07.4
Lindberg T., John; TB-01.3
Lindemann, Udo; ME-07.2; TD-03.1;
TD-03.2
Liotino, Karine; TD-07.4
Liu, Feng-Hsu; TD-08.1
Liu, Jianhua; TE-11.1
Liu, Lewis; WD-07.2
Liu, Min; MD-03.3
Liu, Wenchao; MD-07.4
Liu, Xin; HB-10.2
Liu, Xuefeng; TD-04.2
Liu, Yun; MB-06.3; MD-09.2; TB-04.2;
TE-03.3; WE-05.2
Liu, Yushan; MD-12.2
Liu, Zheng; WE-07.2
Lo, Liang-Huey; TD-06.4
Lu, MingJie; MD-03.1
Lu, Ta-jung; WB-10.1
Lucas, Brandon M.; TB-05.2
Lukoto, Khathutshelo; TD-07.1
Luo, Hui; WD-07.3
Luvizan, Simone S.; MB-07.2

M

Ma, Judy; MD-08.2
Ma, Lei; WE-07.2
Ma, ZhiYun; WE-05.2
Mabogunje, Ade; WE-11.1
Machado, Marcelo A.; TE-03.1
Magnier-Watanabe, Remy; TB-10; TE-03;
TE-03.1
Magwenzi, Rachel; TE-03.2
Mahfuz, Mohammad A.; TD-04.3
Mahmood, Aisha; ME-05.2
Maisenbacher, Sebastian; TD-05.1
Malek, Kouros; TD-09.3
Mancha, Ruben; TD-02.2
Manley, Karen; ME-11.1

Manotungvorapun, Nisit; ME-04.1
Marinakakis, Yorgos D.; HB-01.1
Marks, Adam; TB-09.1
Masuabi, Francis M.; WD-05.2
Masuya, Hitoshi; TB-08.1
Matar, Bassam; MD-04.1
Mattern, Christian; MB-12.1
Mau, Jeremy; ME-01.4
Mawele, Clement C.; WE-09.1
Meek, Taylor J.; TB-09.2
Meijer, Sebastiaan; MB-06.2
Mejia Caballero, Cristian Andres;
WE-05.1
Mello, Adriana M.; ME-01.1
Meng, Donghui; WD-07.2; HB-06.4
Meng, Xiangying; HB-06.4
Merritt, Humberto; WB-03.2; WB-03
Miao, Hong; TB-02.1
Mierin, L A.; TB-06.2
Miyazaki, Kumiko; MD-09.1; ME-09.4
Mizuno, Yutaka; MB-08.2
Mohd Ibrahim, Khairul Ridzwan B.;
MD-12.3; WB-05.3
Mokwalo Monareng, Seun; HB-05.1
More, Rahul Z.; ME-07.4
Mori, Junichiro; TB-09.3
Moritz, Manuel; WD-08.1
Mortl, Markus; TD-05.1
Moser, Bryan; TD-03.1
Mosia, Ngaka N.; WB-06.1
Mudavadi, Caroline; TE-11.2
Mugruza-Vassallo, Carlos A.; MB-07.3
Mulaba-Bafubiandi, Antoine F.;
ME-11.2; HB-05.1
Munkongsujarit, Songphon; ME-06.3;
TB-03.1
Munson, J. Michael; WD-11.2
Muzira, Tichawona; WD-05.3

N

Naegele, Rainer; MD-08.1
Nagasato, Kenji; ME-11.3
Nakamura, Hiroko; TB-08.3; TB-08
Nakamura, Yoshiki; TB-11.2
Nakashio, Yuko; TB-09.3
Nascimento, Gustavo L.; WD-09.3

Nascimento, Paulo T.; MB-07; MB-07.2;
ME-01.1; TD-07; TD-07.3; HB-05.3
Nathwani, Jatin; TD-09.3
Neyer, Bastian; MD-05.1
Ngoune, Severin M.; TD-06.2
Niwa, Kiyoshi; MA-00
Nobeoka, Kentaro; ME-12.3; ME-12
Nomakuchi, Takao; TE-09.1
Nomoto, Shinichiro; TE-08.4

O

O'Connor, Gina; MD-08.2
Odate, Nobutaka; MB-08.2
Ofori-Boadu, Andrea; WD-02.3
Oh, Deog-Seong; WE-11.2
Ohba, Masaaki; TB-11.2
Ohtsuka, Yuichi; WB-08.1
Ojanen, Ville; HB-10.1
Ojha, Abhoy; TE-04.2
Oliveira, Luiz G.; ME-01.1; WB-06.2
Oliver, Terry; TB-01.3
Olivera, Sergio; MB-02.3
Olorunniwo, Moses A.; WD-04.2
Olorunniwo, Oludare; WB-09.3;
WD-04.2
Ono, Masayuki; WB-01.3
Onodera, Akihiko; TD-02.3
Onodera, Reiko; ME-09.4
Oosthuizen, Sameul A.; MD-11.2
Otieno, Francis; TB-02.2
Ozcan, Sercan; TB-04.1; WD-11.1;
HB-07.3
Ozerdem, Baris M.; WD-11.1
Ozozen, Avni; HB-01.3
Ozyazici, M. Sadettin; WD-11.1

P

Pan, Telung; TE-01.3
Pang, G.K.H.; WB-11.1
Paradi, Joseph C.; MB-04; ME-06
Park, Dongkyu; WB-03.3
Park, Sinae; WB-05.1
Park, YoungWon; TD-11.3
Paula, Istefani C.; WD-08.3; WD-08
Pawlowski, Edmund; WD-02.1; WD-02

AUTHOR INDEX

Pellissier, Rene; WE-09.1
Peltola, Tero; TE-03.1
Pereira, Rogerio A.; ME-12.4
Perez-Luno, Ana; TB-07.2
Phaal, Robert; WD-06.3
Phillips, Fred Y.; MB-01; TB-05; WE-11;
WE-11.2
Pihlajamaa, Jussi; TB-03.3; WE-11.1
Poonamallee, Latha; TE-07.1
Porter, Alan L.; TE-11.1; WA-00.2;
WD-09.2
Pretorius, Jan-Harm; ME-11.2
Pretorius, Leon; HB-02.3
Pretorius, Marthinus W.; MB-01; HB-02;
HB-02.3
Probert, David; WD-06.3

Q

Qi, Peixiao; TD-10.3
Qi, Sharon; TD-03.3
Qi, Xingda; HB-06.3
Quan, Xiaohong; TD-03.3; TD-03
Qurashi, Aleena Hasan; ME-05.2

R

Rahelarivolaso, Saholitian; WB-07.3
Rahimi, Noshad; WE-01.1
Rakhmatullin, Ruslan; MB-11.3
Rakotomalala, Olivier Herindrainy;
WB-07.3; WD-03.2; WE-03.3
Rakotomaria, Etienne; WE-03.3
Ramdass, Kem; TE-05.2; HB-05; HB-05.2
Rao, Bharat; WD-07.1; WE-07.1
Ratsimbazafy, Pierre A.; WD-03.2
Ravalison, Andrianaivomalala; WE-03.3
Raveloson, Elise; WB-07.3; WD-03.2;
WE-03.3
Razaivaovololoniaina, Diamondra
Helinoro; WB-07.3; WD-03.2
Razumovskaya, E M.; WB-05.2
Rebentisch, Eric; MB-12; MB-12.1;
TD-03.1; WB-09; WB-09.1
Redlich, Tobias; WD-08.1; WE-05.3
Reutter, John; MD-04.1

Riesener, Michael; MB-12.1; MD-06.3;
ME-12.2
Rietsema, Kees; TB-09.1; WD-04
Robal, Tarmo; WB-08.2
Robbins, Matthew J.; TB-05.2
Rogers, K. Jamie; MB-11.1; MB-11
Rose, Timothy M.; ME-11.1
Roy, Shawn; TE-06.3
Rozman, Ivan; WE-02.3
Rozman Cafuta, Melita; WB-04.1
Ruan, Cao; WD-07.3
Ruan, Pingnan; MB-04.1
Rudaleva, I A.; TB-06.3
Rudolf, Stefan; MB-12.1
Rueger, Marc; MD-08.1

S

Sadia, Rina; ME-02.2
Saito, Hiromi; TE-07.2; WE-01.2
Sakakibara, Kiyonori; TB-07.1; TB-07.3
Sakata, Ichiro; MB-09.2; MD-02;
MD-02.1; ME-04.2; TB-09; TB-09.3;
TD-01.3; TE-02.3
Sasaki, Hajime; TD-01.3; TE-02.3
Sasaki, Yasuo; ME-12.1
Sawaguchi, Manabu; WB-07.2; WB-07
Schewe, Gerhard; MD-05.1
Schmid, Roland; WB-09.1
Schreiner, Lilian C.; TD-07.3
Schroeder, Stephan; MB-12.2; MB-12.4;
MD-06.4
Schuh, Guenther; MB-12.1; MB-12.2;
MB-12.4; MD-06.3; MD-06.4; ME-12.2;
TB-11.1
Scillitoe, Joanne; TE-07.1; TE-07
Scur, Gabriela; ME-12.4
Segawa, Yoshihisa; WD-06.2
Semakhin, E A.; HB-07.2
Sengoku, Shintaro; ME-09.4
Sergeyev, Aleksandr; MD-04.1
Sheikh, Nasir J.; TB-01.2; TB-01
Sheikh, Omar; TB-01.2
Shen, Wanqing; WE-02.2
Shen, Wei-Ting; TE-10.3
Shi, Hui; WB-03.1
Shi, Lei; WD-07.3
Shibata, Masashi; WB-08.1
Shih, Hsin-Yu; TE-10.1
Shin, Jungwoo; HB-02.2
Shirahada, Kunio; WB-11; WB-11.2;
WD-01; WD-01.2; WD-01.3
Shirasaka, Seiko; MB-09.3
Shuai, Shijin; HB-06.3
Shyu, Joseph Z.; TB-01.1; TE-09.2
Sick, Nathalie; ME-07; ME-07.1; TE-04;
TE-04.1; WE-03
Sikander, Arif; ME-04.3
Silva Filho, Luiz Carlos P.; TE-06.2
Silveira, Manoel M.; WD-08.3
Sinha, Kaushik; MB-12.1
Siu, Paul K.Y.; TB-05.1
Solleiro, Jose Luis; ME-03.1
Song, ChiUng; WB-05.1
Sorabayashi, Tetsuro; ME-12.1
Sousa, Willy H.; WD-01.1
Sowells, Evelyn R.; WD-02.3
Spakousky, J. J.; TD-09.1
Spivey, W. Austin; WD-11.2
Srivannaboon, Sabin; TB-03.1
Staphorst, Leon; HB-02.3
Starke, Phillip; TD-03.1
Steenhuis, Harm-Jan; MB-01; ME-10;
TD-09; TD-09.1; HB-07
Stewart, Robert; WD-08.2
Stracke, Felix; MB-12.1
Stuehmer, Annika; MD-07.2
Su, Daoming; ME-02.4
Su, Fang-Pei; MB-10.2
Su, Hsin-Ning; MB-03; MB-03.1; ME-05;
ME-05.1; TB-06; TB-06.1; TE-10.3;
WB-07.1
Su, Jun; ME-03.2
Suarez, Sofia Minano; MB-07.3
Sudrajat, Iwan; MD-03.2; MD-03
Suh, Nam P.; HA-00.1
Sumikura, Koichi; TE-07.2; WE-01.2
Sun, Benson S.; WB-04.2
Suzuki, Masahiko; MD-05.2
Syarif, Muhammad S.; MD-03.2

AUTHOR INDEX

T

Ta kin, Burcu; TE-01.1
Tabira, Yoshihiro; TB-02.2; TB-02
Takada, Naoki; MB-04.2
Takahashi, Masakazu; TE-09.1; WB-08.1
Takai, Keigo; WE-07.3
Takano, Yasutomo; ME-02.3
Talebi, Nasim; WB-01.1; WE-01.3
Talvela, Juhani; HB-10.1
Tam, Migar M.C.; WB-11.1
Tamada, Schumpeter; MD-05; TE-08;
TE-08.2
Tamaki, Kin'ya; TD-11.3
Tan, Long; TE-03.3
Tanaka, Kazuya; ME-04.2
Tanaka, Yoshitoshi; MD-10; MD-10.3;
WE-10; WE-10.1; WE-10.2
Tang, Valerie; TB-05.1
Tanii, Yoji; WB-01.3
Tansakul, Nitipon; WB-11.2
Tarabichi, Hani; TB-03.3; WE-11.1
Tashiro, Hisato; MD-02.1
Tavassi, Ana C.; HB-05.3
Teixeira, Luciana A.; HB-05.3
Terzi, Sergio; WB-09.1
Thal, Jr., Alfred E.; TB-05.2
Thomaz, Murilo; TD-07.3
Tian, Fu-Jun; WD-03.1
Tian, Minrui; TB-05.3
Tien, Wen-Pin; MB-02.4
Tiryakioglu, Burak; TD-01.1
Toms, J. B.; TD-09.1
Tong, Xing; ME-02.4
Towata, Yosuke; WE-10.2
Trakultaweekoon, Kanokorn; TE-08.1
Tromboni, Paulo; TD-07.4
Trzcielinski, Stefan; WE-08.2; WE-08
Tsai, Mavis; MD-01.3; TD-10.2
Tsai, Ming-Lun; MB-02.4
Tsalikova, V V.; WB-05.2
Tung, Cheng-Mei; MD-06; MD-06.2;
TD-07.2
Turk, Abdurrahman; TD-05.2

U

Uchihira, Naoshi; MD-02.2; ME-12.1;
TB-10.3; WD-06.2
Urbina, Ligia Maria S.; TE-10.2;
WE-10.3; HB-10.3
Ushikubo, Masayoshi; MD-02.1

V

Valja, Margus; MB-06.1; TE-02.1;
WD-02.2
Van Blommestein, Kevin; MB-08.1
van der Merwe, Edward; MB-03.3;
WB-10; WB-10.2
van Waveren, Cornelis C.; TE-03.2
Vatananan-Thesenvitz, Ronald; MD-07;
MD-07.2; WE-01.4
Vaughan, Fraser Batchelor; WD-05.1
Visser, Krige; TB-03.2; TB-03
vom Stein, Nicole; TE-04.1

W

Wakabayashi, Naoki; WE-07.3; WE-07
Waller, Lewis; WD-02.3
Walsh, Steven T.; MB-01; ME-11; TD-05;
HB-01.1
Wang, Chun-Chieh; MD-01.2
Wang, Gang; TD-10.3
Wang, Hongtao; MB-07.1
Wang, Jiamin; TB-10.1; TB-10.2
Wang, Liying; TB-10.1; TB-10.2
Wang, Ming-Yeu; TD-09.4
Wang, Pei-Chen; ME-01.3
Wang, Wei; MD-07.4
Wang, Wen; WB-11.3
Wang, Yilin; TB-05.3
Wang, Yunfang; ME-06.2
Warschat, Joachim; MB-04.3
Washida, Yuichi; WE-08.3
Watanabe, Seiichi; TB-08.1; TD-02.3;
WB-01.3
Watanabe, Toshiya; MD-06.1; TE-07.3
Weber, Charles M.; MB-08; TE-09;
TE-09.3; WE-01; WE-01.1; HB-06
Wei, Xianhua; HB-06.4

Wei, Yunfeng; MB-04.1
Wetterney, Tim; MB-12.2; MB-12.4;
MD-06.4
White III, Edward D.; TB-05.2
Williams, Jr., Gerald H.; WB-06.3
Wolfe, Robert A.; TB-05.2
Wongpiromsarn, Tichakorn; WE-01.4
Wu, Chih-Hung; MB-08.3
Wu, Dan; TD-10.1; TD-10
Wu, Jin; TE-06.1
Wu, Xiaobo; HB-07.4
Wu, Yueh; TD-06.4
Wu, Yuhui; MD-12.2
Wu, Zong-Fa; ME-02.4
Wulfsberg, Jens P.; WD-08.1; WE-05.3
Wurth, Bernd; TD-02.2; WD-11.2

X

Xie, Fuji; WE-09.3
Xie, Peng; WE-09.3
Xie, Yuying; TD-04.2
Xu, Jinsong; MD-04.2

Y

Yagita, Hiroyuki; MB-09.3
Yamaguchi, Yoshikazu; WD-10.1
Yamamoto, Taeko; TB-07.3
Yamanaka, Takayuki; TE-10.4
Yamano, Hiroko; TD-01.3
Yamazaki, Akira; WD-10.1
Yan, Siyu; HB-06.3
Yan, Zhe; TE-03.3
Yang, Fangjuan; TE-03.3
Yang, Ming Chung; MB-10.2; MB-10.3
Yang, Wen Goang; MB-10.3
Yassuda, Irineu; WE-03.2
Ye, Xuanting; ME-03.2; TE-03.3
Yen, Tsu-Ti; MB-02.1
Yildirim, Nihan; TD-02.1
Yim, Deok S.; MB-10; WB-05; WB-05.1
Yin, Jingru; ME-03.2
Yip, Man Hang; WD-06.3; WD-06
Yoon, Byung Sung; MB-12.3; TB-01.3

AUTHOR INDEX

Yoshihara Yang, Mariko; TE-08.2

Yoshioka-Kobayashi, Tohru; TE-07.3

Yu, Abraham; MB-07.2; TD-07.4;
HB-05.3

Yu, Chen; MD-03.1

Yu, Chih-Jen; MB-05.1

Yu, Ke; WE-07.2

Yu, Oliver; TE-08.3

Yu, Weijia; TB-10.1; TB-10.2

Yu, Xiang; MD-10.1; HB-10.2

Yun, Liu; ME-03.2

Yurkov, D V.; TB-06.2

Z

Zakirov, Ruslan G.; TB-06.2; TB-06.3;
WB-05.2; WD-04.3; HB-07.2

Zanella, Gianluca; WB-01.1; WE-01.3

Zehr, Wilson; ME-07.3

Zhang, Ben; MD-10.1

Zhang, Bowen; WD-07.2

Zhang, Chun-Hui; TD-10.2

Zhang, Chuqing; ME-09.2

Zhang, Ertao; TB-02.1

Zhang, Gupeng; MD-07.1

Zhang, Jiabing; MB-05.1

Zhang, Jian; ME-03.2

Zhang, Li; WD-07.3; WD-07

Zhang, Pei; MB-05.1; TB-08.2

Zhang, Shanshan; TD-04.2

Zhang, Yi; WD-09.2

Zhang, Yong; TE-02.2

Zhang, Yueyan; HB-06.4

Zhang, Yueyi; TE-02.2

Zhang, Zhenwei; TB-04.2

Zhang, Zihan; HB-07.4

Zhao, Fugang; MD-03.3

Zhao, Linjia; WB-03.1

Zheng, Gang; MD-07.3; HB-06.2

Zheng, Nian; TD-10.3

Zheng, Qingqing; HB-06.2

Zhou, Jianghua; MD-07.1

Zhou, Wei; MD-10.2; ME-05.3

Zhou, Xiaoying; ME-09.2

Zhu, Donghua; WD-09.2

Zhu, Fujin; WD-09.2

Zhu, Hangzi; ME-07.1

Zhu, Jinwei; WB-11.3

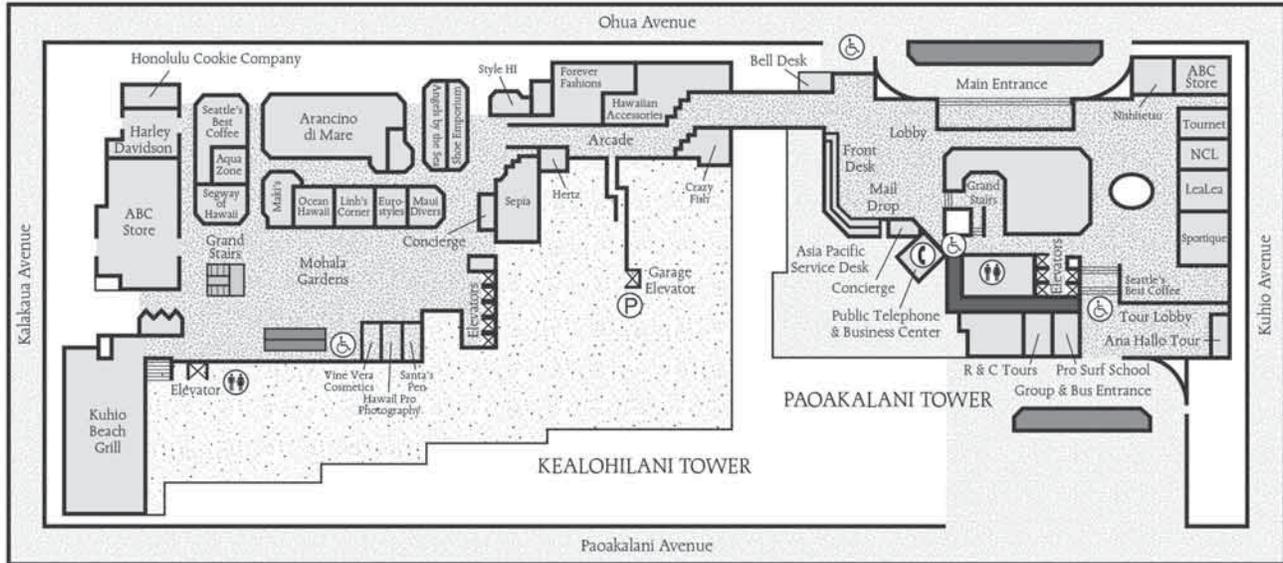
Zhu, Zhaohui; WE-02.2



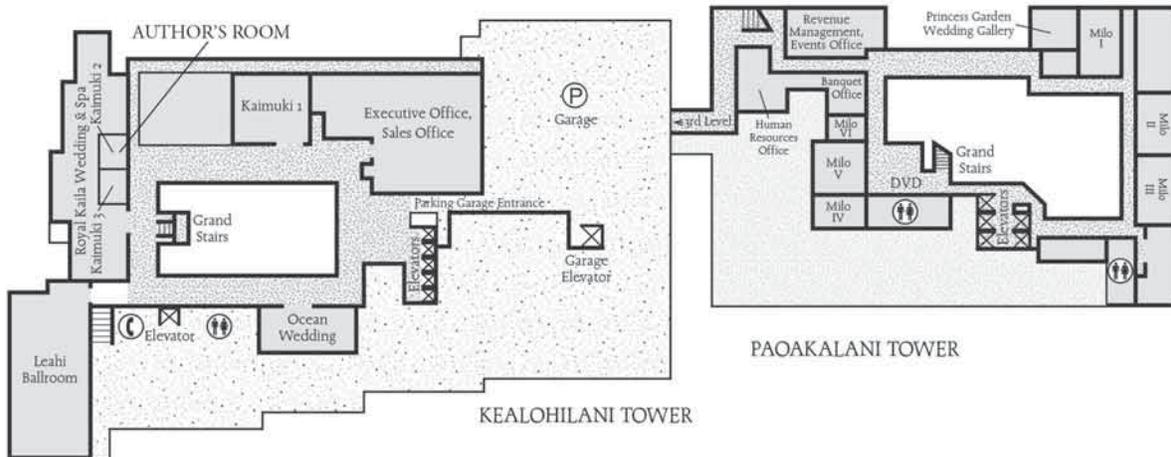
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