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PICMET ’24

Dear PICMET Guests:

We are pleased to welcome you to the PICMET ’24 Conference.

The theme of PICMET ’24 is “Technology Management in the Artificial Intelligence Era.”

The PICMET ’24 Conference is held in Portland, Oregon - USA on August 4-8, 2024. The theme is “*Technology Management in the Artificial Intelligence Era*.” The focus is on the leadership challenges in managing technology to address critical issues in utilizing Artificial Intelligence for the betterment of humanity.

The applications of Artificial Intelligence to education, healthcare, manufacturing, agriculture, transportation and other industries are rapidly changing the world we live in. AI is performing tasks and assisting humans to excel in their jobs. Consequently, the economy, industry and society as a whole are becoming radically different from what they have been. While we harness the incredible power of AI for the good of humanity, it is crucial that we develop safeguards to protect against the intentional or non-intentional misuse of that power and make sure there will be no damage to society. Technology cannot solve every problem by itself, but there are very few problems that can be solved without getting technology involved.

As always, if we cannot manage technology, we will be slaves to it.

The challenge for the Technology Management community is to provide leadership in managing technology to address these issues and to make technology part of the solution, not the problem. We can do this by managing technical, economic, social, political, environmental, legal and ethical systems simultaneously.

PICMET ’24 received 382 submissions from 114 authors and co-authors representing 156 academic institutions, industrial corporations, consulting firms, R&D organizations, and government agencies in 27 countries. After a double-blind refereeing process, 149 papers have been included in the conference. The referees were from academia, industry and government sectors worldwide.

There are eight keynote speeches in four plenary sessions.

Monday
Dr. Bulent Atalay, Professor Emeritus, University of Mary Washington and the University of Virginia, USA; “Artificial Intelligence - The High Renaissance of the Digital Age”

Dr. Jay Lee, Professor, University of Maryland College Park, USA; “Recent Advances of Industrial AI for Smart and Resilient Industrial Systems”

Tuesday
Dr. Marie Elisabeth Paté-Cornell, Professor, Stanford University, USA; “AI Support of Engineering Risk Management: A Potential Risk Attitude Problem”

Dr. Antonio Carcaterra, Professor, Sapienza University of Rome, Italy; “Responsibility in the Decision of Artificial and Human Agents”

Wednesday
Dr. Mel Horwitch, Visiting Scholar/Research Affiliate, MIT Sloan School of Management, USA; “The Emerging AI-Strategy Connection: Ongoing Challenges and Unanticipated Opportunities”

Dr. Rainer P. Hasenauer, Honorary Professor, WU Vienna, Austria; “Intrapreneurship Management in the AI Era”

Thursday
Dr. Gabriela Dutrénit, Professor, Universidad Autónoma Metropolitana (UAM), Mexico; “Digitalization Processes and Industry 4.0 in Mexican Multilatinas”

Mr. Mohan Nair, CEO, Emerge Inc., USA, and Edmund Hillary Fellow, New Zealand; “The 7 Deadly Sins of Business Transformation”

PICMET ’24 received 382 submissions from 114 authors and co-authors representing 156 academic institutions, industrial corporations, consulting firms, R&D organizations, and government agencies in 27 countries. After a double-blind refereeing process, 149 papers have been included in the conference. The referees were from academia, industry and government sectors worldwide.

The PICMET ‘24 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 31 sections listed below. Each section contains several papers on the topic.

- **Technology Management Framework**
- **Strategic Management of Technology**
- **Collaboration and Competition in Technology Management**
- **Science and Technology Policy**
- **AI in Technology Management**
- **Decision Making in Technology Management**

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- **Convergence of Technologies**
- **Emerging Technologies**
- **Entrepreneurship / Intrapreneurship**
- **Innovation Management**
- **Information Management**
- **Knowledge Management**
- **Information / Communication Technologies**
- **Intellectual Property**
- **Enterprise Management**
- **R&D Management**
- **Project/Program Management**
- **Manufacturing Management**
- **Supply Chain Management**
- **Quality Management**
- **Sustainability**
- **Systems Approach**
- **Environmental Issues**
- **Educational Issues**
- **Technology Forecasting and Evaluation**
- **Technology Roadmapping**
- **Technology Adoption**
- **Technology Management in the Energy Sector**
- **Technology Management in the Health Sector**
- **Technology Management in the Semiconductor Industry**
- **Technology Management in the Biotechnology Sector**

A large number of colleagues around the world contributed to the success of the PICMET ’24 Conference.

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

PICMET Honorary Executive Director Ann White edited the Bulletin and prepared the front-end materials; Director of Operations Liono Setiowijoso designed, maintained and managed the information systems and PICMET web site, and formatted the papers for the Proceedings; Executive Director Emeritus Angel Contreras Cruz helped the planning and organization of the Conference; Executive Director Tan Le provided overall coordination for the volunteer teams; Dahm Hongchai and Simge Deniz managed registration; Juan Pablo Herrera Meza managed the On-Site Team; Pei Zhang managed documentation and A/V equipment; Jessica Lopez Garcia managed marketing and communication; Ahmed Alibage prepared the signage; Jeff Birndorf developed graphic arts for the conference; Legal Counsel Scott Schaffer provided continuous legal advice; Treasurer Tom Gillpatrick and Chief Accountant Sang Ahn handled the finances; Isil Berkun was the liaison with the AI Community; Turul Daim was the IEEE Representative; Nasir Sheikh was the Director of Student Activities and Chair of the Brad Hosler Outstanding Student Paper Award Committee; Antonie Jetter, Jonathan Ho, Charles Weber and Hongyi Chen evaluated the papers nominated for the award. Timothy Anderson was the Director of Technical Activities; Kiyoshi Niwa and Dilek Cetindamar Kozanoglu were Co-Directors of International Activities; and Charles Weber was the Director of Awards.

Associate Editors Timothy Anderson, Kiyoshi Niwa, Dilek Cetindamar Kozanoglu and Harm-Jan Steenhuis conducted the review process for the submissions; 152 members of PICMET’s 399-member Panel of Reviewers reviewed the papers submitted to PICMET ’24.

Timothy Anderson did the scheduling of the accepted papers for presentation at the conference. Amir Shaygan was the Editorial Assistant, checking and verifying that the finalized papers had been revised as recommended by the reviewers.

Christina Zarrello of IEEE worked with PICMET from the beginning to the end of the conference planning effort. Her professionalism and 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 ’24 made this conference possible. We extend special thanks to all of them: Portland State University Department of Engineering and Technology Management, IEEE TEMS (Technology and Engineering Management Society), Portland State University Foundation, PSU Maseeh College of Engineering & Computer Science, Portland State University Office of Information Technology, Travel Portland, InFocus, and FreeGeek.

We believe the PICMET ’24 *Bulletin* and *Proceedings* contain some of the best knowledge available on Technology Management for addressing the challenges and opportunities of technological entrepreneurship. We hope they will contribute to the success of technology managers and emerging technology managers worldwide.

~ Dundar F. Kocaoglu, President and CEO

PICMET ’24

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DEDICATION

PICMET ’24 is dedicated to
all researchers, educators and practitioners of Technology Management
who are contributing to the establishment and growth of this field
throughout the world.

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

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PANEL OF REVIEWERS

Papers submitted to PICMET conferences are subjected to a double-blind review process. Each paper included in the PICMET ’24 conference was reviewed by two or more members of the Panel of Reviewers to assure a very high quality. Members of the Panel are listed below in alphabetical order by last name.

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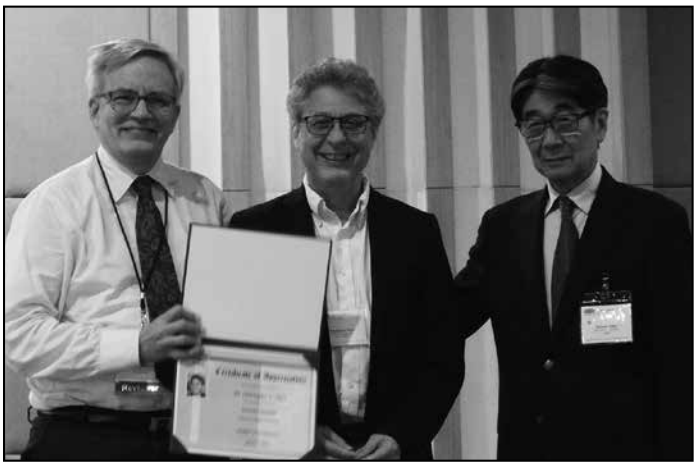

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PICMET LEADERSHIP IN TECHNOLOGY MANAGEMENT (LTM) AWARD RECIPIENTS

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 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

2016
Mr. Shinjiro Iwata, Advisor to Hitachi Ltd., Japan

2017
Dr. Guruduth S. Banavar, Viome, USA
Dr. Robert A. Burgelman, Edmund W. Littlefield Professor of Management, Stanford University, USA

2018
Dr. Kathleen Eisenhardt, W. Ascherman Professor, Stanford University, and Co-Director of the Stanford Technology Ventures Program, Stanford University, USA
Dr. Melissa A. Schilling, Professor, Stern School of Business, New York University, New York, USA

2019
Dr. Tao-ming Cheng, President, Chaoyang University of Technology (CYUT), Taiwan
Dr. Henry W. Chesbrough, Professor and Faculty Director, Garwood Center for Corporate Innovation, UC Berkeley-Haas School of Business, USA
Ms. Mandy J. Mock, VP Information Technology Group, Intel Corporation, USA

2022
Dr. Marie-Elisabeth Paté-Cornell, The Burt and Deedee McMurtry Professor, School of Engineering; and Professor and Founding Chair, Department of Management Science and Engineering, Stanford University, USA

2023
Dr. Gabriela Dutrénit, Distinguished Professor, Universidad Autónoma Metropolitana (UAM) – Mexico

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

2005
Mr. Bob Colwell, President, R & E Colwell and Associates; and former Fellow, Intel Corporation

2006
Dr. Frederick Betz, Former Program Officer, NSF
Dr. Fariborz Maseeh, Founder and President, The Massiah Foundation
Dr. T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami

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 (TÜBITAK)

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

2016
Dr. Jay Lee, Ohio Eminent Scholar, L.W. Scott Alter Chair, and Distinguished University Professor, University of Cincinnati, USA

2017
Mr. Scott Roth, Chief Executive Officer, Jama Software, USA
Dr. Karl Hampton Vesper, Foster School of Business, University of Washington, Seattle, USA

2018
Dr. Bulent Atalay, Professor, University of Mary Washington and the University of Virginia; Member, Institute for Advanced Study, Princeton, USA
Dr. Sadik Esener, Chair, Biomedical Engineering Department at the School of Medicine, Oregon Health and Sciences University, Portland, Oregon, USA

2019
Dr. Gregory A. Daneke, Professor Emeritus, W.P. Carey School of Business, Arizona State University, USA
Dr. Ann Majchrzak, Associates of USC Business Administration Chair and Professor of Digital Innovation Department of Data Sciences and Operations, Marshall School of Business, University of Southern California, USA
Dr. Melanie Mitchell, Professor of Computer Science, Portland State University, USA

2023
Dr. Christopher L. Tucci, Professor, Imperial College, London, UK

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 at the time of the award are listed below.

2011
Mr. Charles Allcock, PGE, USA
Dr. Daniel Berg, Rensselaer Polytechnic Institute (RPI), USA
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 Hambraeus, 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

2019

Dr. Barry Bozeman, Regents' Professor and Arizona Centennial Professor, Science and Technology Policy and Public Management, Arizona State University, USA
Dr. Dilek Cetindamar Kozanoglu, Associate Professor, School of Information, Systems and Modelling, Faculty of Engineering and IT, University of Technology Sydney, Australia
Dr. Jonathan D. Linton, Professor and Chair, Operations and Technology Management, University of Sheffield, Sheffield, United Kingdom
Dr. Dietmar Theis, Honorary Professor, Flat Panel Display Technology, Technical University Munich, Germany

2022

Dr. Adnan Akay, Former Professor and Provost, Bilkent University, Turkey and Lord Professor of Engineering and Head Emeritus of Mechanical Engineering, Carnegie Mellon University, USA
Dr. Robert A. Burgelman, Edmund W. Littlefield Professor of Management of the Stanford University Graduate School of Business, USA
Dr. Henry W. Chesbrough, Professor and Faculty Director, Garwood Center for Corporate Innovation, Haas School of Business, University of California-Berkeley, USA
Dr. Eliezer Geisler, Distinguished Professor Emeritus, Illinois Institute of Technology, USA
Dr. Hans Georg Gemuenden, Former Professor, Technical University-Berlin, Germany, and BI Norwegian Business School, Norway
Dr. Charla Griffy-Brown, Professor, Pepperdine University, USA
Dr. Mel Horwitch, Visiting Scholar/Research Affiliate, MIT-Sloan School, USA
Dr. Edward B. Roberts, David Sarnoff Professor of Management of Technology, MIT, USA
Dr. Aaron J. Shenhar, Dr. Aaron Shenhar, Professor of Project Management and Leadership (Ret.), Rutgers University, CEO and Founder, Technological Leadership Institute, LLC (DLI), USA
Dr. James M. Utterback, David J. McGrath jr (1959) Professor of Management and Innovation, Emeritus, MIT Sloan School, USA
Dr. Steven T. Walsh, Distinguished Professor, University of New Mexico, 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, 2023. 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 AWARD

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
Yi-Fan Lung

ADVISOR & CO-AUTHOR
Prof. Mei-Chih Hu

UNIVERSITY
National Tsing Hua University, Taiwan

PAPER TITLE
"What Factors Influence Entrepreneurial Decision-making?: Insights from Technology-intensive Firms in Taiwan"

ABSTRACT

Researchers in entrepreneurship have extensively discussed the factors that influence entrepreneurial decision-making. However, it remains unclear whether the interactions among these factors may influence an entrepreneur's decision to pursue a venture. To bridge this gap, this research specifically examines how external and internal factors interact and collectively shape an entrepreneur's decisions about exploiting opportunities. Using research methods from inductive to deductive, the research first applies the Delphi method to identify 10 factors perceived by entrepreneurs that influence their decision-making. Next, by utilizing the DEMATEL (DEcision-MAking Trial and Evaluation Laboratory) and ISM (Interpretive Structural Modeling) methods, the research determines the causal relationships and hierarchical significance of these factors. The results identify a significant causal path: (external—internal—external), suggesting that an entrepreneur undergoes an internal perceptual process to sense the impact of external information, which further influences how entrepreneurs perceive resources and ultimately shapes their entrepreneurial decisions. Moreover, external factors are identified as the main influencing factors, while the perception of resources, though valued by entrepreneurs, is susceptible to influence. Innovative firms and entrepreneurs must assess whether environmental contexts represent a "window of opportunity" and subsequently consider their needs, abilities, and motivations to effectively leverage resources when starting a new venture.

The award winning paper will be presented on Wednesday afternoon at 16:00 in the Broadway III room as WE-05.1.

LTM Awards

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

PICMET '24 AWARDEES

Dr. Rainer P. Hasenauer
Honorary Professor, WU Vienna, Austria

Dr. Rainer P. Hasenauer is Honorary Professor of Marketing and Lecturer in Marketing of High-Tech Innovation and Technology Marketing at the Institute for Marketing Management, Vienna University of Economics and Business (WU Vienna).

He is an entrepreneur who has long been involved with high-tech companies as a co-founder and a business angel. He is also a business developer focusing on innovative technologies. He initiated and co-founded the HiTec Marketing Research Association in Vienna (www.hitec.at) and the Cross Border HiTec Center (www.hitechcentrum.eu), where he serves as senior advisor.

Dr. Hasenauer's primary teaching and research interests lie in market entry of high-tech innovation in B2B markets, and in measuring innovation half-life and technology acceptance in B2B markets. He teaches at the Vienna University of Economics and Business, the Vienna University of Technology, and the Campus02 University of Applied Sciences in Graz. He has held guest lectureships at the Institute for Advanced Studies in Vienna, the University of St. Gallen (CH), the University of Klagenfurt, and the University of Economics in Bratislava. His research work is predominantly project-driven for B2B markets and comprises community-based innovation, marketing testbeds for market entry, and multidisciplinary communication in high-tech innovation. Applications include satellite navigation and remote sensing, robotics, sensors, functional materials, flow batteries and remote power supply, threat analysis for safety and security systems of complex products and systems such as road tunnel ventilation and power plants, and applied operations research with focus on multi-criteria decision models.

He has served on the advisory boards of high-tech investment groups, on an expert board for high-tech start-up incubators, and on the supervisory board of a global market leader in the field of safety-critical real-time communication systems.

Dr. Mel Horwitch
Visiting Scholar/Research Affiliate, MIT Sloan School of Management, USA

Dr. Mel Horwitch is currently a Visiting Scholar/Research Affiliate at the MIT Sloan School. He also served for 14 years at NYU-Poly (now NYU's Tandon School of Engineering) as Professor of Technology Management, twice as Department Chair, and as Institute for Technology and Enterprise Director. He publishes and teaches extensively on technology strategy, entrepreneurship, and large-scale innovation, most recently focusing on how innovation and other building blocks help in developing a more strategic society. His publications include *Clipped Wings: The American SST Conflict, Technology in the Modern Corporation: A Strategic Perspective* (editor and contributor), *Energy Future* (chapter contributor), and articles in such journals as *Management Science, Policy Science, MIT Sloan Management Review, Technology in Society, Journal of Engineering and Technology Management, and Journal of High Technology Management Research*, and numerous cases. He was also Dean of Management and Professor at Theseus Institute (now EDHEC) in Sophia Antipolis, France. He also served on the MIT Sloan School and Harvard Business School (HBS) faculties and was Visiting Scholar at UCSD's Rady School, Hitotsubashi University in Tokyo, and London Business School. In 2021, PICMET selected Dr. Horwitch as a PICMET Fellow for his impact on technology management research, education, and leadership. He earned an AB from Princeton University and an MBA and Doctorate from HBS and served a US Peace Corps Volunteer in Thailand.

Medal of Excellence

The PICMET Medal of Excellence (MoE) Award recognizes extraordinary achievements of individuals in any discipline for their outstanding contributions to science, engineering and technology management.

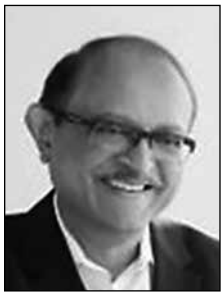
PICMET '24 AWARDEES

Prof. Antonio Carcaterra
Sapienza University of Rome, Italy

Prof. Antonio Carcaterra is the Head of the Department of Mechanical and Aerospace Engineering at Sapienza University of Rome. His research interests include dynamics of structures and complex systems, mechatronics, control of dynamic systems and vehicles, and autonomous drones using artificial intelligence. He is the holder of several patents and is currently managing numerous fundamental and industrial research projects. He has authored about 200 scientific publications. He is currently a senior fellow of the Sapienza School of Advanced Studies, president of the Sapienza Innovation Consortium, scientific manager of National Center for Sustainable Mobility – part of the European program entitled "Next Generation," and key scientific manager of the investment fund I3P on space technology funded by the European Fund of Investment. He was an adjunct professor at the Department of Mechanical Engineering at Carnegie Mellon University, a research scientist at the Marine Engineering Institute of the Italian National Council of Research, past director of the doctorate program in Theoretical and Applied Mechanics, director of the Doctoral School in Sciences and Technologies for Industrial Innovation, president of the degree program in Mechanical Engineering, and a member of the Transport Systems Safety Commission for the Italian Ministry of Transport and Infrastructure.

Mr. Mohan Nair
CEO, Emerge Inc., USA, and Edmund Hillary Fellow, New Zealand

Mr. Mohan Nair is an author, a corporate executive and a proven innovator with six startup creations within a large enterprise. He is Chief Executive of Emerge Inc., where his focus is on innovation and innovator.



Mr. Nair served as Chief Innovation Officer, Senior VP of Cambia Health Solutions for 10 years. Leading a high-performance innovation team called Innovation Force, he launched six startups. Healthsparq, his first startup, was sold to Kyruus in Jan 2021. Prior to Cambia, Mohan was Chief Marketing Executive/EVP for Regence Blue Cross Blue Shield. He formed the consumer-directed digital front-end, telesales, business development and was instrumental in leading the transformation of Regence Group.

He was President of two startups, one in cost/performance management and the other in network management. Earlier in his career, he held executive positions in Mentor Graphics Corporation and Intel.

Mr. Nair is the author of the book *Strategic Business Transformation*: *the 7 Deadly Sins to Avoid* (Wiley & Sons, 2010). He has authored two other books and over 20 refereed journal articles on Performance Measurement, Balance Scorecard and Servant Leadership. He writes for *Forbes*, RamaonHealthcare.com, and is a contributing columnist for *Innovation Leader*.

Mr. Nair was Adjunct Professor of Business at JL Kellogg School of Management for 12 years, and University of Oregon MBA program for five years. He has also been a guest lecturer at Harvard, Berkeley, University of Auckland (New Zealand), and Advisor to the President at George Fox University. He is a TEDx speaker where he outlines his unique business transformation philosophy.

General Information

CONFERENCE FOCUS

The applications of Artificial Intelligence to education, healthcare, manufacturing, agriculture, transportation and other industries are rapidly changing the world we live in. AI is performing tasks and assisting humans to excel in their jobs. The economy, industry and society as a whole are becoming radically different from what they have been. While we harness the incredible power of AI for the good of humanity, it is crucial that we develop safeguards to protect against the intentional or non-intentional misuse of that power and make sure there will be no damage to society. Technology cannot solve every problem by itself, but there are very few problems that can be solved without getting technology involved.

The challenge for the Technology Management community is to provide leadership in managing technology to address these issues and to make technology part of the solution, not the problem. We can do this by managing technical, economic, social, political, environmental, legal and ethical systems simultaneously.

This is a big challenge for the leaders and future leaders in the Technology Management field. Recognizing this challenge, the PICMET ’24 Conference is focused on managing technology in the AI-driven world.

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 ’24 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 ’24 program consists of

- Ph.D. Colloquium, “Getting Your PhD….and Beyond: Critical Stages and Career Paths for the Ph.D. Student,” Sunday, August 4, 13:00 - 17:00, Skyline I (23rd floor)
- Plenary sessions with keynote speeches by global leaders in the Pavilion (Plaza Level)
- Three special meetings:
  1. Panel of Editors Lunch Meeting for the reviewers of papers submitted to PICMET conferences, Monday, August 5, 12:00-14:00, Skyline III (23rd floor)
  2. Country Representatives Lunch Meeting for the current PICMET Country Representatives and those who are interested in becoming Country Representatives, Wednesday, August 7, 12:00-14:00, Skyline III (23rd floor)
  3. PICMET ’24 Debriefing and PICMET ’25 Planning Session for everybody who would like to discuss strategies for future PICMET conferences, Thursday, August 8, 14:00-15:30, Pavilion East
- Research papers by cutting-edge researchers
- Applications papers by researchers and practitioners working on industry applications
- Panel discussions with interactions between panelists and the audience

General Information

PUBLICATIONS

There will be two publications at PICMET '24:

- 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 '24 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 events not covered by the registration fee, you will be required to pay an additional fee.

**The one-day registration fee does not include the evening social events. The PhD Colloquium is not included in the registration fee. Tickets for that event 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: Pavilion 01: Pavilion East 02: Pavilion West 03: Broadway-I 04: Broadway-II 05: Broadway-III 06: Broadway-IV 07: Park

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

PRESENTATION GUIDELINES

SESSION GUIDELINES

The sessions are 90 minutes long and include two, three, or four papers. Depending on the number of papers in the session, the time should be divided equally for each presentation, allowing about five minutes after each one for questions.

SESSION CHAIR GUIDELINES

If you are chairing a session, please follow the guidelines below:

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

SPEAKER GUIDELINES

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

- Introduce yourself to your session chair and provide him/her with a brief background statement that he/she can use in introducing you to the audience.

General Information

- 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

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 on the Plaza level.

PICMET VOLUNTEERS

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

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.

City of Roses

GETTING AROUND PORTLAND

Portland's public transportation system includes MAX (Metropolitan Area Express) light rail, Tri-Met buses, and the Portland Streetcar. Tickets are interchangeable among the three and can be purchased aboard buses or from ticket machines along the MAX or Streetcar lines. Fares are $2.80 ($5.60 for a daily pass), $1.40 for seniors ("honored citizens"), the disabled and youths.

Complete information about Portland's public transportation system is available at http://trimet.org.

AIRPORT TRANSPORTATION

For Lyft (https://www.lyft.com/rider/airports/pdx), Uber and taxi rides, follow signs to the "Transportation Plaza" on Level 1 of the Short-Term parking garage. A map is available at https://www.flypdx.com/GroundTransportation/Taxi.

Most transportation providers serve downtown Portland, which is approximately 20-40 minutes from Portland International Airport, depending on traffic.

If you are traveling light and do not mind walking two blocks, you can board the MAX (Metropolitan Area Express, http://trimet.org) Red Line on the baggage claim level of Portland International Airport (follow the signs to MAX Light Rail). Get off the train at the Pioneer Square stop (between SW 6th Ave. and SW Broadway) in downtown Portland and walk two blocks south on 6th Avenue to the **Hilton Portland Downtown (921 SW 6th Ave., Portland, Oregon**). Tickets are $2.80 and can be purchased at the ticket machine inside the airport close to the MAX line.

CLIMATE

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

GRATUITIES

Informally known as tipping, in the United States gratuities are voluntary. Tips are rewarded for services performed (gratitude) and are a supplement to an employee's income.

Following are recommended gratuities:

- For your hotel stay: housekeeping, $3 to $5 per day; bellman, $2 to $3 per bag; and discretionary for above and beyond services provided for you.
- For a taxi ride: 10 to 15 percent of the fare.
- For restaurant service: 15 to 20 percent of your total bill.

TRAVEL OREGON

Portland, otherwise known as "The City of Roses," is a robust and vibrant city with endless things to see and do. Music, food and art festivals abound throughout the city during the summer months, as well as museums, art galleries, unique retail shops, and restaurants of all varieties.

The State of Oregon is famous for its award-winning wineries and golf courses, as well as its breathtaking coastline, rivers and mountains. We hope you will venture out and experience Portland and the surrounding countryside while you are in Oregon.

Following is a sampling of local events and destinations while you are visiting. For a complete list of all that Oregon has to offer, visit traveloregon.com.

PORTLAND EVENTS

Oregon Zoo Nights Summer Concerts

It wouldn't be summer in Oregon without an evening of great music at the zoo's annual summer series. On Friday, August 2nd, Hit Factory will perform. *(Oregon Zoo, 4001 SW Canyon Road, Portland, Oregon; for schedule and ticket prices visit www.oregonzoo.org/nights)*

Oregon Zoo Summer Concerts

PSU Farmers Market

This market, located at Portland State University, attracts a large crowd of people seeking the finest and freshest produce from local farmers as well as breads, cheese, flowers and more. *(South Park Blocks between SW College &*

City of Roses

Montgomery Streets, Portland, Oregon; 08:30 - 14:00; Saturdays only; www.portlandfarmersmarket.org/psu/)

Portland Saturday Market
Stroll down row upon row of local handcrafted items and homemade foods. The Portland Saturday Market is the nation's largest open-air craft market. Talk directly to the artists and learn about their creative styles and products. *(2 SW Naito Parkway, Portland, Oregon; Saturdays 10:00-17:00, and Sundays, 11:00 – 16:30; www.portlandsaturdaymarket.com)*

PORTLAND ATTRACTIONS

Art Galleries
The Pearl District, loosely bordered by W. Burnside and NW Hoyt, and NW 13th and NW Park, represents a good share of the gallery arena. Galleries can also be found in fairly concentrated numbers in the Skidmore District (roughly between Front and Fourth Aves. from SW Oak to NW Glisan St.) and the city's downtown core.

Lan Su Chinese Garden

Lan Su Chinese Garden
Located in Portland's historic Old Town Chinatown, Lan Su ("Garden of Awakening Orchids") Chinese Garden is one of Portland's greatest treasures and most interesting sites to see while visiting Portland. A result of a collaboration between the cities of Portland and Suzhou, our sister city in China's Jiangsu province that is famous for its beautiful Ming Dynasty gardens, Lan Su was built by Chinese artisans from Suzhou and is the most authentic Chinese garden outside of China. Much more than just a beautiful botanical garden, Lan Su is a creative wonder—a powerfully inspiring experience based on a 2,000-year-old Chinese tradition that melds art, architecture, design and nature in perfect harmony. Once inside the garden's walls, you will feel as if you have traveled through time to another era in a faraway world. Lan Su is a window into Chinese culture, history and way of thinking. Ever changing, Lan Su always has something new to offer - by the minute, by the hour, and with the seasons. *(239 NW Everett Street, Portland, Oregon; hours: 10:00—18:00 daily; admission, $16; www.lansugarden.org)*

Oregon Historical Society
In the heart of Portland's Cultural District, the Oregon Historical Society houses treasures of the Northwest, a priceless collection that tells the story of Oregon from its earliest people to the present day. Exhibits are designed for visitors of all ages, with artwork, artifacts, photographs, audio/visual presentations and hands-on displays for children. The Oregon Historical Society Museum Store is Portland's premier spot for distinctive Northwest gifts, including jewelry, artwork, books and games. *(1200 S.W. Park Avenue, Portland, Oregon; Museum Store: S.W. Broadway at Madison; for hours and admission charge visit www.ohs.org)*

Oregon Museum of Science and Industry (OMSI)
Imagine a place where you can journey to the outer reaches of the galaxy, feel the power of an earthquake, climb aboard a real submarine, uncover a fossil, enter the world of virtual reality, or travel the globe in a five-story high IMAX® domed theater. With more than 200 interactive exhibits and labs, there is something for everyone in the family. Touch, explore, question and discover at the Oregon Museum of Science and Industry (OMSI), located on Portland's waterfront. Open year-round; hours vary. *(1945 S.E. Water Avenue, Portland, Oregon; www.omsi.edu)*

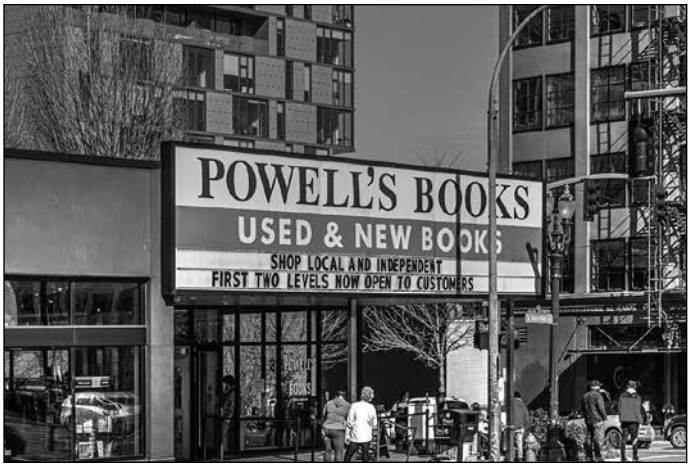
Pittock Mansion
Experience the charm of a lost era as you learn about Henry and Georgiana Pittock and the beautiful estate that symbolizes the growth of Portland. Admire remarkable antique furnishings and fine arts set in a 1914 National Historic Register property. Pack a picnic basket and enjoy a sweeping view of mountains, rivers and the city. *(3229 N.W. Pittock Drive, Portland, Oregon; for hours and admission charge visit www.pittockmansion.org)*

Portland Art Museum
Find out why the oldest museum in the Northwest, the Portland Art Museum, is internationally renowned for exciting art experiences. Located in the heart of downtown's cultural district, the Museum's campus includes an outdoor sculpture court and historical interiors. Tour the world and travel through history in magnificent per-

City of Roses

manent collection galleries, six stories of modern art and special exhibitions. *(1219 S.W. Park Avenue, Portland, Oregon; for hours and admission charge visit www.portlandartmuseum.org)*

Portland Spirit
The Portland Spirit welcomes you aboard the Northwest's premier dining ship. Daily lunch, dinner and sightseeing cruises on the Willamette River offer a perfect opportunity to surround yourself with unmatched views of the Portland skyline. Freshly prepared cuisine, full-service bars and live entertainment complete a river experience unlike any other. *(www.portlandspirit.com)*



Powell's City of Books

Powell's City of Books
More than just a bookstore, Powell's is a Portland institution. The largest independently owned bookstore in the country, Powell's has more than one million volumes of new, used, rare and out-of-print books and covers a city block. Powell's map helps guide browsers from one room to the next. *(1005 W. Burnside; www.powells.com/locations/powells-city-of-books)*

Tom McCall Waterfront Park
It is hard to believe that this stretch along the Willamette River was once a busy expressway. Rather than impatient motorists, the park is now occupied with new types of movers—joggers, bikers and rollerbladers, as well as pedestrians in the mood for nothing more energetic than a stroll. Waterfront Park is taken up during the warmer months with cultural and musical events, as well as overheated folks hoping to cool off in the Salmon Street Springs Fountain at the east end of S.W. Salmon St. *(Naito Parkway between S.W. Harrison St. and N.W. Glisan St., Portland, Oregon)*

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

Oregon Zoo
Trek through the tropics amid the sounds of birds, monkeys and other creatures. You're not in West Africa; you're in Portland at the zoo's African Rain Forest exhibit. After you've survived the steamy tropics, dry off in the savanna, where giraffes, rhinos and gazelles graze. Visit Elephant Lands to see the Asian elephant residents, and then stop by the Pacific Shores to see the polar bears, penguins, sea otters and harbor seals. Five minutes from downtown Portland on Hwy. 26 West, or take MAX light rail. *(Washington Park, 4001 S.W. Canyon Road, Portland, Oregon; for hours and admission price visit www.oregonzoo.org)*

Japanese Garden
Nestled in the scenic west hills of Portland, the Japanese Garden is a haven of tranquil beauty which has been proclaimed one of the most authentic Japanese gardens outside of Japan. Encompassing five and one-half acres and offering five separate garden styles, the Garden includes an authentic Japanese Tea House, meandering streams, intimate walkways, and an unsurpassed view of Mt. Hood. *(Washington Park, 611 SW Kingston Avenue, Portland, Oregon; for hours and admission price visit www.japanesegarden.com)*

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

City of Roses

The Japanese Garden

from downtown Portland via Hwy. 26 or MAX light rail. *(Washington Park, 4033 S.W. Canyon Road, Portland, Oregon; for hours and admission price, visit www.worldforestry.org)*

Hoyt Arboretum
Hoyt Arboretum is a much beloved Portland open space, covering 185 ridge top acres about two miles west of downtown. It is home to a collection of trees representing more than 1,100 species gathered from around the world. Twelve miles of trails wind through this living exhibit. The Visitor Center, at the heart of the Arboretum, offers maps, trail guides, and information. Spiraling up the southwest corner of the arboretum is the Vietnam Veterans' Living Memorial, which honors Oregonians who died or are still missing from that conflict. *(Washington Park, 4000 SW Fairview Blvd., Portland, Oregon; www.hoytarboretum.org)*

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

Willamette Jetboat Excursions
See Portland's waterfront and more aboard the Willamette Jetboats. Enjoy the area's sights, history and scenic beauty while experiencing the fun and excitement found only in a jet boat. See giant ships, bridges, elegant riverfront homes, historic Oregon City and the majestic Willamette Falls. Reservations are highly recommended. (1945 SE Water Avenue, OMSI Submarine Dock, Portland, Oregon; www.willamettejet.com)

SHOPPING

From shop-lined streets to expansive malls, you'll find great spots for tax-free shopping all around town.

Downtown Portland and the Willamette River

Downtown Portland
In the heart of downtown, you will find Pioneer Place – four city blocks filled with shopping, dining and entertainment. *(700 SW Fifth Avenue, Portland, Oregon; www.pioneerplace.com)*

Northwest/Alphabet District
This district's main streets (Northwest 23rd and 21st Avenues) are packed with boutiques selling Portland-designed clothing and housewares.

Alphabet District

City of Roses

Pearl District
You can sample haute couture and hot cuisine in Portland's Pearl District, which has quickly become the place to see and be seen. The Pearl is composed of 50 city blocks of industrial warehouses turned into sleek loft apartments, cutting-edge art galleries and vibrant international restaurants. Though the neighborhood features outstanding brewpubs, delicious international cuisine and the world's largest independent bookstore, the soul of the Pearl is in its galleries. *(www.travelportland.com/neighborhoods/pearl-district)*

PORTLAND'S MALL SCENE

Bridgeport Village offers an exclusive mix of local, regional and national shops unlike any other shopping experience in Oregon. *(7455 SW Bridgeport Rd., Tigard, Oregon; www.bridgeport-village.com)*

Columbia Gorge Premium Outlets has your favorite brands at significant savings. The mall is located just 15 minutes east of downtown Portland. *(Take I-84 east to Exit 17; 450 NW 257th Way, Troutdale, Oregon; http://shopcolumbiagorgeoutlets.com)*

Washington Square pulls shoppers into its many specialty shops and restaurants. *(9585 SW Washington Square Road, Portland, Oregon; www.shopwashingtonsquare.com)*

Bridgeport Village

Woodburn Premium Outlets, Oregon's largest outlet center, features 114 shops including Adidas, Banana Republic Factory Store, Calvin Klein, Eddie Bauer, J. Crew, and Polo Ralph Lauren Factory Store to name a few. *(I-5 South at the Woodburn/Hwy 214 exit; 1001 North Arney Road, Woodburn, Oregon; www.premiumoutlets.com/outlet/woodburn)*

Social Events

To facilitate the informal interaction of the participants, several social events have been scheduled during PICMET '24.

WELCOME RECEPTION/BUFFET

DATE: SUNDAY, AUGUST 4
TIME: 19:00 – 22:00
ROOM: SKYLINE I & II
DRESS: INFORMAL

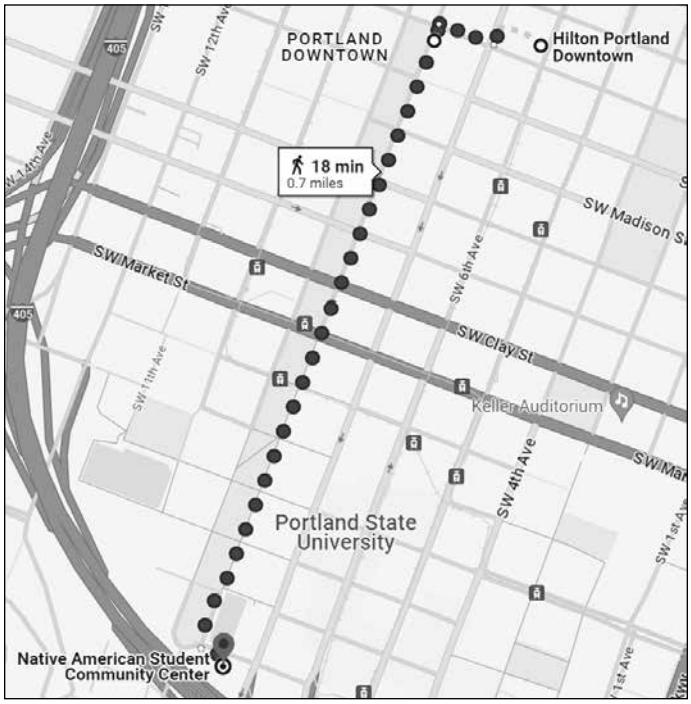
Meet other conference attendees, renew old acquaintances, and begin new friendships and collaborations at this opening reception/buffet. Included in the regular registration fee.*

SALMON DINNER AT THE NATIVE AMERICAN STUDENT & COMMUNITY CENTER, PORTLAND STATE UNIVERSITY

DATE: MONDAY, AUGUST 5
BUFFET: 19:00-21:30
ROOM: NATIVE AMERICAN STUDENT AND COMMUNITY CENTER 710 SW JACKSON ST., PORTLAND
DRESS: INFORMAL

This year PICMET will have a special dinner at Portland State University's Native American Student and Community Center. PICMET's connection to the American Indian community is through PICMET's Director of Technical Activities, Dr. Tim Anderson. According to the American Indian Science and Engineering Society, Dr. Anderson is one of only two department chairs in the country who is an enrolled member of a Native American tribe. He is the Advisor for the PSU American Indian Science and Engineering Society chapter and an AISES Sequoyah Fellow.

The Center is a gathering place, a home and a learning center for Native American, Alaskan Native, and Pacific Islander students. A rooftop garden will be accessible during dinner where you will see indigenous plants of the Pacific Northwest. For more information on the center, visit www.pdx.edu/native-american-center/



PICMET volunteers will lead a short walking tour from the Hilton to the NASCC leaving from the Hilton at 18:30 and 18:45 from the Broadway (West exit) of the Hilton. The NASCC is a short and direct walk (~0.6 miles or 1 kilometer) south on Broadway. A cooler and more scenic tree-lined walk through the park blocks only adds a couple of minutes.

A bus will be provided and available both ways. The bus will leave from Salmon St. between 5th and 6th Avenues at 18:45, with a second run at 19:00.

In the spirit of the Portland food culture and supporting our Native business community, PICMET has contracted with Brigette McConville, owner of Salmon King Fisheries, to cater the dinner. Salmon King Fisheries is a Native Woman-Owned Business from the Confederated Tribes of Warm Springs, Oregon. Salmon King Fisheries was established February 6, 2011. The salmon are caught on the Columbia River.

The menu for this event will feature wild salmon caught by local Native American Indian tribes, along with green salad and a pasta salad, followed by huckleberry cake. Included in the regular registration fee.*

Social Events

AWARDS BANQUET

DATE: TUESDAY, AUGUST 6
CASH BAR: 18:30 – 22:00, PAVILION FOYER
BANQUET: 19:00-22:00
ROOM: PAVILION
DRESS: BUSINESS ATTIRE

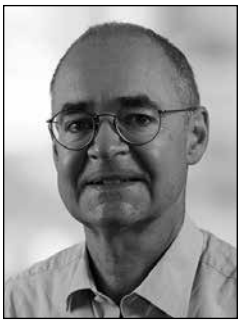
This is the premier social event of the conference. The PICMET '24 Outstanding Student Paper, Medal of Excellence, and Leadership in Technology Management awards will be presented at the banquet. Included in the registration fee.*

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

IEEE Event

IEEE – TECHNOLOGY ENGINEERING MANAGEMENT SOCIETY (TEMS) SPECIAL SESSION AND RECEPTION

DATE: WEDNESDAY, AUGUST 7
TIME: 17:30 - 19:00
ROOM: PARK



SPEAKER:
Prof. Dr. Erskin Blunck,
Nürtingen-Geislingen University (NGU), Nürtingen, Germany

"Public Private Partnerships for Innovation Ecosystems"

This special session provides an opportunity for IEEE TEMS members from the Portland metro area to participate in PICMET. Come and hear from Prof. Dr. Erskin Blunck about how he has built mutually beneficial industry-university partnerships. This may provide ideas and inspiration as Oregon continues to advance our partnerships. Enjoy an ice cream treat as talks continue after the talk.

Prof. Dr. Erskin Blunck, MBA, is Vice-Dean Faculty of Agribusiness, Economics and Management; Program Director MBA International Management; and Professor for International Management at Nürtingen-Geislingen University (NGU), Nürtingen, Germany. He is a teacher, researcher, and academic manager in the areas of international management, sustainability strategy management, and international marketing. He directs the English-taught MBA program in International Management and is part of the internationalization team of the university. Currently, he is focusing on developing a startup support community as project leader of EXIST-funded Zukunft Gründen project, based on funding from the EU and Federal Ministry of Economy and Climate in Berlin. Prior to his academic career at NGU, Dr. Blunck held project positions in management consulting and as Head of Product Management in a French multinational technology corporation. Parallel to his academic work, he held positions on supervisory boards and conducted consulting and interim management tasks.

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

TECHNICAL PROGRAM

PROGRAM OVERVIEW

The PICMET '24 technical program consists of 54 sessions including 4 plenaries, 3 special sessions, 1 panel, 1 workshop, and 51 paper sessions.

The plenaries are scheduled from 08:30 to 10:00 every morning, Monday, August 5, through Thursday, August 8, in the Pavilion on the Plaza Level. 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 '24 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 86 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 7 break-out sessions throughout the day, Monday through Thursday.

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

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

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

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

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

We hope these schedules will help you to take full advantage of the richness of the technical program at PICMET '24.

Daily Schedules

MONDAY, AUGUST 5, 2024

	00 Pavilion	01 Pavilion East	02 Pavilion West	03 Broadway-I	04 Broadway-II	05 Broadway-III	06 Broadway-IV	07 Park
MA 08:30-10:00	Plenary I							
MB 10:30-12:00		AI in Technology Management-1	R&D Management-1	Technology Forecasting and Evaluation	Decision Making in Technology Management		Enterprise Management	
MC 12:00-14:00	**LUNCH**							
MD 14:00-15:30		AI in Technology Management-2	R&D Management-2	Educational Issues-1		Emerging Technologies	Systems Approach	Sustainability-1
ME 16:00-17:30			Innovation Management-1	Educational Issues-2		Project & Program Management	Technology Management in the Health Sector	Sustainability-2

TUESDAY, AUGUST 6, 2024

	00 Pavilion	01 Pavilion East	02 Pavilion West	03 Broadway-I	04 Broadway-II	05 Broadway-III	06 Broadway-IV	07 Park
TA 08:30-10:00	Plenary II							
TB 10:30-12:00		AI in Technology Management-3	Innovation Management-2		Technology Management in the Biotechnology Sector-1	Convergence of Technologies-1		Quality Management-1
TC 12:00-14:00	**LUNCH**							
TD 14:00-15:30				Collaboration and Competition in Technology Management-1		Technology Adoption-1	Technology Management in the Energy Sector	Manufacturing Management
TE 16:00-17:30		AI in Technology Management-4	Innovation Management-3	Collaboration and Competition in Technology Management-2	Strategic Management of Technology-1	Technology Adoption-2		Supply Chain Management

Daily Schedules

WEDNESDAY, AUGUST 7, 2024

	00 Pavilion	01 Pavilion East	02 Pavilion West	03 Broadway-I	04 Broadway-II	05 Broadway-III	06 Broadway-IV	07 Park
WA 08:30-10:00	Plenary III							
WB 10:30-12:00		AI in Technology Management-5	Meet the Editors	Knowledge Management	Technology Management Framework	Technology Adoption-3	Science and Technology Policy	Strategic Management of Technology-2
WC 12:00-14:00	**LUNCH**							
WD 14:00-15:30		AI in Technology Management-6	Innovation Management-4			Intellectual Property	Information Management	Technology Roadmapping
WE 16:00-17:30		AI in Technology Management-7	Innovation Management-5	Strategic Management of Technology-3	Information Communication Technologies-1	Entrepreneurship/ Intrapreneurship	Technology Management in the Semiconductor Industry	

THURSDAY, AUGUST 8, 2024

	00 Pavilion	01 Pavilion East	02 Pavilion West	03 Broadway-I	04 Broadway-II	05 Broadway-III	06 Broadway-IV
HA 08:30-10:00	Plenary IV						
HB 10:30-12:00		AI in Technology Management-8	Innovation Management-6				Technology Management in the Biotechnology Sector-2
HC 12:00-14:00	**LUNCH**						
HD 14:00-15:30		PICMET '24 Debrief and Future PICMET Planning					

SCHEDULE OF SESSIONS

SCHEDULE OF SESSIONS BY DATE

MONDAY, AUGUST 5, 2024

Session	Number	Day	Time	Room	Session Title
MA	00	Monday	08:30 - 10:00	Pavilion	PLENARY: “Plenary I”
MB	01	Monday	10:30 - 12:00	Pavilion East	“AI in Technology Management-1”
MB	02	Monday	10:30 - 12:00	Pavilion West	“R&D Management-1”
MB	03	Monday	10:30 - 12:00	Broadway-I	“Technology Forecasting and Evaluation”
MB	04	Monday	10:30 - 12:00	Broadway-II	“Decision Making in Technology Management”
MB	06	Monday	10:30 - 12:00	Broadway-IV	“Enterprise Management”
MD	01	Monday	14:00 - 15:30	Pavilion East	“AI in Technology Management-2”
MD	02	Monday	14:00 - 15:30	Pavilion West	“R&D Management-2”
MD	03	Monday	14:00 - 15:30	Broadway-I	“Educational Issues-1”
MD	05	Monday	14:00 - 15:30	Broadway-III	“Emerging Technologies”
MD	06	Monday	14:00 - 15:30	Broadway-IV	“Systems Approach”
MD	07	Monday	14:00 - 15:30	Park	“Sustainability-1”
ME	02	Monday	16:00 - 17:30	Pavilion West	“Innovation Management-1”
ME	03	Monday	16:00 - 17:30	Broadway-I	“Educational Issues-2”
ME	05	Monday	16:00 - 17:30	Broadway-III	“Project & Program Management”
ME	06	Monday	16:00 - 17:30	Broadway-IV	“Technology Management in the Health Sector”
ME	07	Monday	16:00 - 17:30	Park	“Sustainability-2”

TUESDAY, AUGUST 6, 2024

TA	00	Tuesday	08:30 - 10:00	Pavilion	PLENARY: “Plenary II”
TB	01	Tuesday	10:30 - 12:00	Pavilion East	“AI in Technology Management-3”
TB	02	Tuesday	10:30 - 12:00	Pavilion West	“Innovation Management-2”
TB	04	Tuesday	10:30 - 12:00	Broadway-II	“Technology Management in the Biotechnology Sector-1”
TB	05	Tuesday	10:30 - 12:00	Broadway-III	“Convergence of Technologies-1”
TB	07	Tuesday	10:30 - 12:00	Park	“Quality Management-1”
TD	03	Tuesday	14:00 - 15:30	Broadway-I	“Collaboration and Competition in Technology Management-1”
TD	05	Tuesday	14:00 - 15:30	Broadway-III	“Technology Adoption-1”
TD	06	Tuesday	14:00 - 15:30	Broadway-IV	“Technology Management in the Energy Sector”
TD	07	Tuesday	14:00 - 15:30	Park	“Manufacturing Management”
TE	01	Tuesday	16:00 - 17:30	Pavilion East	“AI in Technology Management-4”
TE	02	Tuesday	16:00 - 17:30	Pavilion West	“Innovation Management-3”
TE	03	Tuesday	16:00 - 17:30	Broadway-I	“Collaboration and Competition in Technology Management-2”

Schedule of Sessions

TE	04	Tuesday	16:00 - 17:30	Broadway-II	“Strategic Management of Technology-1”
TE	05	Tuesday	16:00 - 17:30	Broadway-III	“Technology Adoption-2”
TE	07	Tuesday	16:00 - 17:30	Park	“Supply Chain Management”

WEDNESDAY, AUGUST 7, 2024

WA	00	Wednesday	08:30 - 10:00	Pavilion	PLENARY: “Plenary III”
WB	01	Wednesday	10:30 - 12:00	Pavilion East	“AI in Technology Management-5”
WB	02	Wednesday	10:30 - 12:00	Pavilion West	PANEL: “Meet the Editors”
WB	03	Wednesday	10:30 - 12:00	Broadway-I	“Knowledge Management”
WB	04	Wednesday	10:30 - 12:00	Broadway-II	“Technology Management Framework”
WB	05	Wednesday	10:30 - 12:00	Broadway-III	“Technology Adoption-3”
WB	06	Wednesday	10:30 - 12:00	Broadway-IV	“Science and Technology Policy”
WB	07	Wednesday	10:30 - 12:00	Park	“Strategic Management of Technology-2”
WD	01	Wednesday	14:00 - 15:30	Pavilion East	“AI in Technology Management-6”
WD	02	Wednesday	14:00 - 15:30	Pavilion West	“Innovation Management-4”
WD	05	Wednesday	14:00 - 15:30	Broadway-III	“Intellectual Property”
WD	06	Wednesday	14:00 - 15:30	Broadway-IV	“Information Management”
WD	07	Wednesday	14:00 - 15:30	Park	“Technology Roadmapping”
WE	01	Wednesday	16:00 - 17:30	Pavilion East	“AI in Technology Management-7”
WE	02	Wednesday	16:00 - 17:30	Pavilion West	“Innovation Management-5”
WE	03	Wednesday	16:00 - 17:30	Broadway-I	“Strategic Management of Technology-3”
WE	04	Wednesday	16:00 - 17:30	Broadway-II	“Information Communication Technologies-1”
WE	05	Wednesday	16:00 - 17:30	Broadway-III	“Entrepreneurship/ Intrapreneurship”
WE	06	Wednesday	16:00 - 17:30	Broadway-IV	“Technology Management in the Semiconductor Industry”

THURSDAY, AUGUST 8, 2024

HA	00	Thursday	08:30 - 10:00	Pavilion	PLENARY: “Plenary IV”
HB	01	Thursday	10:30 - 12:00	Pavilion East	“AI in Technology Management-8”
HB	02	Thursday	10:30 - 12:00	Pavilion West	“Innovation Management-6”
HB	06	Thursday	10:30 - 12:00	Broadway-IV	“Technology Management in the Biotechnology Sector-2”
HD	01	Thursday	14:00 - 15:30	Pavilion East	PANEL: “PICMET ‘24 Debrief and Future PICMET Planning”

SCHEDULE OF SESSIONS

SCHEDULE OF SESSIONS BY ROOM

Session	Number	Day	Time	Room	Session Title
MA	00	Monday	08:30 - 10:00	Pavilion	PLENARY: “Plenary I”
TA	00	Tuesday	08:30 - 10:00	Pavilion	PLENARY: “Plenary II”
WA	00	Wednesday	08:30 - 10:00	Pavilion	PLENARY: “Plenary III”
HA	00	Thursday	08:30 - 10:00	Pavilion	PLENARY: “Plenary IV”
MB	01	Monday	10:30 - 12:00	Pavilion East	“AI in Technology Management-1”
MD	01	Monday	14:00 - 15:30	Pavilion East	“AI in Technology Management-2”
TB	01	Tuesday	10:30 - 12:00	Pavilion East	“AI in Technology Management-3”
TE	01	Tuesday	16:00 - 17:30	Pavilion East	“AI in Technology Management-4”
WB	01	Wednesday	10:30 - 12:00	Pavilion East	“AI in Technology Management-5”
WD	01	Wednesday	14:00 - 15:30	Pavilion East	“AI in Technology Management-6”
WE	01	Wednesday	16:00 - 17:30	Pavilion East	“AI in Technology Management-7”
HB	01	Thursday	10:30 - 12:00	Pavilion East	“AI in Technology Management-8”
HD	01	Thursday	14:00 - 15:30	Pavilion East	PANEL: “PICMET ‘24 Debrief and Future PICMET Planning”
MB	02	Monday	10:30 - 12:00	Pavilion West	“R&D Management-1”
MD	02	Monday	14:00 - 15:30	Pavilion West	“R&D Management-2”
ME	02	Monday	16:00 - 17:30	Pavilion West	“Innovation Management-1”
TB	02	Tuesday	10:30 - 12:00	Pavilion West	“Innovation Management-2”
TE	02	Tuesday	16:00 - 17:30	Pavilion West	“Innovation Management-3”
WB	02	Wednesday	10:30 - 12:00	Pavilion West	PANEL: “Meet the Editors”
WD	02	Wednesday	14:00 - 15:30	Pavilion West	“Innovation Management-4”
WE	02	Wednesday	16:00 - 17:30	Pavilion West	“Innovation Management-5”
HB	02	Thursday	10:30 - 12:00	Pavilion West	“Innovation Management-6”
MB	03	Monday	10:30 - 12:00	Broadway-I	“Technology Forecasting and Evaluation”
MD	03	Monday	14:00 - 15:30	Broadway-I	“Educational Issues-1”
ME	03	Monday	16:00 - 17:30	Broadway-I	“Educational Issues-2”
TD	03	Tuesday	14:00 - 15:30	Broadway-I	“Collaboration and Competition in Technology Management-1”
TE	03	Tuesday	16:00 - 17:30	Broadway-I	“Collaboration and Competition in Technology Management-2”
WB	03	Wednesday	10:30 - 12:00	Broadway-I	“Knowledge Management”
WE	03	Wednesday	16:00 - 17:30	Broadway-I	“Strategic Management of Technology-3”

Schedule of Sessions

MB	04	Monday	10:30 - 12:00	Broadway-II	“Decision Making in Technology Management”
TB	04	Tuesday	10:30 - 12:00	Broadway-II	“Technology Management in the Biotechnology Sector-1”
TE	04	Tuesday	16:00 - 17:30	Broadway-II	“Strategic Management of Technology-1”
WB	04	Wednesday	10:30 - 12:00	Broadway-II	“Technology Management Framework”
WE	04	Wednesday	16:00 - 17:30	Broadway-II	“Information Communication Technologies-1”
MD	05	Monday	14:00 - 15:30	Broadway-III	“Emerging Technologies”
ME	05	Monday	16:00 - 17:30	Broadway-III	“Project & Program Management”
TB	05	Tuesday	10:30 - 12:00	Broadway-III	“Convergence of Technologies-1”
TD	05	Tuesday	14:00 - 15:30	Broadway-III	“Technology Adoption-1”
TE	05	Tuesday	16:00 - 17:30	Broadway-III	“Technology Adoption-2”
WB	05	Wednesday	10:30 - 12:00	Broadway-III	“Technology Adoption-3”
WD	05	Wednesday	14:00 - 15:30	Broadway-III	“Intellectual Property”
WE	05	Wednesday	16:00 - 17:30	Broadway-III	“Entrepreneurship/ Intrapreneurship”
MB	06	Monday	10:30 - 12:00	Broadway-IV	“Enterprise Management”
MD	06	Monday	14:00 - 15:30	Broadway-IV	“Systems Approach”
ME	06	Monday	16:00 - 17:30	Broadway-IV	“Technology Management in the Health Sector”
TD	06	Tuesday	14:00 - 15:30	Broadway-IV	“Technology Management in the Energy Sector”
WB	06	Wednesday	10:30 - 12:00	Broadway-IV	“Science and Technology Policy”
WD	06	Wednesday	14:00 - 15:30	Broadway-IV	“Information Management”
WE	06	Wednesday	16:00 - 17:30	Broadway-IV	“Technology Management in the Semiconductor Industry”
HB	06	Thursday	10:30 - 12:00	Broadway-IV	“Technology Management in the Biotechnology Sector-2”
MD	07	Monday	14:00 - 15:30	Park	“Sustainability-1”
ME	07	Monday	16:00 - 17:30	Park	“Sustainability-2”
TB	07	Tuesday	10:30 - 12:00	Park	“Quality Management-1”
TD	07	Tuesday	14:00 - 15:30	Park	“Manufacturing Management”
TE	07	Tuesday	16:00 - 17:30	Park	“Supply Chain Management”
WB	07	Wednesday	10:30 - 12:00	Park	“Strategic Management of Technology-2”
WD	07	Wednesday	14:00 - 15:30	Park	“Technology Roadmapping”

Personal Schedule

	Sunday August 4, 2024	Monday August 5, 2024	Tuesday August 6, 2024	Wednesday August 7, 2024	Thursday August 8, 2024
08:00 – 08:30 Bright Start (Breakfast)					
08:30 – 10:00 (A)		Plenary - 1 (Pavilion)	Plenary - 2 (Pavilion)	Plenary - 3 (Pavilion)	Plenary - 4 (Pavilion)
10:00 – 10:30 Coffee Break					
10:30 – 12:00 (B)					
12:00 – 14:00 Lunch Break					
14:00 – 15:30 (D)					PICMET '25 Planning Session
15:30 – 16:00 Coffee Break					
16:00 – 17:30 (E)					
19:00 – 22:00	Welcome Reception	Cultural Dinner	Awards Banquet		

SPECIAL SESSIONS

PANEL OF EDITORS LUNCH MEETING

DATE: MONDAY, AUGUST 5
TIME: 12:00-14:00
ROOM: SKYLINE III (23RD FLOOR)

The PICMET Associate Editors invite all PICMET reviewers and members of the "Panel of Reviewers" (pg. 6-8) to join us for a working lunch to discuss the editorial process and get ideas for the future.

Lunch will be provided.

COUNTRY REPRESENTATIVES LUNCH MEETING

DATE: WEDNESDAY, AUGUST 7
TIME: 12:00-14:00
ROOM: SKYLINE III (23RD FLOOR)

PICMET has 146 Country Representatives in 59 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 Kozanoglu, Professor, University of Technology Sydney, 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 '24 DEBRIEFING & '25 PLANNING SESSION

DATE: THURSDAY, AUGUST 8
TIME: 14:00-15:30
ROOM: PAVILION EAST

We invite the entire PICMET community to join us for this interactive session. The PICMET organizing committee will be present to hear feedback about this year's conference, discuss lessons learned, and talk about future PICMET conferences.

PLENARIES

PLENARY SESSION-1

DATE: MONDAY, AUGUST 5, 2024
TIME: 08:30-10:00
ROOM: PAVILION

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

KEYNOTE-1

Dr. Bulent Atalay, Professor Emeritus of Physics at the University of Mary Washington and the University of Virginia, USA

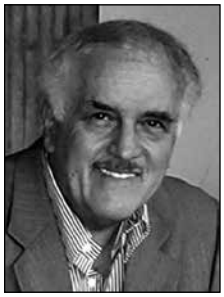
"Artificial Intelligence - The High Renaissance of the Digital Age"

History is marked by cultural revolutions, births, and, sometimes, rebirths. Almost two millennia after the Golden Ages of Classical Antiquity, civilization underwent a cultural rebirth. The Italian Renaissance, spanning the 15th and 16th centuries, represents another great age of humanity. Toward the end of the 15th century, Leonardo, Michelangelo, and Raphael ushered in the High Renaissance, producing the defining works of art…as great or greater than those of Classical Antiquity. Similarly, the Scientific Revolution, spanning the 17th century, and shaped by Galileo, Kepler, and Descartes, took place, reaching a crescendo with Newton. This revolution effectively made humankind modern by demonstrating that nature could be understood through mathematical principles. Finally, the first three decades of the 20th century saw a Renaissance of Science, with the awe-inspiring contributions of Einstein, and a three-year period in the late 1920s as its High Renaissance, the emergence of the quantum revolution.

It is during cultural revolutions that individual and group genius arises. The present lecture springs from the last chapter of the speaker's newest book, Beyond Genius, which examines the internal and external conditions for surpassing genius to appear and change the world. Recreating these conditions will never make us another Leonardo or an Einstein, but it cannot fail to make us more creative and productive than we would be otherwise.

The groundwork for the digital age was laid by mathematicians John von Neumann and Alan Turing in the late 1930s and 40s, with individual and networked computers proliferating during the rest of the 20th century. But only in the 2020s has Artificial Intelligence (AI), foreseen by Turing, suddenly begun to flower. Is this the High Renaissance of the Digital Age? And if so, who will emerge as its most significant innovators?

Scientist, artist, and author ***Bulent Atalay*** *has been described by NPR, PBS, the* Washington Post*, and* National Geographic *as a "Modern Renaissance Man." His academic background is in theoretical physics, distilled from work at Georgetown, the University of California-Berkeley, Princeton, Oxford, and the Institute for Advanced Study Princeton.*



He is the author of three books on the intersection of art, science, and mathematics. In his best-selling books, Math and the Mona Lisa *(Smithsonian Books, 2004) and* Leonardo's Universe *(National Geographic Books, 2009), the focal point was Leonardo da Vinci. His latest and most ambitious book,* Beyond Genius *(Pegasus Books), is a compendium of genius in general, with a special focus on the handful of transformative geniuses, Leonardo, Shakespeare, Newton, Beethoven, and Einstein. Copies of* Beyond Genius *will be available for purchase and signing following the talk. Visit his website www.bulentatalay.com*

Dr. Atalay travels around the world lecturing at academic institutions and on cruise ships on the "A-subjects," art, archaeology, astrophysics, atomic physics, and Ataturk, confessing he knows much less about the "B-subjects," business, banking, biology, and botany. He has lectured at Caltech, Princeton, Yale, Harvard, Stanford, Oxford, NASA, NIST, and NIH. He is a professor emeritus of physics at the University of Mary Washington and the University of Virginia.

KEYNOTE-2

Dr. Jay Lee, University of Maryland College Park, USA

"Recent Advances of Industrial AI for Smart and Resilient Industrial Systems"

Industrial AI, Big Data Analytics, Machine Learning, and Cyber Physical Systems are changing the way we design product, manufacturing, and service systems. It is clear that as more sensors and smart analytics software are integrated in the complex industrial products, predictive

technologies can further learn and autonomously optimize performance with resilience. This presentation will give an introduction about recent advances of Industrial AI for highly complex engineering systems. First, an Industrial AI systematic approach will be introduced. Case studies on lessons learned from fleet-based asset systems including semiconductor, wind farm, electrification, high speed transport, and healthcare/medical systems, etc., will be given. In addition, training industrial AI skills through data foundry for high performance and real-time data analytics in future talents will be discussed.

Dr. Jay Lee *is Clark Distinguished Professor in the Mechanical Engineering of the University of Maryland College Park. He is also the founding director of the Industrial AI Center (www.iaicenter.com). Previously, he served as Ohio Eminent Scholar, L.W. Scott Alter Chair, and University Distinguished Professor at the University of Cincinnati, and was the founding director of the National Science Foundation (NSF) Industry/University Cooperative Research Center (I/UCRC) on Intelligent Maintenance Systems (www.imscenter.net) in partnership with over 100 global company members.*

Dr. Lee was on leave from UC to serve as Vice Chairman and Board Member for Foxconn Technology Group during 2019-2021 to lead the development of Foxconn Wisconsin Science Park in Mt. Pleasant, Wisconsin (www.foxconnwiofficial.com). In addition, he advised Foxconn business units to successfully receive six WEF Lighthouse Factory Awards since 2019. He is a member of the Global Future Council on Advanced Manufacturing and Production of the World Economics Council (WEF), a member of the Board of Governors of the Manufacturing Executive Leadership Council of the National Association of Manufacturers (NAM), Board of Trustees of MTConnect, as well as a senior advisor to McKinsey. Previously, he served as Director for Product Development and Manufacturing at United Technologies Research Center (now Raytheon Technologies Research Center) as well as Program Director for a number of programs at NSF.

He was selected as 30 Visionaries in Smart Manufacturing by SME in January 2016 and 20 most influential professors in Smart Manufacturing in June 2020, and received the SME Eli Whitney Productivity Award and SME/NAMRC S.M. Wu Research Implementation Award in 2022. His book on Industrial AI *was published by Springer in 2020.*

PLENARY SESSION-2

DATE: TUESDAY, AUGUST 6, 2024
TIME: 08:30-10:00
ROOM: PAVILION

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

KEYNOTE-1

Dr. Marie Elisabeth Paté-Cornell, Stanford University, USA

"AI Support of Engineering Risk Management: A Potential Risk Attitude Problem"

Artificial intelligence plays two different roles in risk analysis: managing information, or implementing (suggesting) automatic decisions. Risk management decisions involve preferences including a risk attitude that is implemented in the software but may not be in line with that of the decision maker, or the preferences of the people who are targets of the decision. This can be the case in engineering, but also in medicine or national security. The treatment of risk attitudes is seldom pointed out, yet the decision maker may not be aware of preferences that have been included in the software. My recommendations include the description of AI systems in ways that reveal the preferences and risk attitudes included in the programs, and how to modify them to fit other preferences in their applications.

Dr. Marie Elisabeth Paté-Cornell *is the Burt and Deedee McMurtry Professor in the School of and a Senior Fellow (by courtesy) of the Stanford Engineering Freeman-Spogli Institute for International Studies. Her specialty is engineering risk analysis, with applications to complex systems (space, medical, offshore oil platforms, cyber security, etc.). Her work has been based on probabilistic and stochastic models and on Artificial Intelligence. She is a member of the National Academy of Engineering, the French Académie des Technologies, and the NASA Advisory Council, and she is a Distinguished Visiting Scientist of the Jet Propulsion Lab. She was a member of the President's Foreign Intelligence Advisory Board (2001 to 2008). She holds a BS in Mathematics and Physics, Marseille (France), an Engineering*

PLENARIES

degree (Applied Math/CS) from the Institut Polytechnique de Grenoble (France), an MS in Operations Research (OR) and a PhD in Engineering-Economic Systems (EES), both from Stanford University. She is the author or coauthor of numerous publications including several Best Paper awards. She was awarded the 2002 Distinguished Achievement Award of the Society for Risk Analysis (of which she is a Fellow), the INFORMS Ramsey Medal of Decision Analysis (2010), an Honorary PhD from the University of Strathclyde (2016), and the IEEE Ramo medal for Systems Engineering and Science in 2021.

KEYNOTE-2

Dr. Antonio Carcaterra, Sapienza University of Rome, Italy

"Responsibility in the Decision of Artificial and Human Agents"

A point of view is proposed regarding the responsibility linked to the actions of apparently autonomous machines, i.e., not continuously controlled and supervised during their actions by humans. These devices, many of which classified within the disciplinary area of mechatronics and robotics with the involvement of complex algorithms, some of which pertain to the sphere of popular artificial intelligence, will have a very important social impact in the near future. It is clear how the immersion of these devices in a complex social context, even in physical contact with men engaged in cooperative activities with machines, can determine a large series of circumstances in which this interaction, for various and non-obvious reasons, produces potentially harmful effects, alongside the obvious advantages that promote their use. One suggestive example among all, familiar even to the non-specialist reader, is that of autonomous driving, to which for clarity, where useful, we will refer our examples (the considerations set out being however applicable to every decision-making problem, regardless of the case in question). In this presentation we will focus our attention on the process of determining choices through those foundations of decision theory which is the common ground on which most of the decision-making techniques known today operate (including various artificial intelligence techniques), used both in machines and by man. We will give particular emphasis to the minimum principles, as a central and universal element of rational choices, principles that govern machines, men and natural phenomena themselves. It is from the connection between the need for a compromise, which implies the adoption of minimum principles, and the incomplete controllability of the scenarios that rational choices produce, promoting a new point of view on the concept of responsibility.

***Dr. Antonio Carcaterra** is the Head of the Department of Mechanical and Aerospace Engineering at Sapienza University of Rome. His research interests include dynamics of structures and complex systems, mechatronics, control of dynamic systems and vehicles, and autonomous drones using artificial intelligence. He is the holder of several patents and is currently managing numerous fundamental and industrial research projects. He has authored about 200 scientific publications. He is currently a senior fellow of the Sapienza School of Advanced Studies, president of the Sapienza Innovation Consortium, scientific manager of National Center for Sustainable Mobility – part of the European program entitled "Next Generation," and key scientific manager of the investment fund I3P on space technology funded by the European Fund of Investment. He was an adjunct professor at the Department of Mechanical Engineering at Carnegie Mellon University, a research scientist at the Marine Engineering Institute of the Italian National Council of Research, past director of the doctorate program in Theoretical and Applied Mechanics, director of the Doctoral School in Sciences and Technologies for Industrial Innovation, president of the degree program in Mechanical Engineering, and a member of the Transport Systems Safety Commission for the Italian Ministry of Transport and Infrastructure.*

PLENARY SESSION-3

DATE: WEDNESDAY, AUGUST 7, 2024
TIME: 08:30-10:00
ROOM: PAVILION

Session Chair: Dr. Dilek Cetindamar Kozanoglu, University of Technology Sydney, Australia

KEYNOTE-1

Dr. Mel Horwitch, Visiting Scholar/Research Affiliate, MIT Sloan School of Management, USA

"The Emerging AI-Strategy Connection: Ongoing Challenges and Unanticipated Opportunities"

This keynote speech focuses on the current state and di-

rection of the AI-business strategy relationship. Relevant background of business strategy is examined, with particular attention given to the inherent variety and complexity of business strategy. In particular, emphasis is placed on an ongoing need to integrate disparate explicit and tacit elements and as well as on other tensions existing in strategy - all of which are challenges for AI. The development of a set of concepts dealing with AI and strategy is discussed, observing that up to now AI largely serves as a strategic tool assisting and augmenting existing processes in a generally focused or specialized fashion. Lessons from knowledge management's (KM's) AI experience are noted, especially claims that AI-enabled KM systems represent some success in serving both explicit and tacit knowledge. The current leveraging of AI by some of the best-known strategy consulting firms is reviewed. Energetic progress in incorporating AI into such consulting practices is observed. This talk concludes by speculating that a later unanticipated phase of the AI-strategy relationship could feature AI-enabled strategy systems that enhance the more general management, instinctual, and tacit parts of strategy.

Dr. Mel Horwitch *is currently a Visiting Scholar/Research Affiliate at the MIT Sloan School. He also served for 14 years at NYU-Poly (now NYU's Tandon School of Engineering) as Professor of Technology Management, twice as Department Chair, and as Institute for Technology and Enterprise Director. He publishes and teaches extensively on technology strategy, entrepreneurship, and large-scale innovation, most recently focusing on how innovation and other building blocks help in developing a more strategic society. His publications include* Clipped Wings: The American SST Conflict, Technology in the Modern Corporation: A Strategic Perspective *(editor and contributor),* Energy Future *(chapter contributor), and articles in such journals as* Management Science, Policy Science, MIT Sloan Management Review, Technology in Society, Journal of Engineering and Technology Management, *and* Journal of High Technology Management Research*, and numerous cases. He was also Dean of Management and Professor at Theseus Institute (now EDHEC) in Sophia Antipolis, France. He also served on the MIT Sloan School and Harvard Business School (HBS) faculties and was Visiting Scholar at UCSD's Rady School, Hitotsubashi University in Tokyo, and London Business School. In 2021, PICMET selected Dr. Horwitch as a PICMET Fellow for his impact on technology management research, education, and leadership. He earned an AB from Princeton University and an MBA and Doctorate from HBS and served a US Peace Corps Volunteer in Thailand.*

KEYNOTE-2

Dr. Rainer P. Hasenauer, Honorary Professor, WU Vienna, Austria

"Intrapreneurship Management in the AI Era"

This keynote presentation is based on the book *Intrapreneurship Management: Concepts, Methods, and Software for Managing Technological Innovation in Organizations* by Rainer Hasenauer and Oliver Yu, to be published by Wiley - IEEE Press in June 2024. Internal innovation, or Intrapreneurship, with employees thinking and behaving like entrepreneurs, is the driving force for organizational competitiveness and economic growth. Successful intrapreneurship management requires Organization Readiness for internal innovations and Market and Technology Readiness for innovation projects. Artificial Intelligence (AI) can be particularly effective in supporting the fulfillment of all these readiness. Specifically, AI, especially the emerging Emotion AI and Creativity AI, can develop and apply an extensive knowledgebase of emotional assessments and successful creativity experiences for the in-depth understanding and precise fulfillment of the needs and wants of not only intrapreneurs and internal supporters in building powerful innovative culture and teamwork, but also those of prospective external adopters for the effective development and marketing of innovative technologies.

Additionally, rapidly evolving AI can apply a range of advanced methodologies to provide the optimization of available resources for achieving the combined balance among the integrated Economic-Ecologic-Equity values and risks of all Intrapreneurship participants: Intrapreneur, Internal Supporter, and Final Adopter.

This presentation will provide detailed representative examples for these exciting current and prospective AI applications to enhance Intrapreneurship Management.

Dr. Rainer P. Hasenauer *is Honorary Professor of Marketing and Lecturer in Marketing of High-Tech Innovation and Technology Marketing at the Institute for Marketing Management, Vienna University of Economics and Business (WU Vienna).*

PLENARIES

He is an entrepreneur who has long been involved with high-tech companies as a co-founder and a business angel. He is also a business developer focusing on innovative technologies. He initiated and co-founded the HiTec Marketing Research Association in Vienna (www.hitec.at) and the Cross Border HiTec Center (www.hitechcentrum.eu), where he serves as senior advisor.

Dr. Hasenauer's primary teaching and research interests lie in market entry of high-tech innovation in B2B markets, and in measuring innovation half-life and technology acceptance in B2B markets. He teaches at the Vienna University of Economics and Business, the Vienna University of Technology, and the Campus02 University of Applied Sciences in Graz. He has held guest lectureships at the Institute for Advanced Studies in Vienna, the University of St. Gallen (CH), the University of Klagenfurt, and the University of Economics in Bratislava. His research work is predominantly project-driven for B2B markets and comprises community-based innovation, marketing testbeds for market entry, and multidisciplinary communication in high-tech innovation. Applications include satellite navigation and remote sensing, robotics, sensors, functional materials, flow batteries and remote power supply, threat analysis for safety and security systems of complex products and systems such as road tunnel ventilation and power plants, and applied operations research with focus on multi-criteria decision models.

He has served on the advisory boards of high-tech investment groups, on an expert board for high-tech start-up incubators, and on the supervisory board of a global market leader in the field of safety-critical real-time communication systems.

PLENARY SESSION-4

DATE: THURSDAY, AUGUST 8, 2024
TIME: 08:30-10:00
ROOM: PAVILION

Session Chair: Prof. Harm-Jan Steenhuis, Hawaii Pacific University, USA

KEYNOTE-1

Dr. Gabriela Dutrénit, Universidad Autónoma Metropolitana (UAM), Mexico

"Digitalization Processes and Industry 4.0 in Mexican Multilatinas"

There is already extensive literature on processes of technological capability accumulation (TCA) at the company level. These capabilities differ between companies and are the basis of their innovative activity and competitiveness.

The literature on developing countries and emerging economies shows that companies tend to adopt adaptive TCA strategies, rather than strategies aimed at leading processes to move the technological frontier based on R&D activities. The productive structure of these countries is heterogeneous; there are companies that compete near the frontier of knowledge and technology, while others are far behind. Many of the most modern companies are multilatinas, that is, multinationals that have their headquarters in Latin America, for example in Mexico. These multilatinas are large companies (more than 10,000 employees), with many production plants (generally more than 10 plants) located in different countries and continents. Many of these companies are connected to global value chains.

The objective of this presentation is to analyze both internal factors and the incidence of the economic, environmental, cultural, sociopolitical and scientific and technological spheres, including science, technology and innovation policies, in the TCA processes of Mexican multilatinas. The processes of digitalization and introduction of industry 4.0 are particularly explored, differentiating the drivers of multilatinas that are or are not connected to global value chains. Based on a multiple case study methodology, a set of multilatinas in the auto parts and cable production industries for the generation, transmission and distribution of electrical energy are compared.

***Dr. Gabriela Dutrénit** is an economist with a PhD in Science and Technology Research Studies from the Science Policy Research Unit (SPRU), University of Sussex, UK. She is a professor in the postgraduate Program in Economics, Management and Policy of Innovation at the Universidad Autónoma Metropolitana (UAM), Mexico, and also a "Distinguished Professor" of the UAM and a regular member of the Mexican Academy of Science. Dr. Dutrénit is president of the Latin American Chapter of LALICS (Latin American Network for Economics of Learning, Innovation, and Competence Building Systems). Her research interests include*

innovation and development; learning and technological capability accumulation at the firm level; university-industry linkages; research and development (R&D); and innovation policy. She has coordinated several evaluations of the Mexican STI policy.

KEYNOTE-2

Mr. Mohan Nair, CEO, Emerge Inc., USA, and Edmund Hillary Fellow, New Zealand

"The 7 Deadly Sins of Business Transformation"

When markets transform, companies caught unprepared are left behind. But those who recognize that change is in the air, who are prepared for market shifts, not only prevail but soar to new competitive heights. Transformation is usually equated with digital transformation for businesses which want to accelerate their capabilities, especially in the world of AI. But the real change is one that is prepared years before such structural changes and is a set of capabilities that must be created, energized or even purchased to create the eyesight and insight to see in the fog of future. AirBnB, Disney, and Uber were not created from disruption. They were created from a transformative mindset employed during a structural change in the market resulting in a new recipe unseen by the majority. Now they are the majority.

This presentation will focus on the "seven deadly sins of business transformation" and cover the virtues of businesses which used technology while creating a business model recipe to enact their vision. Focusing on the "seven deadly sins" that businesses must avoid in order to survive and thrive during market fluctuations, this presentation will offer a way to view transformation and guide through anticipating, understanding and riding the waves. It will:

- Examine the new principles of transformation in business.
- Explain the value of purpose/cause in organizations.
- Explore market momentum and how to identify it.
- Focus on value propositions and "values propositions."
- Elaborate on the role of a performance platform in the achievement of an organization.

Mr. Mohan Nair *is an author, a corporate executive and a proven innovator with six startup creations within a large enterprise. He is Chief Executive of Emerge Inc., where his focus is on innovation and innovator.*

Mr. Nair served as Chief Innovation Officer, Senior VP of Cambia Health Solutions for 10 years. Leading a high-performance innovation team called Innovation Force, he launched six startups. Healthsparq, his first startup, was sold to Kyruus in Jan 2021. Prior to Cambia, Mohan was Chief Marketing Executive/EVP for Regence Blue Cross Blue Shield. He formed the consumer-directed digital front-end, telesales, business development and was instrumental in leading the transformation of Regence Group.

He was President of two startups, one in cost/performance management and the other in network management. Earlier in his career, he held executive positions in Mentor Graphics Corporation and Intel.

Mr. Nair is the author of the book Strategic Business Transformation: the 7 Deadly Sins to Avoid (Wiley & Sons, 2010). He has authored two other books and over 20 refereed journal articles on Performance Measurement, Balance Scorecard and Servant Leadership. He writes for Forbes, RamaonHealthcare.com, and is a contributing columnist for Innovation Leader.

Mr. Nair was Adjunct Professor of Business at JL Kellogg School of Management for 12 years, and University of Oregon MBA program for five years. He has also been a guest lecturer at Harvard, Berkeley, University of Auckland (New Zealand), and Advisor to the President at George Fox University. He is a TEDx speaker where he outlines his unique business transformation philosophy.

PhD Colloquium

GETTING YOUR PHD… AND BEYOND

Critical Stages and Career Paths for the PhD Student

DATE: SUNDAY, AUGUST 4
TIME: 13:00-17:00
(COFFEE BREAK AT 15:00)
ROOM: SKYLINE 1, 23RD FLOOR

REGISTRATION FEE: $40

SESSION CHAIR:

Dr. Nasir Sheikh, Visiting Scholar, ETM Dept., Portland State University; and Former Associate Professor, Chair, and PhD Program Director, Technology Management Department, University of Bridgeport, USA

SPEAKERS:

Dr. Charles Weber, Associate Professor, Engineering and Technology Management Department, Portland State University, USA
Rainer Hasenauer, Honorary Professor of Marketing, Institute of Marketing Management, Vienna University of Economics and Business, Austria
Dr. Hugo Carlos Gomez Guzman, Director (ret.), GEPP, Mexico

This interactive session will give PhD candidates an excellent opportunity to learn how to successfully defend their dissertation, how to publish their research and how to become confident in searching for jobs in academia and industry after obtaining the PhD degree. In addition, the PhD candidates will be able to meet peers and colleagues, share experiences, and network with scholars from many countries. The invited speakers and the participants will share experiences in the following areas:

- Critical stages in the PhD process and how to successfully master them

- The PhD process and career paths
- Coping with possible challenges while pursuing the PhD degree
- Entering the job market – academia, government, or industry (tips/tools for job searching)
- Publishing PhD research

We encourage research students in all stages of the PhD process, as well as recent graduates, to join this illuminating colloquium.

PANEL

MEET THE EDITORS

DATE: WEDNESDAY, AUGUST 7
TIME: 10:30 – 12:00
ROOM: PAVILION WEST

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

Moderator:
- Tim Anderson, PICMET Director of Technical Activities

Panelists:
- Gloria Barczak, Editor in Chief, *Journal of Product Innovation Management*
- Jin Chen, Editor in Chief, *International Journal of Innovation and Technology Management*
- Dilek Cetindamar, Department Editor, *IEEE Transactions on Engineering Management*
- Gabriela Dutrenit, Former Editor in Chief (currently Department Editor), *Research Policy*
- Nazrul Islam, Editor in Chief, *International Journal of Technology Intelligence and Planning;* Associate Editor, *Technological Forecasting & Social Change*
- Harm-Jan Steenhuis, Editor in Chief, *Journal of Manufacturing Technology Management*
- Steven Walsh, Editorial Board, *IEEE Transactions on Engineering Management*

WORKSHOP

WELCOME TO THE AI ERA! WHAT'S NEXT FOR TECHNOLOGY MANAGEMENT?

DATE: SUNDAY, AUGUST 4
TIME: 09:00 – 12:00
ROOM: DUNIWAY TOWER, CAPTAIN GRAY I
REGIST: $150 FOR REGISTERED PICMET ATTENDEES
$200 FOR NON-REGISTERED
$100 FOR STUDENTS

AI that generates, rather than classifies, is quickly changing how we study, learn, write, innovate, and work with data. Many academics, students, and industry employees are using multi-modal Large Language Models such as ChatGPT on a daily basis, while companies embed LLM functionality in their own products and services. What does this mean for engineering and technology management education? We explore these questions during this highly interactive workshop.

How To Work with Large Language Models
This workshop uses hands-on exercises with ChatGPT and short lectures to introduce the capabilities and technical foundations of LLM. Lectures and exercises are adapted from a series of "Learning Labs" for graduate students, developed at Portland State University. The mix of foundational knowledge, first-hand technology experiences, and models for teaching and learning enables participants to further explore generative AI in their own work. The workshop is suitable for participants with no prior LLM knowledge and regular LLM users who are interested in technology foundations and educational models.

WORKSHOP FACILITATOR:
Dr. Antonie Jetter, Associate Dean of Research at the Maseeh College of Engineering and Computer Science at Portland State University, is co-founder of the Compassionate Computing Lab and leads ThriveAI, Portland State's faculty development initiative for generative AI.

SESSIONS

MA-00 PLENARY: PLENARY-1

DATE: MONDAY, 8/5/2024
TIME: 08:30-10:00
ROOM: PAVILION
CHAIR: TIMOTHY R ANDERSON; PORTLAND STATE UNIVERSITY

MA-00.1 [K] • Artificial Intelligence - The High Renaissance of the Digital Age

Bulent Atalay; Scientist, Artist and Author, United States

History is marked by cultural revolutions, births, and, sometimes, rebirths. Almost two millennia after the Golden Ages of Classical Antiquity, civilization underwent a cultural rebirth. The Italian Renaissance, spanning the 15th and 16th centuries, represents another great age of humanity. Toward the end of the 15th century, Leonardo, Michelangelo, and Raphael ushered in the High Renaissance, producing the defining works of art…as great or greater than those of Classical Antiquity. Similarly, the Scientific Revolution, spanning the 17th century, and shaped by Galileo, Kepler, and Descartes, took place, reaching a crescendo with Newton. This revolution effectively made humankind modern by demonstrating that nature could be understood through mathematical principles. Finally, the first three decades of the 20th century saw a Renaissance of Science, with the awe-inspiring contributions of Einstein, and a three-year period in the late 1920s as its High Renaissance, the emergence of the quantum revolution. It is during cultural revolutions that individual and group genius arises. The present lecture springs from the last chapter of the speaker's newest book, Beyond Genius, which examines the internal and external conditions for surpassing genius to appear and change the world. Recreating these conditions will never make us another Leonardo or an Einstein, but it cannot fail to make us more creative and productive than we would be otherwise. The groundwork for the digital age was laid by mathematicians John von Neumann and Alan Turing in the late 1930s and 40s, with individual and networked computers proliferating during the rest of the 20th century. But only in the 2020s has Artificial Intelligence (AI), foreseen by Turing, suddenly begun to flower. Is this the High Renaissance of the Digital Age? And if so, who will emerge as its most significant innovators?

MA-00.2 [K] • Recent Advances of Industrial AI for Smart and Resilient Industrial Systems

Jay Lee; University of Maryland College Park, United States

Industrial AI, Big Data Analytics, Machine Learning, and Cyber Physical Systems are changing the way we design product, manufacturing, and service systems. It is clear that as more sensors and smart analytics software are integrated in the complex industrial products, predictive technologies can further learn and autonomously optimize performance with resilience. This presentation will give an introduction about recent advances of Industrial AI for highly complex engineering systems. First, an Industrial AI systematic approach will be introduced. Case studies on lessons learned from fleet-based asset systems including semiconductor, wind farm, electrification, high speed transport, and healthcare/medical systems, etc., will be given. In addition, training industrial AI skills through data foundry for high performance and real-time data analytics in future talents will be discussed.

MB-01 AI in Technology Management-1

Monday, 8/5/2024, 10:30 - 12:00
Room: Pavilion East
Chair(s) Alisa Kongthon; King Mongkut's University of Technology Thonburi

MB-01.1 [R] • Towards Effective Human-AI Collaboration in Decision-Making: A Comprehensive Review and Conceptual Framework

Daniel A Molina; Yuan Ze University, Taiwan
Vladimir Kharlov; Yuan Ze University, Taiwan
Ja-Shen Chen; Yuan Ze University, Taiwan

This ongoing study explores the symbiotic relationship between humans and Artificial Intelligence (AI) within organizational settings, challenging the conventional perception of AI as a mere tool and establishing it as an integral component of the workforce. The research seeks to address the question: "In what ways does the collaborative interaction between humans and AI influence specific dimensions within organizations?" Drawing from the Extended Mind Theory, which suggests that cognitive processes can extend beyond the human mind into objects and environments (including AI), the study explores diverse applications of AI in business contexts. From data analysis and decision-making to customer service, marketing, risk management, and product development, the research analyzes the multifaceted impacts of AI integration. This also encompasses the potential challenges and considerations associated with their implementation across various domains. This research aims to redefine the perception of AI and its "new" role in organizations, providing valuable insights for decision-makers adapting to the changing AI integration.

MB-01.2 [R] • The New Era of Knowledge Retrieval: Multi-agent Systems Meet Generative AI

Niklas Holtz; Volkswagen AG, Germany
Sven Wittfoth; Volkswagen AG, Germany
Jorge Marx Gómez; University of Oldenburg, Germany

In the realm of interactive chat systems, the fusion of Multi-Agent Systems (MAS) with Generative Artificial Intelligence (GAI) presents a promising approach to dynamic information retrieval and personalized user experiences. Handling diverse data sources with distinct modalities, especially in real-time, poses challenges. This paper provides a comprehensive overview of MAS and GAI, emphasizing their synergistic potential in complex real-time searches. A notable contribution is an experimental prototype adept at navigating real-time data sources beyond the AI's training data, enhancing the user's information-seeking experience. By integrating MAS adaptability with GAI's data-processing capabilities, our approach delivers valuable real-time insights. The exploration of knowledge graphs based on acquired data further enriches the system. However, inherent limitations include scalability challenges, data integrity maintenance, and the refinement of the user experience. Addressing these challenges lays the foundation for future research in the exciting intersection of MAS and GAI, offering insights into the potential of this combined approach in advancing interactive chat systems.

MB-01.3 [A] • Decrypting the Success Path of High Potential Start-ups: The Application of Process Mining Algorithms on Key Developments

Christoph Schroeer; University of Oldenburg / Datenschmide.ai GmbH, Germany
Sven Wittfoth; Volkswagen AG, Germany
Tabea Hüllen; Volkswagen AG, Germany
Florian Naumann; Volkswagen AG, Germany
Jonas Frischkorn; Volkswagen AG, Germany
Wolfgang Müller-Pietralla; Volkswagen AG, Germany

Numerous data-driven approaches made their way into the strategic decision-making process for identifying companies for strategic partnerships or M&A-activities. While the data availability such as of financials of global player is given sufficiently, it's not for start-ups. However, start-ups occupy a high potential in terms of growing yields. In contrast, only 10 percent of European start-ups survive their first seven years. To overcome the lack of data to evaluate start-ups, we process key developments sourced by S&P. Key developments are daily-based events such as private placements or product announcements. We preprocess time-series of key developments for around 76,600 global start-ups acting in five different industries. Based on criteria derived from the reference literature, we divided start-ups into less or more successful companies to train several models by using the process mining algorithms alpha, heuristic and inductive miner in combination with classification algorithms like XGBoost, support-vector machine and decision tree to classify a start-up's performance. In doing so, we significantly identify processes of successful start-ups. Beside theoretical implications regarding the application of algorithms on key developments, our approach addresses managerial implications by supporting at finding high potential start-ups to enlarge

business opportunities as well as for minimizing risks deriving from unprofitable investments.

MB-02 R&D Management-1
Monday, 8/5/2024, 10:30 - 12:00
Room: Pavilion West
Chair(s) Mel Horwitch; MIT Sloan School

MB-02.1 [R] • Identification of Exogenous Disturbances of Product Development

Michael Riesener; RWTH Aachen University, Germany
Alexander Keuper; RWTH Aachen University, Germany
Jonas Tittel; RWTH Aachen University, Germany
Carsten Boßmann; RWTH Aachen University, Germany
Alexander Menning; RWTH Aachen University, Germany
Günther Schuh; RWTH Aachen University, Germany

In the context of sustainable management, organizational resilience is gaining importance. Crises usually result from the combined occurrence of disturbances. Manufacturing companies are increasingly exposed to exogenous disturbances. Although several concepts such as PESTLE-Analysis and Porter's Five Forces address exogenous disturbances in the context of risk management strategy, current literature does not provide an extensive overview of relevant disturbances. This makes it difficult for companies to prepare systematically for external influences, and thus jeopardizes the resilience of manufacturing companies. Crisis-resistant product development is of particular importance, as innovative products offer a promising opportunity to create competitive advantages and thus secure the company's existence or even enable a company to increase its market share in the event of a crisis. This paper presents the relevant disturbances of product development. Based on a literature review, exogenous disturbances are identified followed by a structured consolidation. The results are filtered to the exogenous disturbances relevant to product development using suitable evaluation criteria. The approach is transferable to other corporate functions.

MB-02.2 [R] • Identification of Product Development Goals to Increase Organizational Resilience

Michael Riesener; RWTH Aachen University, Germany
Alexander Keuper; RWTH Aachen University, Germany
Jonas Tittel; RWTH Aachen University, Germany
Carsten Boßmann; RWTH Aachen University, Germany
Pawan Singh; RWTH Aachen University, Germany
Günther Schuh; RWTH Aachen University, Germany

The corporate function of product development is of particular importance, as innovative products offer a promising opportunity to create competitive advantages and thus secure the company's existence or even enable a company to increase its market share. However, current literature lacks an overall view of possible product development goals. Hence, this paper aims to provide a hierarchical overview of product development goals based on an extensive literature review. With the help of the results of this work, manufacturing companies are able to conduct an uncomplicated examination of product development goals and prioritize them according to their planned short-term as well as long-term future.

MB-02.3 [R] • Impact Analysis of Research-intensive University Development Program for Professors' Research Performance

Sora Lee; Sungkyunkwan University, Korea, South
Heesang Lee; Sungkyunkwan University, Korea, South

In a knowledge society, global competition based on a market economy emphasizes research-intensive universities that focus on discovering new knowledge and nurturing the next generation of scholars. Therefore, policymakers in many countries have undertaken various projects to fund research at their universities to give their countries an edge in global competition. Since the end of the 20th century, countries that have adopted programs to foster research-intensive universities have greatly succeeded in rapidly increasing the research productivity of their supported universities. However, despite these achievements, little research has been conducted on evaluating these programs using empirical data. In this study, we conduct a time-series analysis of the research performances of BK21, Korea's long-running research-intensive university support program. Using interrupted Time Series Analysis, which assesses the impact of an event or policy intervention at a specific time, we analyzed differences in performance by participant group size and field across project phases. As a result, participation in the project positively impacted research outputs, but the project's effect varied depending on the type of participant group. This result gave some implications to determine the field of participating groups according to the project's purpose when planning future national R&D projects.

MB-03 Technology Forecasting and Evaluation
Monday, 8/5/2024, 10:30 - 12:00
Room: Broadway-I
Chair(s) Nathasit Gerdsri; Mahidol Univeristy

MB-03.1 [R] • Challenges and Potentials in Evaluating Early-Stage Deep Technology

Miha Podbreznik; Fraunhofer FFB, Germany
Florian Degen; Fraunhofer FFB, Germany
Achim Kampker; Fraunhofer FFB, Germany

Deep technology, or 'deep tech', represents a class of technologies distinguished by their basis in scientific breakthroughs or significant engineering innovations. This paper investigates the challenges and potentials of the technical due diligence required to evaluate deep tech in its early stages of development. Traditional evaluation methodologies often fall short, particularly in these early stages. The focus of this research is to identify the specific challenges of evaluating deep tech and the potential that future evaluation methodologies could achieve. Using a qualitative research methodology, expert interviews were used to explore the requirements for identifying and analyzing the challenges and potentials for evaluating early-stage deep tech. The interviews include perspectives from both industry and academia, exploring the diverse challenges and methodological approaches relevant to technical evaluation in this area. The analysis identifies key elements and challenges that influence the due diligence process for early-stage deep tech. The findings of this research are instrumental in laying the basis for future development of a specialized framework for technology evaluation and the refinement of the technical due diligence process in sectors driven by innovation and sustainability.

MB-03.2 [R] • Technology Forecast of Artificial Intelligence Applied to Medication Decision Support System

Kae-Kuen Hu; National Taiwan University, Taiwan
Kuo-Liang Chen; Providence University, Taiwan
Mo-An Chu; National Taiwan Univ. of Science and Technology, Taiwan
Chen Peng; National Taiwan University, Taiwan
Chia-Min Lin; National Taiwan University, Taiwan
Li-Ling Cho; National Taiwan University, Taiwan

This study analyzes the decision-making support system based on artificial intelligence, which provides decision-making support and suggestions for doctors' clinical medication, and its technical characteristics. The study conducted interviews with 6 experts and scholars and analyzed a total of 267 experts with questionnaires. Three rounds of questionnaire interviews and responses were conducted from the four aspects dimensions of "technology", "process", "behavior" and "influence", and a hierarchical mixed method approach was adopted. The analysis method is used to analyze to clarify the technical predictions or expectations of technology developers and technology users for the application of artificial intelligence in clinical medication drug delivery decision support systems. The research results indicate that the construction of the system requires a large amount of patient medical

information, clinical treatment guidelines and other medical professional knowledge for technology developers. For technology users, there are issues related to "user field" and "user habits" regarding user processes and behaviors, so opinions are inconsistent. In particular, clinical experts believe that critical procedures and high-risk situations will affect the utilization rate of artificial intelligence introduction. Therefore, system development should include medical personnel to provide suggestions and feedback on the construction of the system, in terms of medical information, clinical treatment guidelines and other medical professional knowledge.

MB-03.3 [R] • Assessing Digital Disruptiveness in the Age of Mobile Internet: Case of Vehicle Location-Based Services

Demei Lee; Chang Gung University, Taiwan
Jonathan C Ho; Yuan Ze University, Taiwan

The advancement in digital identification technologies presents many opportunities for innovation. However, not any technology with superior performance turns into a successful innovation. To understand the technological potential for business innovations, this research assesses technological alternatives for electronic vehicle identification (EVI) which can play a critical role in the field of vehicle economy. RFID and infrared OBU are the most used technologies in electronic toll collection. The advance in mobile communication technologies, especially the debut of fifth-generation long term evolution (5G LTE), provide some other alternatives for EVI with potential business applications. A multiple criteria technology assessment model is developed. Using the analytic hierarchy process (AHP), the technology assessment model will be quantified by experts in both technologies and business management. The research result should be able to help companies with businesses related to vehicle economy allocate research resources to the most promising EVI technologies.

MB-04 Decision Making in Technology Management
Monday, 8/5/2024, 10:30 - 12:00
Room: Broadway-II
Chair(s) David Guemes Castorena; Tecnologico de Monterrey

MB-04.1 [R] • Interactive and Immersive Media for Training in Decision-making: A Literature Review

Mauricio Hincapié-Montoya; EAFIT, Colombia
David Guemes Castorena; Tecnologico de Monterrey, Mexico
Christian A Díaz León; EAFIT, Colombia
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Sofia P Recinos Dorst; Tecnologico de Monterrey, Mexico

Technology has been changing society in many ways, most of them with a positive impact. One of the areas where technology has slowly adapted is in education - we are still teaching the same way as years, decades, or even centuries ago. In this paper, we explore through a literature review how interactive and immersive media has impacted training in decision-making. We consider business case studies, such as those that Harvard uses and masters in the practice of teaching with cases, to be an excellent way to teach and learn decision-making at the university; this learning technique has recently been applied with the addition of different technologies, which is the topic of this literature review. This review aims to shed some light on the use of emerging immersive technologies to improve the decision-making learning process. We applied the PRISMA method to identify trends in themes, research topics, the main authors and countries, and their impact on the academic arena. We found that most applications were in the medical field rather than business, so the latter can benefit from using these technologies.

MB-04.2 [R] • Intellectual Capital and Resource Integration Capability in Decision Making Processes: The Moderating Role of Managerial Capability

Chun-Hsien Wang; National Chiayi University, Taiwan
Chi Cheng Wu; National Sun Yat-sen University, Taiwan
Chin Chia Ou; National Sun Yat-sen University, Taiwan

Small and medium enterprises (SMEs) are increasingly leveraging intellectual capital to enhance their capacity for resource integration and decision-making, which is expected to benefit their strategic planning. However, much remains unknown about how intellectual capital facilitates decision-making. By integrating theories of intellectual capital and upper echelon theory with evidence from SMEs, we hypothesize that intellectual capital is associated with resource integration capability, which in turn influences decision-making in SMEs, particularly when managerial capabilities are well-developed. Our large-scale survey-based studies of SMEs support this mediated moderation model, indicating that the positive effect of intellectual capital on decision-making through resource integration capability is contingent upon managerial capability. This underscores the importance of both resource integration capability and managerial capability in leveraging intellectual capital for SMEs.

MB-04.3 [R] • Green Strategy Orientation and Green Innovation: Based on Text Analysis and Machine Learning

Jingwen Liang; Beijing University of Posts and Telecommunications, China
Yawen Li; Beijing University of Posts and Telecommunications, China
Lun Li; Beijing Normal University, China
Jinyi Zhou; University of Science and Technology Beijing, China
Guanhua Ye; Deep Neural Computing Company Limited (DNCC), Austria
Mengyu Zhuang; Beijing University of Posts and Telecommunications, China

In discussions on sustainable transformation, green innovation emerges as a pivotal strategy for enterprises seeking a competitive edge. In this research, we explore the impact of green strategy orientation on green innovation within enterprises, focusing on the mediating roles of governance-based and prevention-based investments, as well as the moderating effect of managers' overseas background. Utilizing text analysis and machine learning, we construct a model of green strategic orientation and conduct empirical research on A-share listed enterprises in Shanghai and Shenzhen from 2008 to 2020. Our findings reveal that green strategic orientation significantly promotes green innovation, with governance-based and prevention-based green investments serving as crucial mediators. Additionally, the managers with overseas background enhance the influence of green strategic orientation on green innovation, particularly amplifying the mediating role of governance-oriented investments. The research also indicates that green strategic orientation has a more pronounced effect on green innovation in state-owned enterprises, while its impact on high-quality green innovation is comparatively weaker. The findings of this research offer guidance for implementing green strategic orientations during the green transformation process of enterprises. This, in turn, is expected to further encourage organizations to engage in green innovation.

MB-06 Enterprise Management
Monday, 8/5/2024, 10:30 - 12:00
Room: Broadway-IV
Chair(s) Marko Seppanen; Tampere University

MB-06.1 [R] • Exploring the Dynamics of Business Model Portfolio: Unveiling Strategic Restructuring

Saeid Heshmatisafa; Tampere University , Finland
Marko Seppänen; Tampere University, Finland

In the dynamic business landscape, with rapidly changing technological and market demands, firms are compelled to operate multiple business models within a firm to maintain competitive advantage. Managing multiple business models adds significant complexity, necessitating an in-depth knowledge of business model dynamics and the proactive management of synergies for strategic adaptation due to inherent interdependencies. The advent of transformative technologies, such as electrification and automation, particularly in the equipment industry, introduces both novel opportunities and challenges, further complicating this landscape. Despite the widespread adoption of a portfolio of business models, a comprehensive understanding of their dynamics, especially among non-digital native firms, remains scarce. This research aims to bridge this knowledge gap by conducting a single case study that explores the rationales non-digital native firms in the construction equipment

industry employ to restructure their business model portfolios for sustainability. Through a longitudinal qualitative analysis of a specific case, we have identified both intra- and inter-complementarities among customers and business models within the portfolio. Furthermore, we have highlighted strategic intents and the rationales behind each business model, offering insights into the complexities of managing business model portfolios in a dynamic industry context.

MB-06.2 [R] • The Strategy and Its Evolution Trajectory of Product Innovation and Servitization: An Empirical Study of Manufacturing SMEs in Taiwan

Bang-Ning Hwang; National Yunlin University of Science & Technology, Taiwan
Ying-Zhen Chen; National Yunlin University of Science & Technology, Taiwan

Product innovation has been a crucial strategy for manufacturing companies. However, drastic changes in the global economy have led to declining profits from products alone. In response, modern manufacturers have embraced the "servitization" strategy, combining product and service innovations to enhance sales opportunities. Previous research primarily focused on the relationship between product innovation and servitization in large manufacturing enterprises, neglecting small and medium enterprises (SMEs), despite certain SMEs excelling in implementing these strategies. To address this research gap, this study conducted a large-scale empirical investigation to explore the strategies of product innovation and servitization, as well as their evolutionary trajectory. The study analyzed 96 manufacturing companies that received the Taiwan SME Innovation Research Award over the past decade. It identified four distinct strategies based on the innovativeness level of product innovation and the extent of value-added services, uncovering two levels of evolutionary trajectory and associated progression patterns among SMEs. Furthermore, the research examined the impact of industry sector differences on the evolutionary trajectory of SMEs. This study offers a dual contribution: academically, addressing the previously understated role of SMEs in the context of product innovation and servitization; practically, providing valuable reference models for SMEs seeking to implement these strategies.

MB-06.3 [R] • How Does the Synergy between Technical Standards and Intellectual Property Rights Affect the Digital Transformation of the Automotive Industry? Empirical Evidence from China

Liying Wang; Zhejiang University of Technology, China
Peiling Yu; Zhejiang University of Technology, China
Ying Wu; Zhejiang University of Technology, China
Lingxiang Cai; University of Illinois Urbana-Champaign, United States
Wenxin Xie; Zhejiang University of Technology, China
Jia Wen; Zhejiang University of Technology, China

The intensification of technological competition induced by digital technologies has underscored the significance of technical regulations and innovation systems, influencing the process of digital transformation in industries through the synergistic development trend of technical standards and intellectual property rights. This study focuses on the Chinese automotive industry, utilizing data from 155 Chinese listed automotive companies from 2016 to 2021 to analyze the impact and mechanism of action of the synergy between technical standards and intellectual property rights on digital transformation. The findings reveal that the synergy between technical standards and intellectual property rights exerts an impact on digital transformation, displaying an "inverted U-shaped" curve effect. The influence of this synergy on new energy automotive companies and autonomous automotive companies is lower compared to non-new energy and non-autonomous automotive companies. Open innovation plays a partial mediating role in the impact of the synergy between technical standards and intellectual property rights on digital transformation, while environmental uncertainty exhibits a positive moderating effect in the impact of this synergy through open innovation on digital transformation. We finalize our study by deliberating on how our insights might inform and enhance the practical roadmap for advancing the digital transformation of industries, through the synergy between technical standards and intellectual property rights.

MD-01 AI in Technology Management-1

Monday, 8/5/2024, 14:00 - 15:30
Room: Pavilion East
Chair(s) Jihwan Lee; Pukyong National University

MD-01.1 [A] • A Systematic Approach to Enhance Creativity and Exploration of Potential Applications of Artificial Intelligence

Oliver Yu; San Jose State University, United States
Rainer Hasenauer; Vienna University of Economics and Business, Austria
Christopher Yu; The STARS Group, United States

It has been widely observed that people tend to be less creative as they mature. However, in-depth studies have shown that this phenomenon is not caused by aging but by a variety of psychological barriers, including cognitive rigidity and risk aversion. In this paper, we will systematically examine these barriers and how to overcome them and then explore how artificial intelligence (AI) can be applied to enhance creativity.

MD-01.2 [A] • Value Proposition Design with Artificial Intelligence

Arturo Atl A Rodriguez de la Torre; ITESO AC, Mexico
Gabriela Calvario; ITESO AC, Mexico

Businesses and firms rely strongly on their capacity to articulate and innovate their value proposition. Derived from the empowerment of artificial intelligence to leverage data from the environment and its capacity to analyze language, we present an innovation methodology that encompasses machine learning techniques and the canvas value proposition. Our methodological approach focuses specifically on the operation and design of the value proposition model. This allowed us to demonstrate the feasibility of implementing text mining techniques to support business model innovation. Overall, we introduce a novel approach for managers and innovators to employ artificial intelligence to facilitate the conception of new strategic value propositions. Furthermore, we set a path to do further research on the many ways in which computer sciences through artificial intelligence will reset the way to conceive innovation within organizations.

MD-01.3 [R] • Artificial Intelligence Applications in Ionospheric Irregularities: A Bibliometric Analysis

Alisa Kongthon; King Mongkut's University of Technology Thonburi, Thailand
Pornchai Supnithi; King Mongkut's Institute of Technology Ladkrabang, Thailand

Ionospheric irregularities such as equatorial plasma bubbles (EPBs) in low-latitude regions often lead to disruptions in trans-ionospheric radio systems, navigation systems and satellite communications. Understanding and monitoring equatorial plasma bubbles is important for improving the reliability of communication and navigation systems. Recently, artificial intelligence (AI) has been applied to a wide variety of satellite communication aspects including ionospheric irregularities detection. This paper aims to apply bibliometric analysis on research publications related to AI applications in ionospheric irregularities. Such analysis can help researchers understand the evolving trends in AI and its diverse sub-fields, guiding future research directions. In addition, researchers can use the results of bibliometric analysis to benchmark their own work against the broader research landscape, identifying areas where their contributions can have the most impact.

MD-02 R&D Management-2

Monday, 8/5/2024, 14:00 - 15:30
Room: Pavilion West
Chair(s) Carsten Boßmann; RWTH Aachen University

MD-02.1 [R] • Technology Opportunity Analysis for Creating Innovative Solutions: Applying Semi-supervised Topic Modelling on Patent Data

Jinseob Kim; Seoul National University, Korea, South
Sungjoo Lee; Seoul National University, Korea, South

This paper introduces a technology opportunity analysis (TOA) framework designed to assist researchers in solving technological issues by leveraging insights from diverse domains. The methodology centers on the concept of functional approach and recombinant search, addressing technological issues of a specific domain by focusing on related functions realized in diverse reference fields. Beginning with the selection of a target technology and the collection of relevant data, the framework progresses to the extraction of reference fields and functions, utilizing patent classification codes and action-object structures of patent data. The zero-shot topic modeling module of BERTopic then clusters patent documents in a semi-supervised manner using reference field and function information, to provide technological insights of how different domains employ each function related to target technology. Next, the methodology leads to the evaluation process that prioritizes document clusters based on their potential value and technological feasibility. Finally, the document clusters with top scores are analyzed to extract detailed technological insights that can help solve the target technological issue. The proposed methodology was demonstrated with the case of miniaturization of wearable device. This study presents a data-driven TOA framework that fosters interdisciplinary collaboration, and extracts technology opportunities of high granularity using semi-supervised topic modeling technique.

MD-02.2 [R] • Technological Competitiveness among Global Leader Companies: Patents Analysis of Atomic Layer Deposition Technology

Seunghwan Lee; Sungkyunkwan University, Korea, South
Heesang Lee; Sungkyunkwan University, Korea, South

In recent years, the semiconductor industry has become more important than any other industry due to the remarkable development of computers, smartphones, and artificial intelligence. As the gate length of semiconductor transistors evolves to the nanoscale, nanotechnology is becoming a highly competitive technology among individual companies in the semiconductor industry. Companies in the semiconductor industry are engaged in a nanotechnology war to gain market leadership. This study focuses on atomic layer deposition (ALD) technology, considered the core technology of nanotechnology in the semiconductor industry. We collected 5,161 ALD patents registered from 2003 to 2022 by 34 leading companies in major semiconductor countries, including the United States, South Korea, Japan, China, Taiwan, and the European Union (EU). We analyzed the patent performance of the company over 20 years. First, the 34 leading companies were divided into early movers and laggards based on the timing of their first ALD patent registration and into growing and declining companies based on the growth rate of their patent registration performance over 20 years. Next, the analysis by company was integrated into an analysis by country and an analysis by industry sector. The contribution of this study is that we were able to organize and analyze the dynamic competition between companies, sectors, and countries in the atomic layer deposition process. We also presented the implications of this study on the competition for ALD patent technology leadership among semiconductor technology leaders, as well as the limitations and solutions of the study.

MD-02.3 [R] • The Generation of Hybrid Feature-based Research Topics Using Text Mining and K-means Algorithms for Government Science and Technology Projects

ChiaYi Chuang; STPI, NARLabs, Taiwan
Ching-Hsua Lin; STPI, NARLabs, Taiwan
Rui-Qi Lin; STPI, NARLabs, Taiwan
Chin-Yuan Fan; STPI, NARLabs, Taiwan

Many research projects contain large amounts of contextual data. This helps researchers quickly understand the research topic of a research project from large amounts of contextual data. In this paper, we propose the topic identification system, which uses text mining and K-means algorithm to generate hybrid feature-based research topics for government science and technology (GRB) projects. It uses the titles, abstracts and keywords of research projects for cross-analysis and utilizes natural language processing technology to obtain keywords that determine hybrid features from a large amount of contextual data. Then we use the K-means algorithm to group and analyze research topics for GRB projects. Finally, the framework makes it possible to find optimal functions and clusters using ChatGPT. Then, the results of ChatGPT are used to generate research topics.

MD-03 Educational Issues-1

Monday, 8/5/2024, 14:00 - 15:30
Room: Broadway-I
Chair(s) Jonathan C. Ho; Yuan Ze University

MD-03.1 [R] • Adaptation of Keller's IMMS Questionnaire to Measure Undergraduate Class Motivation

Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Fabiola Salas-Diaz; Tecnologico de Monterrey, Mexico
Armando Guerrero-Cerrano; Tecnologico de Monterrey, Mexico
Carolina Alcantar-Nieblas; Tecnologico de Monterrey, Mexico
Naveen Tiruvengadam; Kettering University, United States
Luis C Félix-Herrán; Tecnologico de Monterrey, Mexico
Tecilli Tapia-Tlatelpa; Tecnologico de Monterrey, Mexico
Luis A Lozano- Taba; Tecnologico de Monterrey, Mexico
Jocelyn A Castro-Echeverría; Tecnologico de Monterrey, Mexico
Omar Galindo-Hernandez; Tecnologico de Monterrey, Mexico
María R Forte-Celaya; Tecnologico de Monterrey, Mexico
Álvaro A Castillo-Paz; Tecnologico de Monterrey, Mexico
Cecilia Ramírez-Figueroa; Tecnologico de Monterrey, Mexico
Jonathan Cuevas-Ortuño; Tecnologico de Monterrey, Mexico
Carlos R Garnier-Ortiz; Tecnologico de Monterrey, Mexico
Roberto J Velazquez-Valdez; Tecnologico de Monterrey, Mexico
José L Ceciliano-Meza; Tecnologico de Monterrey, Mexico
Mario A Negrete Rodríguez; Tecnologico de Monterrey, Mexico
María S Ramírez-Montoya; Tecnologico de Monterrey, Mexico
David Guemes-Castorena; Tecnologico de Monterrey, Mexico
Fernando Ruiz-Méndez; Tecnologico de Monterrey, Mexico

Undergraduate education requires innovation to adapt to the learning needs and expectations of students. Over the years, a typical class has evolved to now include technologies and pedagogical tools like programming languages, personal computers, learning management systems, computer-aided design, simulators, advanced computation software, etc. Fortunately, there has been a concomitant increase in the assessment of the impact of adoption and use of such technologies on student motivation and learning. Several methodologies and tools have been developed to measure student motivation specifically, among which Keller's Instructional Materials Motivation Survey (IMMS) is renowned. The IMMS is comprehensive, but it is this attribute that limits its use in specific instances such as the one in an undergraduate class. With reducing attention spans characterizing younger adults who form a typical undergraduate class, we wished to adapt the IMMS methodology to get a higher response rate among other things while also not compromising on the study goals. The adapted IMMS questionnaire is abbreviated in that it has fewer questions that are more directed and defined. This adapted IMMS questionnaire was found to be reliable as tested on a sizable sample ($n > 200$) of undergraduate students. This study presents the details of the adaptation, reliability testing, and guidelines on further use and study of the adapted questionnaire.

MD-03.2 [R] • A Systematic Literature Review on the Use of Simulators to Train Undergraduate Students in Logistics

Esteban E Rodriguez-Garcia; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Francisco L Camou-Grijalva; Tecnologico de Monterrey, Mexico
Abenameth Romero-Araiza; Tecnologico de Monterrey, Mexico
Juan F Piñal-Moctezuma; Tecnologico de Monterrey, Mexico
Miguel A Sandoval-Jaramillo; Tecnologico de Monterrey, Mexico
Tecilli Tapia-Tlatelpa; Tecnologico de Monterrey, Mexico
Fabiola Salas-Diaz; Tecnologico de Monterrey, Mexico

Business and engineering education requires tools to expose students to the complexities of

the logistics field beyond the experience provided in lectures and assigned readings. Up to this moment, logistics education can be complemented by simulators of different types. For instance, the well renowned beer game developed by MIT provides a vivid experience in the whip effect to undergraduate students. In fact, the beer game can be played in both a physical classroom or a virtual classroom and the same is true for other renown simulators. Another alternative to train students is the development of simulators that take different configurations of a supply chain to expose students to the variability and complexities of a real-world supply chain. This last alternative is referred to as supply chain or logistic laboratory. Despite the wide availability of tools, there is a paucity in the knowledge on how many simulators are and how effective each simulator is to train undergraduate students in logistics. To address this issue, this work performs a systematic literature review to map both the types of simulators and how effective each simulator has been in undergraduate education.

MD-05 Emerging Technologies
Monday, 8/5/2024, 14:00 - 15:30
Room: Broadway-III
Chair(s) Leon Pretorius; University of Pretoria

MD-05.1 [R] • Determining Maintenance 4.0 Readiness: A Case Study of a South African Food Manufacturing Company

Malusi Mabaso; University of Pretoria, South Africa
Rina H Peach; University of Pretoria, South Africa
Leon Pretorius; University of Pretoria, South Africa

The Fourth Industrial Revolution has ushered in unprecedented technological advancement, demanding that companies seize the opportunities it offers or risk obsolescence in a rapidly evolving market landscape. Maintenance 4.0 (M4.0), as a subset of Industry 4.0, is a paradigm shift in maintenance driven by transformative technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and Big Data Analytics (BDA). Implementing Maintenance 4.0 presents a complex challenge, exacerbated by lacking a comprehensive readiness assessment framework and tailored implementation strategies. The research addresses this gap in the literature to develop a Maintenance 4.0 readiness matrix and implementation strategies and evaluate readiness application within a food manufacturing company. The critical readiness factors were categorized from literature studies into technological, organizational, and external environmental factors. The study employed a cross-sectional survey design with a population of management and engineering practitioners. Data collection used survey questionnaires and statistical techniques to analyze gathered data. The key findings were that the food manufacturing company was M4.0 ready in culture, structure, customers, service providers, regulations, and standards. However, the company was unprepared for technology infrastructure, financial resources, business cases, 4IR technology, awareness, skilled resources, change, leadership, and strategy. Findings provide valuable insights into the organization's preparedness and assist management in developing comprehensive strategies when adopting Maintenance 4.0.

MD-05.2 [R] • Management of Disruptive Technologies as Applied in Stages of Long-term Insurance Processes

Thabo T Moloi; Management College of Southern Africa (Mancosa), South Africa
Antoine F Mulaba-Bafubiandi; University of Johannesburg, South Africa

The long-term insurance industry is undergoing a transformative shift driven by disruptive technologies, presenting both challenges and opportunities for insurers. This paper explores the strategic management of disruptive technologies within the value chain stages of long-term insurance processes. The study investigates how an insurer effectively navigated this dynamic landscape to enhance operational efficiency, customer engagement, and overall competitiveness. The paper delves into the identification and categorization of disruptive technologies affecting various stages of the long-term insurance value chain, including product development, underwriting, policy administration, claims processing, and customer service. Drawing on a case study from a South African perspective, it provides a comprehensive analysis of how emerging technologies such as big data analytics, websites, social networks, digital platforms, robo-advice, application programme interface (API), robotic process automation (RPA), chatbots, voice recognition, artificial intelligence (AI), blockchain, telematics, and InsurTech solutions impact stages of the value chain. Furthermore, the paper outlines a strategic framework for insurers to proactively integrate and manage disruptive technologies into their existing processes. It emphasizes the importance of fostering a culture of innovation, establishing agile organizational structures, and nurturing cross-functional collaboration to swiftly adapt to technological advancements. The study explores potential challenges associated with the integration of disruptive technologies, such as data security concerns, regulatory compliance, and the need for upskilling the workforce. It offers insights into mitigating these challenges through robust risk management strategies, regulatory compliance frameworks, and targeted workforce development initiatives. In conclusion, the study provides a roadmap for long-term insurers to not only survive but thrive amidst the disruptions caused by emerging technologies. It encourages a forward-thinking approach to technology adoption, positioning disruptive innovations as enablers of growth and sustainable competitive advantage in the rapidly evolving landscape of long-term insurance.

MD-05.3 [R] • Discovering Technological Opportunities in the Hydrogen Industry: An Adoption of GNN and Patent Data

Runzhe Zhang; Huazhong Univ. of Sci. & Tech. (HUST), China
Xiang Yu; Huazhong Univ. of Sci. & Tech. (HUST), China
Zhiqiang Guo; Huazhong Univ. of Sci. & Tech. (HUST), China
Ben Zhang; Huazhong Univ. of Sci. & Tech. (HUST), China

It is increasingly important to timely discover technology opportunities in nowadays business, while patent data has been widely used for technology opportunity discovery (TOD) so far. However, most available research focuses on intricately processed one-dimensional co-occurrences or citations, as the information hidden in higher dimensions, such as patentee-technology relation, has been ignored so far. To fetch this valuable information, this paper adopts a graph neural network method with a recursive process, for analyzing the internal capacity of firms, and combines it with external challenges evaluated by competitiveness index. Taking the hydrogen industry with 39,413 patent families from 1969 to 2021 as the basic dataset, the case study shows a 32.49% promotion compared to the analogous TOD model. The proposed opportunities are tested by the recent filings of the case entity, Dalian Institute of Chemical Physics. This approach provides a novel perspective for patent data mining and contributes theoretically to the network analysis method.

MD-06 Systems Approach
Monday, 8/5/2024, 14:00 - 15:30
Room: Broadway-IV
Chair(s) Nathasit Gerdsri; Mahidol Univeristy

MD-06.1 [R] • Product Modularity: Literature Since 2016

Jeff R Carpenter; Portland State University, United States

In 2016, Bonvoisin et al. published a Systematic Literature Review of Modularity. They identified 106 metrics and 15 Strategic Goals of Modularity. This paper will consider the formulae used to describe Product Modularity, and evaluate the subsequent literature, looking for expanded or advanced ideas. We will compile the tools for the Technology Manager to identify logical modules and evaluate a product - in all phases of the life cycle - for the enumerated benefits of modular thinking in recent literature.

MD-06.2 [R] • Organizational Reliability and Resilience as a Dynamic System: Knowledge Modeling with Fuzzy Cognitive Maps

Antonie J Jetter; Portland State University, United States
Ahmed Alibage; Portland State University, United States
Nan (Peter) Liang; Louisiana State University, United States

Safety research in complex environments recommends that high-hazard industries improve reliability and increase their capacity for resilience by enacting principles for high-reliability organizing (HRO). This view has been highly influential in many industries, ranging from avi-

ation to hospitals, and is at the core of many safety culture programs. However, even though HRO principles originated in business practice and were observed in diverse organizations, practitioners frequently struggle to enact them in the contexts of their work. This is likely caused by two limitations of current research: principles are insufficiently specified and the interdependencies between them, such as mutually reinforcing vs. tradeoff relationships, are poorly understood, forcing practitioners to fill in the gaps based on experience and intuition. In response, this study develops a generalized system model of organizational reliability (ORM), based on Fuzzy Cognitive Map modeling, that reflects two sources of knowledge: academic research literature on HRO and practitioner knowledge in a specific safety context, namely the offshore oil and gas industry. The FCM-based ORM (FORM) is tested through simulation and evaluated through focus groups with industry experts. Findings show challenging interdependencies between HRO principles and the role of industry-specific conditions, which necessitate context awareness and system perspective.

MD-07 Sustainability-1
Monday, 8/5/2024, 14:00 - 15:30
Room: Park
Chair(s) Kunio Shirahada; Japan Advanced Institute of Science and Technology

MD-07.1 [R] • Contributions of AI-based Smart Services to Sustainable Value Creation

Nicole C Gladilov; Fraunhofer IAO, Germany
Lena Ahner; Fraunhofer IAO, Germany
Jens Neuhüttler; Fraunhofer IAO, Germany
Katharina Hölzle; Fraunhofer IAO, Germany

This paper systematically investigates and specifies the possibilities of AI-based service systems (so-called "smart services") and provides practical design approaches for companies. Building on a structured approach for a sustainable design of AI-based services, we examine the potential of AI-based smart services for ecological, social, and economic impact on company value creation. Our work is based on a comprehensive literature review and use cases from applied research projects in collaboration with companies, contributing to technology management in the era of artificial intelligence and the sustainable transformation of the economy and society.

MD-07.2 [R] • Exploring Green Consumption Awareness through the Application of Electronic Point Redemption: A Conceptual Framework

Khiem D Mai; Global Partner Service Center Corp., Taiwan
Ja-shen Chen; Yuan Ze University, Taiwan

Green innovation is critical for improving business sustainable development and a new path toward sustainable social development. The current ongoing study explores the inter-relationship between green innovation and green consumption through the application of electronic point redemption. The research purpose is to address how the application of electronic point redemption has influences on a company's green innovation as well as consumer's green consumption awareness of the products or services. Although understanding the mechanism underlying member customers' decision to redeem is essential for the success of Loyalty Program (LP) providers, this issue of electronic point redemption has received scant attention in prior literature. Furthermore, while research theory of Diffusion of Innovation (DOI) mostly relied on data analyzed from the manufacturer's perspective, this study investigates the motivation of implementing LP, taking advantages of digital technology in both business and consumer side. Drawing from the Diffusion of Innovation theory, this study investigates in resource-based aspects that play crucial role in business and consumer contexts. From literature review and data analysis, this study provides an integrated conceptual framework at the firm level. Through relevant references, this study provides robust theoretical and empirical foundation synthesizes existing knowledge, insights with practical considerations, thereby providing a roadmap for future empirical research in this domain. The implications for electronic point redemption research and practice are also discussed.

ME-02 Innovation Management-1
Monday, 8/5/2024, 16:00 - 17:30
Room: Pavilion West
Chair(s) Timm Schulz-Isenbeck; WZL, RWTH Aachen University

ME-02.1 [R] • Derivation of Targets for the Portfolio Planning of a Solution Provider in Machinery Engineering

Michael Riesener; RWTH Aachen University, Germany
Alexander Keuper; RWTH Aachen University, Germany
Carsten Boßmann; RWTH Aachen University, Germany
Günther Schuh; RWTH Aachen University, Germany

Companies in the machinery engineering sector are increasingly forced to make a strategic decision to transform from product to solution providers. Increasing competitive pressure from international competitors, fewer technological differentiation options for mechatronic products, increased establishment of software applications and increasingly individualized customer requirements are posing challenges for companies. The transformation into a solution provider is one way to address these challenges. In addition, the transformation promises stable sales in the long term and the opportunity to use the resources utilized longer and more intensively in terms of the circular economy. Accordingly, solution providers are no longer selling products, but rather individualized bundles of products, services and software applications in result-oriented business models. However, companies lack a suitable target system for the planning of the portfolio for this transformation. The target system provides a framework to make decisions about the necessary products, services and software applications in the portfolio as well as the most reasonable composition of portfolio elements for individualized solutions. To this end, this paper derives and describes the corresponding targets and associated target dimensions for planning the portfolio of solution providers.

ME-02.2[A] • Learning Effects in Informal Consensus Building During the Innovation Process: Questionnaire Survey on Nemawashi

Nikka Ko; Japan Advanced Institute of Science and Technology, Japan
Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan

In the early stages of innovation, explaining the success of innovation logically and objectively is impossible because of the great technological and market uncertainty. Takeishi et al. analyzed successful Japanese innovation cases, which were driven not only by objective technological and economical rationality but also by the shared subjective reasons among stakeholders for legitimizing resource mobilization. This type of innovation is common in collectivist decision-making in Japanese companies and is considered deeply related to the Japanese informal consensus building method called Nemawashi. This study aims to elucidate Nemawashi from an innovation perspective. A questionnaire survey was conducted among employees of Japanese companies to determine the effectiveness of Nemawashi in the innovation process. The results of the questionnaire survey quantitatively reveal that Nemawashi not only is used effectively in legitimizing resource mobilization but also contributes to improving organizational learning capability, which is the theoretical contribution of this study. The organizational learning capabilities gained owing to Nemawashi include (1) the ability to utilize human networks, (2) the ability to carry out knowledge creation, and (3) the ability to gain empathy and trust.

ME-02.3 [R] • Leveraging AI Technology to Facilitate Innovation Management at System-of-systems Level from Second-order Science: A Study Based on VSM and Reflexivity Theory

Qian Chen; Tsinghua University, China
Jin Chen; Tsinghua University, China
Keren Zhang; Tsinghua University, China

The recognized importance of systemic and dynamic perspectives on both AI and innovation management calls for the retheorization to support the AI technology adoption in innovation

management. As extant knowledge about a systems approach to realize dynamic roles of both augmentation and automation of AI-human collaboration in innovation management is limited, this study aims to explore how to leverage AI technology to facilitate innovation management at system-of-systems (SoS) level from second-order science systemically and dynamically. By doing so, different typologies of AI technology and innovation were first reviewed and identified, where the need to combine both AI technology and innovation as complex systems from second-order science is highlighted. Second, a key approach named Viable System Model (VSM) was argued as the one capable of setting the SoS level and providing a systemic framework for AI technology adoption. Third, the key theory of reflexivity was used as a support to understand the dynamic capability of VSM for the changing external environment in innovation management. Finally, a conceptual model of leveraging AI technology to innovation management at SoS from second-order science was built based on VSM and reflexivity. This study not only sheds new light on combining AI and innovation research from second-order science by combing systemic and dynamic perspectives but also provides managers instructions to leverage AI technology to innovation management from second-order science at SoS level.

ME-03Educational Issues-2
Monday, 8/5/2024, 16:00 - 17:30
Room: Broadway-I
Chair(s) Humberto Merritt; Instituto Politecnico Nacional (IPN)

ME-03.1 [R] • Aligning Industry Needs and Education: Unlocking the Potential of AI via Skills

Katri Salminen; Tampere University of Applied Sciences, Finland
Pia Hautamäki; Tampere University of Applied Sciences, Finland
Markus Jähi; Tampere University of Applied Sciences, Finland

This study explores the impending impacts of Artificial Intelligence (AI) on work environments, forecasting significant shifts in the skill sets of emerging talents across various industries over the next decade. Despite AI's technological strides, industries lag in the data management and utilization capabilities. A significant obstacle to innovation is the shortage of a skilled workforce. This paper highlights the necessity to develop comprehensive skill sets across all organizational tiers to unlock data utility and to fully leverage AI's potential to the products, processes and services. Drawing on datasets from Finland, the paper elucidates the current state and needs of the manufacturing industry and identifies pressing skill requirements. It argues that companies aiming for a leading position in the AI era must focus on updating skills and consider collaboration with universities to synchronize educational curricula with forthcoming industry requirements. For this purpose, the paper addresses views of business and ICT lecturers regarding AI skills development. The paper continues to propose examples of learning environments supporting reskilling and upskilling initiatives, ensuring a smooth industry transition to meet the evolving exigencies of the AI landscape.

ME-03.2 [R] • A Study on Highly Effective Human Resource Development Methods for Project Managers in National R&D Projects in Japan

Takeshi Maeno; New Energy and Industrial Technology Development, Japan
Yoshiro Tasaki; New Energy and Industrial Technology Development, Japan
Hiroyuki Hori; New Energy and Industrial Technology Development, Japan

As one of Japan's largest public R&D management organizations, New Energy and Industrial Technology Development Organization (NEDO) plans, designs and manages numerous national R&D projects. NEDO covers a wide range of fields, such as storage batteries, hydrogen, robotics, AI, electronics, and materials. A typical NEDO project has an implementation period of about 5 years, a total budget of about 3 billion yen, and about 7 participating companies. Project managers (PMs) formulate basic project plans, establish implementation systems, manage progress, and allocate budgets in NEDO projects. NEDO has developed two tools for enhancing PM's leadership capabilities: 1) "R&D Management Guideline" to foster PM mindsets and 2) a "Training Course" that teaches the basic knowledge and skills needed to serve as a PM. This "Training Course" consists of 5 management skills classes and 5 planning skills classes. This study analyzes the PM "Training Course" by applying quantitative and text analysis on questionnaire results in order to improve PM human resource development. Results show that management skills classes were more satisfactory and useful than planning skill classes. This result suggests that emphasizing the acquisition and advancement of management skills is an effective strategy for PMs human resource development.

ME-03.3 [R] • Human Resources Formation for Technology Management in Emerging Nations

Humberto Merritt; Instituto Politecnico Nacional (IPN), Mexico

The surprising arrival and speedy diffusion of artificial intelligence (AI) functions have concerned many nations. One of the main worries lies in the required formation of specialized human resources (HR) that can successfully meet the new skills that AI is demanding. If this condition preoccupies advanced nations, the future of emerging countries' workforce looks uncertain. To a large extent, human capital formation is one of developing nations' main challenges; therefore, they must implement strategies for preparing their employees for the AI era. In this study, we review the main challenges that need to be addressed, such as adjusting training programs to prioritize critical thinking, encouraging creativity and problem-solving, investing in digital infrastructure and promoting digital literacy, fostering international collaboration and knowledge sharing, and implementing ethical frameworks for responsible AI development and deployment. By reviewing the case of a Master's Program on Technology Management in Mexico, we propose a policy roadmap to address these incoming requirements, including a human capital development index.

ME-05 Project & Program Management
Monday, 8/5/2024, 16:00 - 17:30
Room: Broadway-III
Chair(s) Dongphil Chun; Pukyong National University

ME-05.1 [R] • Investigating the Impact of Transportation Infrastructure Investment on Urban Expansion in Chengdu-Chongqing Urban Agglomeration

Rongyue Liu; Tianjin University, China
Lianying Zhang; Tianjin University, China
Fengcai Liu; Tianjin University, China

Transport infrastructure's role in urbanization, particularly in the expansive western regions, is a key research area. This study employs a spatial econometric model to perform empirical analysis, yielding several findings: (1) The urbanization rate significantly denotes urban development; (2) Transport infrastructure in the Chengdu-Chongqing agglomeration lacks a significant spatial spillover on urbanization, with a negative direct impact evident in Chongqing; (3) Spatial agglomeration effects are more marked in Chongqing than in Sichuan within the agglomeration. By devising a novel indicator system, the paper assesses urbanization levels and investigates the spatial spillover of transport infrastructure on these levels within the Chengdu-Chongqing area, aiming to discern the effects of infrastructure investment on regional growth and provide policy recommendations for strategic planning and development.

ME-05.3 [R] • Research on Key Influencing Factors of the Life-cycle Incremental Cost of Green Building

Anmin Wang; Tianjin University, China
Yilin Zhu; China Bohai Bank Co., Ltd, China
Junna Meng; Tianjin University, China

The goal of this research is to study the influencing factors of the incremental cost of green buildings from the perspective of life cycle theory, to find the main factors that affect the incremental cost of green buildings, and try to give countermeasures and suggestions. First, this paper reviews the current status of research on green buildings and the research status of the life-cycle incremental cost of green buildings, as well as the theory of life-cycle cost. Second, we identify 21 influencing factors of the life-cycle incremental cost of green buildings through literature analysis and expert interviews. Then we use the questionnaire survey

method to score the influence level of each influencing factor. We use the SPSS19.0 software and the interpretative structural modeling approach to analyze data and create a structural model of influencing factors. Through analysis, the four-level hierarchical relationship of the influencing factors of the life-cycle incremental cost of the green building is obtained. Additionally, we determine that the most fundamental influencing factor is program optimization. This paper identifies the key influencing factors of the life-cycle incremental cost of green buildings and provides suggestions and solutions to guide the further development of the life-cycle cost management of green buildings.

ME-05.4 [A] • Five Pivotal Practices for Leaders to Cultivate Empathy within Virtual Scrum Teams

Dahm M Hongchai; Portland State University, United States
Charles Weber; Portland State University, United States

In the digital and global economy, business leaders need more than just business and technology competencies; they also require empathy. However, there is a notable scarcity of research on empathy in Scrum for product development. This study aims to uncover critical insights into how leaders can foster empathy within virtual Scrum teams. Accordingly, this paper proposes five pivotal themes leaders can employ: Scrum fundamentals, meditation, self- and other-analysis, healthy interactions, and informal connections. These vital strategies offer actionable methods for leaders seeking to enhance empathy within their virtual Scrum teams.

ME-06 Technology Management in the Health Sector
Monday, 8/5/2024, 16:00 - 17:30
Room: Broadway-IV
Chair(s) Antonie J Jetter; Portland State University

ME-06.1 [R] • A Cloud-enhanced Secure Healthcare System to Combat Antibiotic Resistance

Iffat Tasnim Haque; American International University, Bangladesh
Fawzia Tamanna; Jahangirnagar University, Bangladesh
Tahmina Meem ; Jahangirnagar University, Bangladesh
Rashed Mazumder; Jahangirnagar University, Bangladesh

The discovery of antimicrobials, starting with penicillin in 1928, marked a transformative era in healthcare, saving countless lives. However, the global rise of antimicrobial resistance poses a significant threat to the effectiveness of these life-saving drugs. This crisis is particularly challenging in low- and middle-income countries, such as Bangladesh. In this third-world country inefficient healthcare practices, including inappropriate antibiotic use, lack of awareness, and an overstretched public health system exacerbate the problem. To address this pressing issue, a secure e-health system dedicated to combating anti-microbial resistance at a national scale in the case of Bangladesh is developed. The primary objective of this digital solution is to enhance medication adherence by sending timely notifications to patients prescribed antibiotics while simultaneously functioning as a monitoring system. A key aspect of this initiative is to raise awareness among the population, aiming to reduce vulnerability to antimicrobial resistance. By leveraging digital innovation and data-driven insights, our system strives to improve healthcare practices and contribute to the protection of public health. This initiative will hold particular significance within the challenging context of an overstretched public health system in Bangladesh.

ME-06.2 [R] • Mental Models of Translational Scientists

Rasnia Tabpla; Portland State University, United States
Antonie J Jetter; Portland State University, United States

Translational science aims to bridge the gap between scientific discoveries and practical application yet faces challenges in achieving high success rates. This study examines the effective engagement of translational scientists, who play a key role in the translation process. It uses Fuzzy Cognitive Maps (FCMs) to analyze the scientists' mental models and identify common concepts related to success factors, such as ability, resources, opportunity, and entrepreneurial competencies. It then compares the mental models of the scientists and finds that mental models exhibit similarities, yet variations exist such as density and connectedness. Scenario analysis with FCM is then used to identify leverage points for enhancing scientists' abilities and entrepreneurial competencies. The work, which is intended as an exploratory study to help structure a larger research program, finds that strengthening translational science likely requires improving scientists' performance through enhancing abilities, providing resources and opportunities, and fostering entrepreneurial competencies, ultimately leading to impactful translation of discoveries into solutions.

ME-06.3 [R] • Redefining Collaborative Dynamic in Drug Development: Patient Organizations as New Stakeholders for Oncology Clinical Trials in the U.S.

Yesup Lee; Tokyo Institute of Technology, Japan
Shintaro Sengoku; Tokyo Institute of Technology, Japan

In pharmaceutical development, it has become recognized as important to leverage the voices of patients, the end-users, in addition to existing stakeholders such as pharmaceutical companies and healthcare professionals, in addressing unmet medical needs. This study focused on patient organizations as new stakeholders, especially analyzing environmental factors that encourage their collaboration as sponsors in conducting clinical trials and their relationships with other stakeholders. It analyzes 14,830 cancer-related clinical trials from the ClinicalTrials.gov database, conducted in the U.S. between 2010 and 2020, categorizing them by sponsor types and cancer categories. The research reveals that patient organizations co-sponsored 2% of these studies, with a significant number of these collaborations taking place at specific National Cancer Institute (NCI)-designated centers. These patient organization co-sponsored studies often involved specific investigators. Notably, patient organization co-sponsored trials showed a higher proportion of pediatric indications (30%) compared to the overall total (9%). The findings highlight that patient organizations are more actively involved in trials focusing on certain cancer types and pediatric populations, areas typically less prioritized by corporate sponsors. The study underscores the crucial role of comprehensive cancer centers and key investigators in facilitating collaborations with patient organizations and in the successful execution of co-sponsored trials.

ME-06.4 [R] • Multi-sectoral Collaboration and the Role of the Private Sector in Extending Healthy Life Expectancy: A Case of Frailty Prevention

Tomoki Ouchi; Tokyo Institute of Technology, Japan
Yasuhiro Tsuchida; Moff Corporation, Japan
Shintaro Sengoku; Tokyo Institute of Technology, Japan

This study addresses Japan's ageing demographic and the escalating issue of frailty from the viewpoint of social innovation. Although frailty control is essential for reducing the burden of care and controlling national health expenditure, adopting effective products and services for this purpose has been limited due to the absence of established health economic evidence. This study explored the role of the private sector and a collaboration process model to simultaneously promote preventive healthcare and public expenditure. We conducted a case study involving a startup's transition from manufacturing smart toys for children to providing ageing healthcare services, revealing a strategic method within the industrial sector to produce evidence through innovative approaches, including intermediaries. These intermediaries provide essential resources, facilitate industry connections, and integrate products and services, effectively assuming the role of product providers. The findings provide significant insights for various industries seeking entry into the healthcare sector, offering a strategic approach for integrating Information and Communication Technology in preventive healthcare.

ME-07 Sustainability-2
Monday, 8/5/2024, 16:00 - 17:30
Room: Park
Chair(s) Nicole C Gladilov; Fraunhofer Institute for Industrial Engineering

SESSIONS

ME-07.1 [R] • Sustainable Technology Management: A Causal Loop Analysis of Circular Economy Adoption and Stakeholder Dynamics

Leandi van der Linde; University of Pretoria, South Africa
Leon Pretorius; University of Pretoria, South Africa
Rudolph Oosthuizen; University of Pretoria, South Africa

This study presents a dynamic causal loop diagram (CLD) as the expected outcome, representing a dynamic hypothesis, to explore the relationships within sustainable Technology Management initiatives, Circular Economy model adoption, and the integration of Artificial Intelligence (AI). Rooted in Systems Engineering and Technology Management, our investigation employs holistic systems thinking to reveal feedback loops and causal connections, supporting strategic planning and decision-making in technology-centric ecosystems. The developed CLD illustrates that adopting Circular Economy models influences AI integration within sustainable Technology Management initiatives, enabling advanced data analytics and predictive modeling to strengthen agile and sustainable practices. This research addresses crucial aspects of incorporating Circular Economy practices and seamlessly integrating AI. The significance lies in the increasing need for sustainable practices, emphasizing the recognition of biases, societal perceptions, and collaborative dynamics among stakeholders. By providing actionable intelligence, this paper serves as a bridge from theory to practice, offering a guide for sustainably managing technology. The CLD is a roadmap for making informed decisions in our ever-changing world.

ME-07.2 [R] • Transitioning the Firm to a Circular Stakeholder-value Creation Model

Kunio Shirahada; Japan Advanced Institute of Science and Technology, Japan
Charles Romito; Corpus Transformation Services, Australia
Nancy Bocken; Maastricht University, Netherlands

In the past two decades, there has been increasing interest in both Business Model innovation within a purely shareholder-value paradigm and simultaneously the Circular Economy (CE) within a stakeholder-value paradigm. Additionally, there have been some efforts to combine these two distinct strands of thought. Based on the literature review, this paper builds on that work to consider an overall process for established firms to design a "Circular Stakeholder-Value Creation Model" (CSVCM) and transition to that new model. The motivation to do so stems from the very low adoption rates of Circular Business Models (CBMs) which potentially arise from barriers to adoption in practice. The proposition is that there is insufficient granularity in existing theories of practice by which to provide prescriptions for management. Additionally, this paper highlights the promise that may exist in Well-Being (WB) marketing practices as a catalyst to CSVCM transformation through the increased customer engagement they can generate, with ensuring positive revenue impacts then able to de-risk broader CE related initiatives within the firm. The paper concludes by highlighting future research into this area, including that which will be presented in the conference.

TA-00 PLENARY: PLENARY-2

DATE: TUESDAY, 8/6/2024
TIME: 08:30-10:00
ROOM: PAVILION
CHAIR: KIYOSHI NIWA; THE UNIVERSITY OF TOKYO

TA-00.1 [K] • AI Support of Engineering Risk Management: A Potential Risk Attitude Problem

Marie-Elisabeth Paté-Cornell; Stanford University, United States

Artificial intelligence plays two different roles in risk analysis: managing information, or implementing (suggesting) automatic decisions. Risk management decisions involve preferences including a risk attitude that is implemented in the software but may not be in line with that of the decision maker, or the preferences of the people who are targets of the decision. This can be the case in engineering, but also in medicine or national security. The treatment of risk attitudes is seldom pointed out, yet the decision maker may not be aware of preferences that have been included in the software. My recommendations include the description of AI systems in ways that reveal the preferences and risk attitudes included in the programs, and how to modify them to fit other preferences in their applications.

TA-00.2 [K] • Responsibility in the Decision of Artificial and Human Agents

Antonio Carcaterra; Sapienza University of Rome, Italy

A point of view is proposed regarding the responsibility linked to the actions of apparently autonomous machines, i.e., not continuously controlled and supervised during their actions by humans. These devices, many of which classified within the disciplinary area of mechatronics and robotics with the involvement of complex algorithms, some of which pertain to the sphere of popular artificial intelligence, will have a very important social impact in the near future. It is clear how the immersion of these devices in a complex social context, even in physical contact with men engaged in cooperative activities with machines, can determine a large series of circumstances in which this interaction, for various and non-obvious reasons, produces potentially harmful effects, alongside the obvious advantages that promote their use. One suggestive example among all, familiar even to the non-specialist reader, is that of autonomous driving, to which for clarity, where useful, we will refer our examples (the considerations set out being however applicable to every decision-making problem, regardless of the case in question). In this presentation we will focus our attention on the process of determining choices through those foundations of decision theory which is the common ground on which most of the decision-making techniques known today operate (including various artificial intelligence techniques), used both in machines and by man. We will give particular emphasis to the minimum principles, as a central and universal element of rational choices, principles that govern machines, men and natural phenomena themselves. It is from the connection between the need for a compromise, which implies the adoption of minimum principles, and the incomplete controllability of the scenarios that rational choices produce, promoting a new point of view on the concept of responsibility.

TB-01 AI in Technology Management-3
Tuesday, 8/6/2024, 10:30 - 12:00
Room: Pavilion East
Chair(s) Sven Wittfoth; Volkswagen Aktiengesellschaft

TB-01.1 [R] • Open Technology Management for Maximizing the Public Value of Large Language Models

Aki Tomita; Toyo University, Japan

The legal, ethical, and safe use of machine learning (ML) is crucial for digital transformation in an AI-ready society. The issues are to interpret and manage the behavior of ML models. Unlike ordinary software, the behaviors of ChatGPT with a large language model (LLM) called GPT3.5 which involves massive neural networks, are learned from data, not programmed explicitly, not having a specification, and being changed dynamically in use. So volatile and dynamically changing technology that is limited in its user control with prompts requires managing the technology development process in addition to the technology itself to maximize its benefits. AI and its applications have been the most potential research area for a long time. Due to the Internet's openness, people know its specifications to make the most of it. Because business organizations do not fully understand how ChatGPT acts and do not have opportunities to adapt its proficiency as their competitive advantage, they cannot effectively manage their organizational resources. Aiming to maximize the public value of LLMs, this paper analyzes the impacts of an LLM-based AGI on digital transformation management and proposes an open technology management framework for LLM-based AGI.

TB-01.2 [R] • Exploring the Usage of a Technology Acceptance Model for

4th Industrial Maintenance Management Technologies in Petrochemical Industries

Sello W Mollo; University of Johannesburg , South Africa
Leon Pretorius; University of Pretoria, South Africa
Jan-Harm C Pretorius; University of Johannesburg, South Africa

The desire to increase reliability and productivity in petrochemical industries has driven these organisations to adopt newer technologies that promise predictable operations. Information technology has for years been identified as an enabler of higher competitiveness. The perceived opportunity has driven this rapid technology usage by petrochemical industries, including associated workflows and processes. This paper aims to explore the successful acceptance and adoption of these technologies with the usage of the Technology Adoption Model (TAM). The research method used in this paper to validate the maturity of adoption of these newer technologies is an exploratory literature review. The outcome of this research paper will be utilized to consider an early model that can be utilized to develop a sustainable technology adoption approach that will consider both internal and external aspects affecting technology adoption, especially in petrochemical maintenance management.

TB-01.3 [R] • The Network Position of AI Venture Companies in Investment Network

Boa Kim; Yonsei University, Korea, South
Keeheon Lee; Yonsei University, Korea, South

In the startup landscape, social capital is a vital component within the innovation ecosystem. Startups accumulate social capital through investor networks to enhance their return on investment. However, the optimal network formation for maximizing social capital in startups remains unclear. Two opposing theories on network structure emerge: Coleman and Bourdieu view social capital as a communal resource within the social structure, advocating for the maintenance of existing relationships in a closed network. In contrast, Burt emphasizes individual entrepreneurship, urging entrepreneurs to exploit 'structural holes' and navigate around constrained relationships to optimize social capital. We hypothesize that startups with greater structural holes exhibit a higher positive correlation with revenue performance. Our study indicates that social capital significantly influences ventures' sales performance, with the highest impact achieved through non-redundant bridging contacts rather than secure, closed contacts. This research illuminates the dynamic interplay between social capital and network structures in startups, providing insights for strategic optimization in the pursuit of enhanced performance and growth.

TB-02 Innovation Management-2
Tuesday, 8/6/2024, 10:30 - 12:00
Room: Pavilion West
Chair(s) Nasir Sheikh; Portland State University

TB-02.1 [R] • Systematic Evaluation of Hybrid Portfolios for Solution Providers in Machinery Engineering

Michael Riesener; WZL, RWTH Aachen University, Germany
Alexander Keuper; WZL, RWTH Aachen University, Germany
Carsten Boßmann; WZL, RWTH Aachen University, Germany
Timm Schulz-Isenbeck; WZL, RWTH Aachen University, Germany
Günther Schuh; WZL/IPT, RWTH Aachen University, Germany

The change from traditional manufacturers to solution providers represents a comprehensive business reorientation. As a solution provider, manufacturing companies emphasize the customer's benefit. Through the combination of physical products, software and services, individual solutions are provided for the customer in order to achieve the greatest possible added value. The transformation has a particular impact on the structure and composition of traditional portfolios in machinery engineering, since new software and service components are gradually added. Therefore, portfolio evaluation methods need to address hybrid portfolios in order to manage the transformation effectively. Existing portfolio management approaches are limited to structuring physical product portfolios only. Thus, this paper develops a new methodology to evaluate hybrid portfolios. A comprehensive framework is employed integrating portfolio evaluation techniques and technology management principles to analyze and optimize hybrid portfolios. The evaluation comprises two principal evaluation fields, which consider both external market and internal perspectives to identify strategic directions for portfolio and technology management. By systematizing the portfolio evaluation, the results contribute to the transformation into solution providers, encompassing increasing software and services.

TB-02.2 [R] • Establishing Sustainable Business Models through Subscription in Machinery and Plant Engineering

Michael Riesener; RWTH Aachen University, Germany
Alexander Keuper; RWTH Aachen University, Germany
Carsten Boßmann; RWTH Aachen University, Germany
Jonathan Smerz; RWTH Aachen University, Germany
Timm Schulz-Isenbeck; RWTH Aachen University, Germany
Günther Schuh; RWTH Aachen University, Germany

Companies in machinery and plant engineering make a significant contribution to global greenhouse gas emissions and the use of raw materials. Therefore, they have decisive potential to make better use of resources, increase efficiency and avoid overproduction with regard to a more sustainable economy. However, sustainability is not necessarily an end in itself for companies and must therefore be motivated by incentives. In addition to political legislation and its mandatory implementation of sustainability initiatives, there must also be financial incentives for companies. In this way, sustainable companies can be successful in a competitive environment in the long term. By using subscription models, companies can establish a long-term and stronger connection to the products and customers. The resulting longer and more intensive use of the utilized resources or the extension of the life cycle through upgrades make a significant contribution to sustainability. This paper therefore examines the effect of subscription models on the establishment of sustainable business models. On the one hand, interdependencies between subscription models and sustainable business models are determined. On the other hand, these interdependencies are analyzed concerning influencing factors for sustainability.

TB-02.3 [R] • Theoretical Study of the "Front Line" in Economic Growth

Kazuhiko Itaya; Kagawa University, Japan

Economic growth is a fundamental concern for the wealth of nations and the richness of their lives. In order to unravel the mechanisms of economic growth, models of economic growth have also been studied and developed centered on mathematical notation. On the other hand, innovation, which is the source of economic growth, is a long-term phenomenon with a complex process, making it difficult to accurately grasp its entire picture or to reproduce it mathematically. Therefore, innovation and economic growth models are not perfectly aligned, posing several questions in between. For example, who are the bearers of innovation, where are the ideas to change the paradigm generated from, and what are the incentives to do so? In this paper, in addition to the stages of economic activity named "current paradigm" and "emerging new style" based on the previous economic growth model, a new stage called "front line" is introduced to present a frame for considering economic activity in society in relation to the process of innovation creation from the perspective of economic growth.

TB-04 Technology Management in the Biotechnology Sector-1
Tuesday, 8/6/2024, 10:30 - 12:00
Room: Broadway-II
Chair(s) Koichi Kamijo; Int'l Professional Univ. of Technology in Tokyo

TB-04.1 [A] • Annual Pharmaceutical Sales Estimates Using Patents

Koichi Kamijo; Int'l Professional Univ. of Technology in Tokyo, Japan
Yaeko Mitsumori; Osaka University, Japan
Hiroshi Kato; Nihon University, Japan
Akiko Kato; Nihon University, Japan

Pharmaceutical developments are often lengthy, requiring decades in certain cases, and en-

tail enormous costs that may exceed $1 billion for a single product. Therefore, pharmaceutical development as well as marketing companies would benefit greatly from sales volume estimates of products at their early stages of development. Moreover, it would be desirable to estimate not only total sales but also annual volumes. In this work, we propose an artificial intelligence model to estimate future yearly pharmaceutical sales volumes. Accordingly, we use actual annual sales from pharmaceuticals and future sales forecasts provided by experts as data. For sales estimation, the attributes related to the pharmaceutical, such as manufacturer and therapy area, are used along with patents filed in the early stages of development. With regard to patents, attribute information such as the count of claims, inventors, and citing references are used along with text in the patent application for sales estimation. Experimental results show that the estimation accuracy improves as the number of words in the text used for estimation increases and by using the actual sales data from a few years after launch.

TB-04.2 [R] • Effects of the COVID-19 Pandemic on Pharmaceutical Companies' Performance

Yaeko Mitsumori; Osaka University, Japan
Hiroshi Kato; Nihon University, Japan
Akiko Kato; Nihon University, Japan
Koichi Kamijo; International Professional Univ. of Technology, Japan

The COVID-19 pandemic, which started in Wuhan, China at the end of 2019, spread all over the world and has killed more than seven million people. In 2020, the pandemic affected almost all of the countries of the world, forcing many countries to close their borders. Substantial damages were sustained by almost all economies, including the pharmaceutical industry. However, recent financial reports showed that numerous pharmaceutical firms, including so-called Mega-Pharma and venture companies, have achieved favorable financial results. This study examined the effects of the COVID-19 pandemic on pharmaceutical firms and identified the drivers of excellent/compromised financials in these enterprises. This analysis is expected to help countries fight with the next pandemic.

TB-04.3 [R] • A Study of the Long-term Performance after the Initial Public Offering of Korean Biopharmaceutical Companies

Suha Hwang; Sungkyunkwan University, Korea, South
Heesang Lee; Sungkyunkwan University, Korea, South

An initial public offering (IPO) is one of the key events in corporate growth because it allows a company to raise external capital in the capital markets. In Korea, in 2005, given the long time it takes for technologically advanced companies to generate sales and profits, the Technology Special Listing (TSL) System was introduced to provide opportunities for sustainable growth through rapid company disclosure. In this study, we used an event study analysis to determine whether there was a difference in long-term performance after the IPO depending on the listing type. We analyzed the Buy-and-Hold Abnormal Return (BHAR) with the controlled company approach for three years after the IPO. As a result of the study, Korean biopharmaceutical companies showed positive performance after the IPO. Ordinary listed biopharmaceutical companies show positive performance for three years after the IPO. On the other hand, TSL biopharmaceutical companies showed negative performance in the first year after the IPO but positive performance in the long term in three years. This study also derived some implications for policymakers, investors, and biopharmaceutical industries.

TB-05 Convergence of Technologies-1
Tuesday, 8/6/2024, 10:30 - 12:00
Room: Broadway-III
Chair(s) Terry Bristol; Inst. for Science, Engineering and Public Policy

TB-05.1 [R] • Next Stop Metaverse: Opportunities and Barriers of AI-based Virtual Worlds for Companies

Peter Schrader; Fraunhofer IPA, Germany
Nicole Gladilov; Fraunhofer IAO, Germany
Franz Falkenau; Fraunhofer IPA, Germany
Jens Neuhüttler; Fraunhofer IAO, Germany
Günter Wenzel; Fraunhofer IAO, Germany
Oliver Schöllhammer; Fraunhofer IPA, Germany
Katharina Hölzle; Fraunhofer IAO, Germany
Thomas Bauernhansl; Fraunhofer IPA, Germany

This paper explores the emergence of the Metaverse and its implications, focusing on the convergence of physical and virtual space. It presents the findings of an empirical survey conducted with thirty companies in Baden-Württemberg (Germany), regarding the opportunities and challenges of AI-based virtual worlds. The study was conducted following the methodological approach of Grounded Theory according to Gioia et al. [1]. The results reveal common opportunities across industries but varying challenges similar to those of digitalization. The findings offer actionable recommendations for companies, investors, and governments to align their strategies with the needs of the Metaverse.

TB-05.2 [R] • Research on Technology Convergence Mechanism Based on Multi-layers Network: A Case Study of Industrial Robots

Dejing Kong; Beijing University of Posts and Telecommunications, China
Haoran An; Beijing University of Posts and Telecommunications, China
Yufei Liu; Chinese Academy of Engineering, China

Technology convergence is meaningful for emerging technology development and transitional industry transformation, and there are more and more researches focusing on its development pathway and effects. However, there are still few researches concerning why the technology convergence appears and changes. This research proposes to unfold its evolution mechanism from the perspective of network evolution. Besides the network structure features, this research tries to embed the nature features of nodes to analyze the mechanism based on multiple exponential random graph models, such as technology features, enterprises features, etc. It utilizes patentee cooperation network and IPC co-occurrence network to characterize the enterprise cooperation and technology convergence based on patent data and conducts empirical study on industrial robots to test the mechanism. The results indicate that the network structure features of two networks and the nature features of nodes which contain technology features and enterprise features all have a significant impact on the mechanism of technology convergence, and the impact on converging mechanism changes over time. The findings of this research bear concrete implications for capturing technology convergence mechanism and the direction of technology development within the technical field.

TB-05.3 [R] • Technology Convergence and Its Influence on Innovation Networks: An Assessment of Emerging Trends

Shuying Li; Chinese Academy of Sciences, China
Wudan Ma; Zhejiang Normal University Library, China
Xiaoyu Wang; Chinese Academy of Sciences, China
Xian Zhang; Chinese Academy of Sciences, China
Haiyun Xu; Chinese Academy of Sciences, China
Edwin Garces; Portland State University, United States
Tugrul Daim; Portland State University, United States

AI-age technologies will evolve at an accelerated pace, driven by long-term mutually beneficial symbiosis. Technology convergence will disrupt existing industrial technology fields in general. Assessing and predicting technology convergence will become an important technology management issue in the AI era, providing new clues for distinguishing key technologies in innovation. Existing analytical models prefer to detect retrospective convergence. The role of emerging converging technologies in developing new technologies, generating new applications, and facilitating collaboration and commercialization across different phases is not well understood. In this paper, we build a technology co-occurrence network from the perspective of technology evolution and community detection, analyze and evaluate the emerging technology convergence paths generated by Artificial Intelligence (AI), Blockchain (BC), and Internet of Things (IoT) in the field of cybersecurity, and further explore the impact

and role of emerging technology convergence in various stages.

TB-07 Quality Management-1
Tuesday, 8/6/2024, 10:30 - 12:00
Room: Park
Chair(s) Gary O Langford; Portland State University

TB-07.1 [R] • System Dynamics Modeling for Engineering Change Administration in Serially Produced Vehicles: A Case Study in Electrical and Electronics Assembly Operations

Álvaro A Castillo-Paz; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Adrián Benavides; BMW Group Plants, Mexico
José V Cuellar; BMW Group, Mexico
Gareth L Emmett; BMW Group, Germany
Jennifer Rouen; BMW Group, United Kingdom
Andreas Topp; BMW Group, Germany
Roberto Liñán; BMW Group, Mexico
Alan S Perez; BMW Group, Mexico
José L Ceciliano-Meza; Tecnologico de Monterrey, Mexico
Juan F Piñal-Moctezuma; Tecnologico de Monterrey, Mexico

This study introduces a System Dynamics model developed to optimize Engineering Change Administration (ECA) in Electronics Assembly within automotive manufacturing. The model employs historical data and expert insights to accurately simulate the complexities involved in Current Product ECA Operations. It methodically explores key pathways including the Direct Implementation Pathway and the Serial Production Feasibility Pathway, each designed to accommodate engineering changes with varying degrees of complexity and urgency. This model addresses the critical challenges of maintaining production efficiency while effectively integrating innovative electronic components into automotive vehicles. Detailed outcomes highlight the pivotal roles of the Complexity Index and Quality Coordination Cost in predicting the success of implementations and in managing potential disruptions. By providing insights into the nuances of engineering change impact and operational adaptability, the model enhances operational efficiency and supports strategic decision-making within the automotive industry. This research demonstrates how dynamic modeling can be a vital tool in managing the sophisticated dynamics of automotive electronics assembly, contributing to both theoretical frameworks and practical applications in industrial operations.

TB-07.2 [R] • System Dynamics Modeling in Automotive Electronics Assembly: A Case Study on New Product Engineering Change Administration

Álvaro A Castillo-Paz; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
José V Cuellar; BMW Group, Mexico
Adrián Benavides; BMW Group Plants, Mexico
Gareth L Emmett; BMW Group, Germany
Jennifer Rouen; BMW Group, United Kingdom
Andreas Topp; BMW Group, Germany
Roberto Liñán; BMW Group, Mexico
Alan S Perez; BMW Group, Mexico
José L Ceciliano-Meza; Tecnologico de Monterrey, Mexico
Juan F Piñal-Moctezuma; Tecnologico de Monterrey, Mexico

This paper examines the complexities of Engineering Change Administration (ECA) in Electronics Assembly New Product Operations within the automotive industry, focusing on the integration of both tangible and intangible engineering changes. Utilizing a System Dynamics (SD) approach, it models the multifaceted processes involved during new vehicle prototyping phases. The study assesses how different pathways influence time efficiency and error rates in implementing engineering changes, emphasizing the dual nature of these changes and their impact on operational efficacy. By leveraging Vensim modeling software, the research provides a nuanced exploration of coordination characteristics and their risk profiles. It also examines the role of human factors, particularly the variability introduced by Engineering Change Analysts' workload and expertise levels, enhancing the model's predictive accuracy and strategic decision-making. Findings suggest that pathways with advanced planning, like the Lean Implementation Pathway, show lower error rates and improved efficiency. In contrast, the Late Implementation Request Pathway, triggered by unforeseen delays, exhibits higher error incidences, highlighting the need for better risk management strategies. This study advances methodologies that significantly impact the efficacy of engineering change operations in the automotive sector.

TB-07.3 [R] • A Case Study in Engineering Change Administration Operations in Serially Produced Vehicles: A System Dynamics Approach to Painted Body Current Product Operations

Álvaro A Castillo-Paz; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Adolfo Ramirez; BMW Group, Mexico
Gareth L Emmett; BMW Group, Germany
Jennifer Rouen; BMW Group, United Kingdom
Andreas Topp; BMW Group, Germany
Roberto Liñán; BMW Group, Mexico
Alan S Perez; BMW Group, Mexico
José L Ceciliano-Meza; Tecnologico de Monterrey, Mexico
Juan F Piñal-Moctezuma; Tecnologico de Monterrey, Mexico

This research explores the dynamics of Engineering Change Analysis (ECA) in Painted Body Current Product Operations within the automotive industry, employing a System Dynamics model to evaluate the impact of engineering changes on error rates during car assembly. Our study focuses on a luxury car production facility in Mexico, analyzing how changes in body-in-white and painted body components affect downstream integration with other vehicle parts. Utilizing Vensim modeling, we simulate various engineering change scenarios to predict complications and assess process efficiency and error rates. Key concepts such as Quality Coordination Cost (QCC), Complexity Index, and Incorrect Physical Implementation (InPhyImp) are introduced to provide frameworks for understanding the challenges and enhancing decision-making in ECA operations. The findings underscore the critical role of properly coordinated engineering changes in minimizing production errors and ensuring seamless integration of new technologies into existing manufacturing processes. The model not only addresses immediate operational needs but also offers insights into improving strategic decision-making in ECA operations by integrating advanced simulation techniques and considering the human factors involved in engineering changes.

TB-07.4 [R] • Usability in B2B Software Development

Anh T Nguyen; Portland State University, United States
Charles Weber; Portland State University, United States

Software engineering often overlooks the benefits and practicality of usability when working in customer-heavy settings. Previous research and extant methodologies in software development have focused on the primary business model, while alternative approaches such as business-to-customer (B2C) and business-to-business (B2B) have not received much attention. This paper describes a study that deploys Eisenhardt's case study research method to explore the challenges of B2B software development from three perspectives: end-user, client, and developer. The paper also introduces six techniques that improve usability in business-to-business software development that are based on agile approaches. The findings from this paper provide a context for and an approach to future research in B2B software development.

TD-03 Collaboration and Competition in Technology Management-1
Tuesday, 8/6/2024, 14:00 - 15:30

Room: Broadway-I
Chair(s) Julia Babcock; Portland State University

TD-03.1 [R] • 3D Printing Mergers and Acquisitions

Harm-Jan Steenhuis; Hawaii Pacific University, United States
Xin Fang; Hawaii Pacific University, United States
Julia Heilig; Hawaii Pacific University, United States

One of the areas with a lot of activity in terms of mergers and acquisitions is additive manufacturing, which is also known as 3D printing. This industry has a very strong emphasis on technology. The purpose of this study is to investigate the merger and acquisition activities in additive manufacturing. It explores the role of acquiring new technology versus other motives such as market expansion.

TD-03.2 [R] • Fostering Establishment of BtoB Platform Ecosystem: Ingot Information-sharing Platform Case Study

Hisao Toriyama; Japan Advanced Institute of Science and Technology, Japan
Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan

In recent years, establishing a platform ecosystem has become important for companies to gain a competitive advantage, but doing so is quite difficult for many companies. Previous studies have mainly focused on the business-to-consumer (BtoC) platform ecosystem, and limited attention has been given to the complex industrial business-to-business (BtoB) platform ecosystem, which involves industrial users instead of consumers. Although some studies have addressed the issues faced by platform leaders and complementors in the establishment phase of platform ecosystems, few have examined issues from the perspective of industrial platform users who cocreate value through the platform. This study explores the mechanism of user participation in industrial BtoB platform establishment based on a single case study and then proposes a model for building an industrial BtoB platform ecosystem. This model shows that service values are created in three stages (early, middle, and late) of the successful establishment phase, which is the theoretical and practical contribution of this study to platform ecosystem research.

TD-03.3 [R] • Research on Network Relationships and Collaborative Governance of Multiple Stakeholders in Urban Renewal

Nian Liu; Tianjin University, China
Lianying Zhang; Tianjin University, China

As China's urbanization process steps from incremental expansion to stock renewal, urban renewal has emerged as a reasonable way to enhance land value, improve the living environment and achieve sustainable urban development. Nevertheless, there are intricate relationships among the multiple stakeholders engaged in urban renewal, which constitute a comprehensive and complex system. Whether it is possible to ensure their better interaction and realize the synergistic state within the system from the internal and external factors has become one of the difficult issues to address for the smooth implementation of urban renewal. This study analyses the power position of stakeholders in urban renewal through a single-mode social network. Additionally, based on the 21 collaborative relationship influencing factors identified by the Latent Dirichlet Allocation (LDA) theme model, we further construct a two-mode social network linking influencing factors and multiple stakeholders. Analyzing the characteristics of the relational network through assessments of node centrality, cohesive subgroup and the core-edge structure of the complex network, our study identifies the crucial factors influencing the collaborative relationships among stakeholders in urban renewal. Finally, the study establishes the collaborative governance mechanisms for multiple stakeholders in urban renewal in terms of information synergy and balanced spatial benefit allocation. This study can serve as a strategic guide for policymakers aiming to implement collaborative governance in urban renewal efforts, offering valuable insights into promoting collaborative cooperation among stakeholders in urban renewal and enhancing the comprehensive benefits of projects.

TD-05 Technology Adoption-1

Tuesday, 8/6/2024, 14:00 - 15:30
Room: Broadway-III
Chair(s) Shiu-Wan Hung; National Central University

TD-05.1 [R] • Personalized Technology Recommendation System Based on the Company's Technology Transfer

Seokhyun Ryu; Seoul National University, Korea, South
Sungjoo Lee; Seoul National University, Korea, South

Companies need to secure new technologies and enhance their capabilities to address technological shortages, crucial for maintaining a competitive advantage in a rapidly evolving tech environment. Personalized technology recommendations for companies can be instrumental in effectively identifying their needs from an extensive pool of patents. Technology transfer emerges as a key strategy for companies to efficiently utilize costs and time in technology development. Understanding a company's technological preferences based on its technological information is essential for recommending suitable technologies for technology transfer. However, existing studies tend to focus solely on technology capability without considering the dynamically changing technological preferences of companies. Therefore, this study explores the utilization of technology transfer as a strategy to secure core technologies needed by companies. The research methodology involves constructing a portfolio of patents filed by companies to identify candidate companies for technology transactions and understanding their preferred core technologies. Considering technology development trends helps identify technology domains with high preferences. Finally, a patent recommendation strategy is proposed based on preference, utilizing Cooperative Patent Classification (CPC) code similarity. Through this, companies are expected to develop and implement practical strategies for securing effective technology.

TD-06 Technology Management in the Energy Sector

Tuesday, 8/6/2024, 14:00 - 15:30
Room: Broadway-IV
Chair(s) Dongphil Chun; Pukyong National University

TD-06.1 [R] • Smart Grid Cybersecurity in the Age of Artificial Intelligence

Chip Corbett; Portland State University, United States
Charles Weber; Portland State University, United States
Tim Anderson; Portland State University, United States

The security of the power grid is essential for the proper function of a democratic society, yet it is constantly under threat. The internet of things (IoT) will make a bad situation much worse. Misinformation, disinformation, and malinformation (MDM) have been identified as serious threats to our democratic institutions, and that same acronym applies to mobile device management (MDM), and these devices have become ubiquitous. People are notoriously bad at doing basic cybersecurity. With trillions of devices and remote access everywhere, what could possibly go wrong? Now add in the engaging opportunity of distributed energy resources (DERs) and life gets very interesting. Supervisory control and data acquisition (SCADA) systems may require substantial upgrades to meet minimal cybersecurity standards. Balancing the demand-response system is much more complex, especially if the islanding of neighborhoods is promoted within a Smart Grid. Artificial Intelligence (AI) may assist in daily operations, but also poses a potential threat. This paper uses a literature review to assess the current technology management status and evaluate the impetus for progress against future threats.

TD-06.2 [R] • Power Resilience Planning under the Threat of Artificial Intelligence

Chip Corbett; Portland State University, United States
Cuong Nguyen; Allbirds, United States
Dahm M Hongchai; Portland State University, United States
Prajakta Thorat; Portland State University, United States
Pavithra Prassad; Portland State University, United States

Sarah von Schimmelmann; Intel, United States
Charles Weber; Portland State University, United States
Tim Anderson; Portland State University, United States

The earth is an unstable planet. Change is constant and frequently chaotic. It is very important to plan carefully to manage changes that can be anticipated now, and to cover potential issues that might not yet have been discovered. The dawn of artificial intelligence (AI) presents a host of new concerns and opportunities. The criteria for evaluation are diverse and complex. Cybersecurity is absolutely essential, yet advances in technology have created an internet of things (IoT) where threat vectors might gain access to critical command and control elements through trillions of connected IoT devices. Whereas elegant zero trust cybersecurity models can be constructed and deployed, the vast majority of successful attacks involve a human element. Disruptive change makes decisions on any future course of action very difficult to evaluate. Distributed energy resources (DERs) can be designed to benefit individuals and improve the resilience of the power grid. We propose to direct the deployment of limited resources in an efficient fashion by evaluating the multi-discipline criteria using a hierarchical decision model (HDM), evaluated by human subject matter experts (SMEs) and generative artificial intelligence (GenAI).

TD-06.3 [R] • Sustainability to Financial Realities: A Comparative Study of Renewable Energy's Impact on Financial Performance

Dounia Chlyeh; HafenCity University, Germany
Erkan Bayraktar; Gulf University for Science and Technology, Kuwait
Mustafa K Yilmaz; Ibn Haldun University, Turkey
Ekrem Tatoglu; Gulf University for Science & Technology, Turkey
Selim Zaim; Ibn Haldun University, Turkey

This study examines the impact of renewable energy (RE) performance on companies' financial performance, primarily focusing on RE-related sustainable development goals (SDGs) and environmental factors. We analyze a sample of 2,737 companies across 47 countries from 2009 to 2018 using panel data analysis. Our results suggest that the effect of RE performance can be understood through three phases: policies adopted, targets established, and actions implemented. Interestingly, RE policies negatively impact profitability due to the substantial costs incurred by companies. Moreover, RE-related SDGs are found to affect companies' financial performance adversely. However, environmental factors demonstrate a positive and significant impact on corporate financial performance, which is observed consistently across developed and emerging countries. Furthermore, RE performance targets and actions have a significant positive impact, specifically in developed countries. This highlights the complex relationship between RE initiatives and financial outcomes, highlighting differential effects across various stages of implementation and geographic contexts.

TD-07 Manufacturing Management
Tuesday, 8/6/2024, 14:00 - 15:30
Room: Park
Chair(s) Hugo C Gomez-Guzman; PepsiCo (retired)

TD-07.1 [R] • Improving Attendance to Achieve Organizational Goals: A Case Study of Human-centered Design in a Small US Plant-based Food Manufacturer

Angel Contreras-Cruz; Portland State University - ETM, United States
Eduardo Ahumada-Tello; Autonomous University of Baja California, Mexico

Plant-based food manufacturing companies face high staff turnover rates and attendance problems. It is challenging for those companies to maintain an acceptance level of employee retention and attendance to achieve their objectives. Companies rely on front-line employees to meet production plans, but employees who do not show up at work jeopardize companies' operations. Additional challenges, such as retaining and attracting talent after the COVID-19 pandemic, are present daily for several U.S. organizations. This study analyzes attendance data from the case study company to design an attendance policy. Attendance data suggested that nearly 60 percent of the operational workforce had attendance or punctuality problems. The research project was conducted in a small company located in the U.S. that manufactures plant-based food following the human-centered design (HCD) methodology to design a four-level attendance policy: 1) good standing, 2) improvement, 3) disciplinary, and 4) termination. The new attendance policy is designed and implemented by incorporating literature review gaps, feedback from other companies with similar workforce populations, and including the needs of the staff and not solely those of the company. After a successful project management design, training, and implementation, the expected goals are to reduce employee absenteeism, decrease the number of new hires and training hours, and increase the likelihood that the company meets its organizational goals.

TD-07.2 [A] • Method for Production Capacity Forecasting

Leonard B Weitman; Weitman Consulting, United States

All manufacturers need to understand their overall line's capacity, and each process's capacity, to plan and keep up with growing customer product demand and changing product mix. In addition to keeping up with product demand, it is important to understand future equipment needs for the purpose of forecasting required space, capital, and labor. Many small to medium-sized companies do not have the enterprise resource planning tools, or in-house expertise, to readily develop these production capacity forecasts. The methodology discussed in this paper provides answers to the above business needs by considering the following attributes: products manufactured; expected product demand for the foreseeable future; process flow for each product; equipment used for each process; equipment used for each material movement; processing rate at each process step; process yield (scrap rate) at each process step; equipment reliability (unplanned downtime) and preventive maintenance time; and labor required at each process step and material movement. Applying the above attributes, using a common spreadsheet, future needs for equipment, space, capital, and labor are forecasted. Once equipment needs over time are understood, it is also possible to identify a floorplan designed for minimally disruptive growth, opportunities for automation, more sophisticated equipment, reduced work-in-process inventory, and utility usage reduction.

TD-07.3 [R] • A System-dynamics-based Simulation to Assess the Behavior Over Time of the Production Error Rate Caused by New Product Introduction in General Assembly Activities of an Automotive Mfg. Facility

Álvaro A Castillo-Paz; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Rodrigo Cervantes; BMW Group Plants, Mexico
Gareth L Emmett; BMW Group, Germany
Jennifer Rouen; BMW Group, United Kingdom
Andreas Topp; BMW Group, Germany
Roberto Liñán; BMW Group, Mexico
Alan S Perez; BMW Group, Mexico
Leunam Duarte-Pacheco; BMW Group, Mexico
José L Ceciliano-Meza; Tecnologico de Monterrey, Mexico
Juan F Piñal-Moctezuma; Tecnologico de Monterrey, Mexico

This research paper investigates the critical dynamics of engineering changes in the automotive industry, focusing on the New Product Engineering Change Administration (ECA) in General Assembly operations. As automotive companies strive to align their new models with market demands, regulatory requirements, and technological advancements, managing engineering changes efficiently becomes paramount. This study employs System Dynamics modeling to simulate the impacts of these changes on the production error rates during the initial phases of new vehicle introductions. Through the creation of causal loop diagrams and stock and flow models, developed in collaboration with industry professionals, we analyze the interdependencies and feedback loops inherent in the automotive production system. Our model specifically addresses the General Assembly New Product ECA, which deals extensively with the assembly of complex exterior and interior vehicle components. We evaluate various scenarios to determine the effect of different engineering changes on production outcomes, such as delay times, error rates, and overall system responsiveness. The findings highlight significant variances in error rates and introduce strategies to mitigate risks associ-

ated with the implementation of engineering changes. The study underscores the necessity for automotive manufacturers to adopt robust system dynamics models to optimize engineering change processes, thereby enhancing product quality and reducing time-to-market for new vehicle launches.

TE-01 AI in Technology Management-4
Tuesday, 8/6/2024, 16:00 - 17:30
Room: Pavilion East
Chair(s) Jihwan Lee; Pukyong National University

TE-01.1 [R] • Impact of AI in Product Lifecycle

Atmesh Tiwari; San Jose State University, United States
Minnie H Patel; San Jose State University, United States

Industries are evolving more rapidly in today's time than ever before; human needs and lifestyle are constantly adapting and changing as technology is becoming an irreplaceable part of their lives. In today's world Artificial Intelligence (AI) is emerging as a groundbreaking force replacing conventional ways with new innovative processes. Product development in this era of AI is going under major transformations. A review of papers and research shows that the role of AI in product management is going to increase with time. This paper dwells through the tasks, roles, and perspectives of the product lifecycle stages, along with latest AI tools available in today's market. Further, this paper proposes the advantages and challenges of implementing AI in product development and management, to provide insight on how AI influences and improves the stages of the product life cycle, from concept generation to product launch.

TE-01.2 [R] • Managing Educational Quality through AI: Leveraging NLP to Decode Student Sentiments in Engineering Schools

Enrique Diaz de Leon; Tecnologico de Monterrey, Mexico

This article comprehensively analyzes 70,000 student comments provided to the Faculty of Engineering using advanced Natural Language Processing (NLP) tools. The study aims to uncover valuable insights and practical applications of NLP in education. The findings reveal a nuanced perspective of student sentiment through meticulous analysis and provide actionable information for academic institutions. This study underscores the efficacy of NLP in handling large-scale feedback analysis in the academic context. The insights gained from this research are invaluable for institutions seeking to enhance their educational quality, student experiences, and overall performance. Furthermore, it demonstrates the potential for NLP to revolutionize feedback analysis and inform decision-making processes in higher education.

TE-01.3 [R] • Effect of Knowledge Sharing on Participant Performance in Artificial Intelligence Contests: A Quasi-experiment

Lingling Wang; China University of Petroleum (East China), China
Meijian Yang; Anhui Polytechnic University, China
Sen Li; Shandong Youth University of Political Science, China

The effective use of open data and shared knowledge to enhance digital innovation in enterprises has become a trending research area in the cross-disciplinary field of AI and management. And AI contests have emerged as pivotal forms for the industrialization of digital technologies and open innovation. Yet, in a competitive and cooperative setting, the role of knowledge sharing in solution generation among contestants remains uncertain. This study conducted a quasi-experiment in conjunction with the launch of the AI contest platform's knowledge-sharing function, and the Propensity Score Matching and Difference-in-Differences (PSM-DID) methodology was used to empirically investigate the knowledge-sharing effect on participant performance, with further analysis on participant's heterogeneity. The findings indicate that the introduction of the knowledge-sharing function positively affects participant performance, though with a latency period. Additionally, the knowledge-sharing function shows a heterogeneous impact on participant performance; while the performance of individual participants significantly improved, team participants experienced a decrease, yet not significantly. Participants with more entries and longer tenure significantly increased, whereas those with more submissions showed a significant performance decline. These results offer valuable management implications for the platform and contestants to effectively utilize the knowledge-sharing function.

TE-02 Innovation Management-3
Tuesday, 8/6/2024, 16:00 - 17:30
Room: Pavilion West
Chair(s) Carsten Boßmann; RWTH Aachen University

TE-02.1 [R] • Waning Breakthroughs?: Investigating the State of Innovation in the Field of NLP

Abebe Gasparini; Yonsei University, Korea, South
Carl Hannes Lohmander; Yonsei University, Sweden
Keeheon Lee; Yonsei University, Korea, South

In this study, we conducted a bibliometric analysis of the Natural Language Processing (NLP) community. Our research hinged on key theoretical frameworks, including Polanyi's republic of science, Kuhn's paradigm shifts, Popper's falsificationism, and Lakatos's scientific research programs. In this study, we hypothesized that authors with higher co-authorship centrality and greater topic diversity could indicate innovative research that contributes to paradigm shifts. Through an evaluation of author productivity, institutional contributions, thematic mapping, topic modeling and co-citation networks, we reveal the vital role of academic institutions, the centrality of specific research themes within the community as well as a shift in research focus from the early pioneering explorations on the foundations of AI to the more recent commercially focused engineering implementations of machine learning techniques. This exploration allowed us to assess the state of the NLP community, and to draw the potential steps necessary to avoid an excessive narrowing of focus in the community's research agendas and to preserve the long-term relevance of NLP-based AI research for the broader scientific community. Our proposed future investigations include expanding the datasets to better identify niche research programs and training deep learning models to analyze semantic content. With this research, we hope to inform researchers, policymakers and business leaders alike on the measures, incentives and research objectives necessary to make the NLP community a true republic of science.

TE-02.2 [R] • What Kind of Persons are 'Empathetic Innovators' Crucial to Innovation?

Takaki Yasuda; Japan Advanced Institute of Science and Technology, Japan
Chiaki Oshiyama; Japan Advanced Institute of Science and Technology, Japan
Koki Ijuin; Japan Advanced Institute of Science and Technology, Japan
Naoshi Uchihira; Japan Advanced Institute of Science and Technology, Japan
Takuichi Nishimura; Japan Advanced Institute of Science and Technology, Japan

This study focuses on the human resources necessary for generating innovations that can transform society. Specifically, it examines not the central figures who propose unconventional ideas but the nearest neighbor figures with strong motivation, high qualifications, and interactions with others based on these. Based on a case study, the essential characteristics of advanced followers for driving innovation have been distinctly identified. Each was originally motivated by desires for self-efficacy, challenge, achievement, and so on, and possessed specialized knowledge, creative thinking tendencies, and social skills. Furthermore, as network hubs, they had a panoramic cognitive ability to survey their environment and a forecasting ability for the future to drive innovation autonomously. And the most important thing was for the desires of advanced followers to resonate and empathize with the winning story.

TE-02.3 [R] • Linking Industry, Technology and Business: A Deep Learning-based Approach to Predict their Future Relationships to Identify Innovation Opportunities

Taeeun Kim; Seoul National University, Korea, South
Sungjoo Lee; Seoul National University, Korea, South

Patents and trademarks play distinct yet complementary roles in the realms of industry and innovation. Understanding the intersection of technology and business is vital in today's fast-paced world to identify critical innovative opportunities. However, existing research tends to separately analyze these elements which lacks a holistic perspective. Therefore, this study constructed the linkages between industry, patent, and trademark codes, which is used to analyze their relationship to investigate the innovation path in a holistic perspective. To achieve this goal, first, the deep learning classifier is employed to link patents and trademarks with industries respectively and the link prediction method is employed to link patents and trademarks connected by industry, establishing a refined interconnected network. Next, by using the established network, a multilayer network is constructed with the linkage probabilities of three factors and the link prediction is conducted for each layer, using the artificial node of a target firm. Lastly, the opportunity nodes that can be adjustable to the target firm are filtered in intra and inter layers perspective. This is one of the earliest attempts to take a consolidated view of the interconnected relationships among technology, market, and industry. Also, by defining opportunities as the strategic points within the network where a firm can leverage new technological capabilities, market positions, or industry standards to gain competitive advantage, this data-driven linkage analysis enables precise macro-level analysis of innovation opportunities.

TE-03 Collaboration and Competition in Technology Management-2

Tuesday, 8/6/2024, 16:00 - 17:30
Room: Broadway-I
Chair(s) Harm-Jan Steenhuis; Hawaii Pacific University

TE-03.1 [A] • Strengthening Capacity in Industrial Revolution 4.0 (IR 4.0): A Case Study on Training Product-service Systems between the US and Vietnam

Man Hang Yip; University of Cambridge, United Kingdom
Ana Sofia Castellanos Santamaria; Portland State University, United States
Julia Babcock; Portland State University, United States

This case study analyzes how value is created in the development process of a collaborative training product-service system (PSS) designed for provincial government officials in Vietnam. This initiative, part of the USAID Strengthening Provincial Capacity (USAID SPC) project, encapsulates a series of training solutions designed to empower officials with key skills in engineering and technology management, including the knowledge to improve global value chains, upgrade technology infrastructure and sustainable production models. A primary driver for the "four-day course delivery", the PSS analyzed in this study, was to bolster economic competitiveness at the provincial level in the context of Industrial Revolution 4.0 (IR 4.0). This case study offers lessons on stakeholder-value mapping and recommendations for future approaches to training courses development that enhances capacity development. These trainings aligned with the demands of balancing organizational development and public value creation in the context of developing countries transitioning to a knowledge economy, such as Vietnam. The learnings from this case study may provide a blueprint for similar endeavors in other countries navigating the complexities of digital transformation of public services.

TE-03.2 [R] • Research on the Evolutionary Game of Urban Regeneration Multiple Participants Supported by Blockchain

Yuman Liu; Tianjin University, China
Lianying Zhang; Tianjin University, China

Urban regeneration is an important vehicle for promoting the transformation of urban construction from scale expansion to connotative development. In this process, there are complex spatial interests among local governments, market players, and the public (mainly referring to the original property owner). Therefore, this research firstly analyzes the emergence mechanism of spatial interest conflicts and summarizes them into three aspects: the centrality of decision-makers, capital logic utilitarianism, and asymmetric information communication. Secondly, this research analyzes the behavioral strategy choices of stakeholders to lay the theoretical foundation for the evolutionary game of three participants. Then, this study uses replicated dynamic equations and stable evolution strategies in the evolutionary game. The results show that increasing the punishment, reducing the cost of government regulation, and increasing the social welfare is the key to the game balance. Finally, based on blockchain technology, we propose policy recommendations for urban regeneration in China to realize the reconstruction of spatial interest patterns from physical renewal to quality improvement among multiple subjects.

TE-04 Strategic Management of Technology-1

Tuesday, 8/6/2024, 16:00 - 17:30
Room: Broadway-II
Chair(s) Shintaro Sengoku; Tokyo Institute of Technology

TE-04.1 [R] • A Comprehensive Review of Factors Influencing Mergers and Acquisitions in Technology Startups

Hanae Suzuki; Tokyo Institute of Technology, Japan
Shuto Miyashita; Tokyo Institute of Technology, Japan
Shintaro Sengoku; Tokyo Institute of Technology, Japan

Technology startup firms have emerged as primary generators of innovative technologies and products. Established corporations strategically employ mergers and acquisitions (M&A) and collaborative alliances to seamlessly integrate these innovations into their operations. Concurrently, venture capital firms (VCs) regard exits as pivotal elements within their investment strategies among their life cycle, considering M&A as a pivotal exit strategy, alongside initial public offerings (IPOs). Variations exist among countries, where M&A exits are more prevalent in certain regions, while IPOs remain the principal exit strategy in others. Despite this landscape, a comprehensive understanding of enabling and inhibitory factors influencing M&A transactions remains incomplete. This study addresses this gap by conducting a systematic review and organization of previous research on the factors influencing and outcomes of M&A, employing a logical model. These factors include macro factors, such as political, economic, social, and technological factors, and key stakeholders, including start-ups, established corporations as acquirers, VCs, and others. Finally, we discuss the landscape and its related factors.

TE-04.2 [R] • China's Potential to Overtake the United States: The Role of Technical Diffusion and Catch-up Speed

Byung Gwun Choy; Tashkent University of Information Technologies, Uzbekistan

The U.S. imposed sanctions on China focusing on cutting-edge technology. This study examines whether the U.S. sanctions policy against China is effective. If it is effective, we would like to analyze why it is effective through the technical diffusion index and catch-up index. As the U.S. imposed sanctions on Chinese semiconductors and other cutting-edge technologies, the speed of catch-up and diffusion of China's cutting-edge technologies slowed down. From 1980 to 2022, macro data was collected from the IMF (2023) and ILO (2023). Approximately 300,000 patents related to semiconductors, AI, and Big data were used. The impact of advanced technical diffusion on GDP and per capita income was analyzed statistically rigorously using the general sequential logit model (VGAM, VGLM), difference-in-differences (DID) model, hierarchical mixed model, and Long Short-Term Memory (LSTM) model. We used LSTM to assess whether China could overtake the United States by 2030. In conclusion, U.S.'s sanctions on China were partially effective. It appears that China is rapidly approaching the U.S. through the development of AI and Big data technologies. However, it is doubtful whether China will be able to catch up with the U.S. by 2030. If the U.S. cannot effectively control AI, the possibility of being overtaken by China may increase.

TE-04.3 [A] • Developing Socio-Technology Scenarios for the Realization of a Carbon-Neutral Society

Shigeki Saito; Tokyo Institute of Technology, Japan

Haruhisa Okuda; Mitsubishi Electric Corporation, Japan
Tomohiro Yatagawa; Mitsubishi Electric Corporation, Japan
Yuichi Washida; Hitotsubashi University, Japan

In order to achieve a carbon-neutral (CN) society, a Japanese high-tech electronics manufacturing company conducted foresight. As the initial step, a workshop was organized with approximately 20 corporate researchers and two academic researchers, utilizing diverse societal change scenarios created through the horizon scanning method, extending up to the year 2050. The outcome of this effort resulted in the formulation of six hypotheses regarding changes in the Japanese societal environment by around 2050, along with six future issues set towards those changes. By synthesizing these, over 30 technological scenario ideas were generated. For the second step, these ideas were clustered to create 4-5 socio-technology scenarios, and a mapping of academic research that could serve as the background technology for these scenarios was carried out. Looking ahead, as a future research task, it's essential to consider how to communicate these outcomes with various stakeholders.

TE-04.4 [R] • The Study on the Technological Infrastructure R&D Policy through Research Equipment Network Analysis

Hyeongrye Cho; Korea Basic Science Institute, Korea, South
Minsoon Park; Korea Basic Science Institute, Korea, South
Geonhoi Kim; Korea Basic Science Institute, Korea, South

The infrastructure of science and technology is a very important factor for the competitiveness of science and technology. In particular, research facilities, equipment, research information, and analysis technologies that make up the infrastructure of science and technology are important areas that need to be managed and promoted at the national level for scientific commercialization as well as basic research. The existing research does not include a convergence study focusing on the substructure of science and technology. This study examined the concept and scope of analytical science, which plays a key role among the infrastructure of science and technology, and presented new implications for building an analytical science platform. This study performs the characteristics and structure analysis of research equipment network from the user's perspective, and presents the technical infrastructure R&D policy and new policy demand that can be generated through the joint use of research equipment. In particular, policy implications were derived for analytical science and technology, which can serve as a platform for technical infrastructure R&D policies. This study conducted social network analysis (SNA) using a time series data on the co-use of research equipment by research equipment users and proposed policy implications so that it can be used to explore the possibility and direction of convergence research based on the use of research equipment by research equipment users. According to the analysis results, equipment with high level of intermediate center and proximity center could be selected, and new research demands could be found as well as utilization of convergence research according to the use of research equipment. These findings can present a policy perspective on Korea's basic science and basic science infrastructure and a policy perspective on Technological Infrastructure (TI) research and provide some basis for strategic selection of future industries and promising technologies.

TE-05 Technology Adoption-2
Tuesday, 8/6/2024, 16:00 - 17:30
Room: Broadway-III
Chair(s) Alireza Dadashi; German Aerospace Center (DLR)

TE-05.1 [A] • Technological Capabilities for the Adoption of Industry 4.0 in a Multi-Latin Mexican Company

Maribel García Barrientos; Metropolitan Autonomous University, Mexico
Gabriela Dutrénit Bielous; Metropolitan Autonomous University, Mexico
Alexandre Oliveira Vera-Cruz; Metropolitan Autonomous University, Mexico

Industry 4.0 faces great challenges in developing countries, such as Mexico, especially in terms of its effective adoption and modernization. The adoption of these new technologies presupposes the existence of productive organizations endowed with innovative technological capabilities, supported by national infrastructure. The following paper aims to discuss the motivations, strategy and technological capabilities required for the adoption of Industry 4.0 by a Mexican large company. The case is the process of adoption of Industry 4.0, and the unit of observation is a Mexican multi-Latin company, with its headquarters in Mexico and facilities in Brazil and Spain, which is part of global value chains in the automotive industry producing auto parts. This company faces pressure from clients (the global value chain) and competitors to advance in the adoption of Industry 4.0. The evidence shows that the adoption process is neither linear nor automatic and it is highly costly.

TE-05.2 [R] • Simulation-based Evaluation of the Total Cost of RFID Absorption in a Manufacturing Firm

Naveen Tiruvengadam; Kettering University, United States
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
David Güemes-Castorena; Tecnologico de Monterrey, Mexico
Emanuel Josue Vega-Gonzalez; Tecnologico de Monterrey, Mexico

In this study, we extend an existing System Dynamics model of Radio Frequency Identification (RFID) technology absorption in an automotive manufacturing firm to evaluate the total costs of such an initiative as a function of leverage variables. RFID technology has been in existence for a while and has matured sufficiently to be affordable. The aim of this particular study is to not only evaluate total costs but also to find the values of the leverage variables that minimize the cost. The larger objective is to create a choice framework for technology managers to assist with technology adoption and make informed technology investment decisions.

TE-07 Supply Chain Management
Tuesday, 8/6/2024, 16:00 - 17:30
Room: Park
Chair(s) Leon Pretorius; University of Pretoria

TE-07.1 [R] • Supply Chain Management and Operational Effectiveness: A Transportation Case Study

Euphodia Netshakhuma; University of Johannesburg, South Africa
Jan Harm C Pretorius; University of Johannesburg, South Africa
Leon Pretorius; University of Pretoria, South Africa

Operational efficiency in the rail engineering company is impacted by the performance of supply chain management. The procurement processes at state-owned entities within the realm of supply chain management are characterized by extended durations, mostly attributable to the legislative framework governing their procedures. The purpose of this study is to evaluate the existing supply chain management strategy to maximize operational efficiency. The study will explore demand planning, supply chain efficiency, effectiveness, and inventory management solutions. The study focused on the rail Engineering case study company in the Republic of South Africa. The primary data involved semi-structured interviews with experienced participants who are managers and specialists in operation management and supply chain management in rolling stock maintenance in rail Engineering company and engaging in various techniques to improve the efficiency of operations. This study provides insight into the supply chain management techniques used in the rail industry to ensure operational efficiencies. Additional analysis may be required to develop cost-effective solutions for implementing a comprehensive demand planning and management department, including the automation of the entire process to seamlessly integrate suppliers. The rail operations are minimally researched, especially regarding their operational efficiency and practices in supply chain management. The results of this study appear to have applicability to other state-owned enterprises that also have strict requirements.

TE-07.3 [R] • Digital Governance and Material Security in Emergencies: Modeling and Simulation Research Based on System Dynamics

Mengyu Zhuang; Beijing University of Posts and Telecommunications, China
Jingwen Liang; Beijing University of Posts and Telecommunications, China
Yawen Li; Beijing University of Posts and Telecommunications, China

Material management in emergencies is a complex and systematic undertaking. Due to the limitations imposed by the level of digital governance, the process of ensuring the security of emergency materials is typically characterized by slow information response, low transportation efficiency, and other challenges. In this study, we developed an emergency-oriented material management system dynamics model and conducted simulations to assess the operational status of emergency material management during emergencies, using a public security incident in Changchun City as a case study. The findings indicate the following: Firstly, reducing the delay in information feedback through the digital emergency management platform effectively narrows the gap in emergency supplies. The impact of this reduction is positively correlated with the severity of emergencies. Secondly, the establishment of a digital transportation governance system improves the response speed of the overall system and effectively reduces the backlog of supplies in transit. The research findings presented in this paper provide a foundation for enhancing the level of emergency material protection through digital governance, thus further promoting the development of a Chinese-style modernized emergency management system and capacity building.

WA-00 PLENARY: PLENARY-3

DATE: WEDNESDAY, 8/7/2024
TIME: 08:30-10:00
ROOM: PAVILION
CHAIR: DILEK CETINDAMAR; UNIVERSITY OF TECHNOLOGY SYDNEY

WA-00.1 [K] • The Emerging AI-Strategy Connection: Ongoing Challenges and Unanticipated Opportunities

Mel Horwitch; MIT Sloan School, United States

This keynote speech focuses on the current state and direction of the AI-business strategy relationship. Relevant background of business strategy is examined, with particular attention given to the inherent variety and complexity of business strategy. In particular, emphasis is placed on an ongoing need to integrate disparate explicit and tacit elements and as well as on other tensions existing in strategy - all of which are challenges for AI. The development of a set of concepts dealing with AI and strategy is discussed, observing that up to now AI largely serves as a strategic tool assisting and augmenting existing processes in a generally focused or specialized fashion. Lessons from knowledge management's (KM's) AI experience are noted, especially claims that AI-enabled KM systems represent some success in serving both explicit and tacit knowledge. The current leveraging of AI by some of the best-known strategy consulting firms is reviewed. Energetic progress in incorporating AI into such consulting practices is observed. This talk concludes by speculating that a later unanticipated phase of the AI-strategy relationship could feature AI-enabled strategy systems that enhance the more general management, instinctual, and tacit parts of strategy.

WA-00.2 [K] • Intrapreneurship Management in the AI Era

Rainer P Hasenauer; WU Vienna, Austria

This keynote presentation is based on the book Intrapreneurship Management: Concepts, Methods, and Software for Managing Technological Innovation in Organizations by Rainer Hasenauer and Oliver Yu, to be published by Wiley - IEEE Press in June 2024. Internal innovation, or Intrapreneurship, with employees thinking and behaving like entrepreneurs, is the driving force for organizational competitiveness and economic growth. Successful intrapreneurship management requires Organization Readiness for internal innovations and Market and Technology Readiness for innovation projects. Artificial Intelligence (AI) can be particularly effective in supporting the fulfillment of all these readiness. Specifically, AI, especially the emerging Emotion AI and Creativity AI, can develop and apply an extensive knowledgebase of emotional assessments and successful creativity experiences for the in-depth understanding and precise fulfillment of the needs and wants of not only intrapreneurs and internal supporters in building powerful innovative culture and teamwork, but also those of prospective external adopters for the effective development and marketing of innovative technologies. Additionally, rapidly evolving AI can apply a range of advanced methodologies to provide the optimization of available resources for achieving the combined balance among the integrated Economic-Ecologic-Equity values and risks of all Intrapreneurship participants: Intrapreneur, Internal Supporter, and Final Adopter. This presentation will provide detailed representative examples for these exciting current and prospective AI applications to enhance Intrapreneurship Management.

WB-01 AI in Technology Management-5

Wednesday, 8/7/2024, 10:30 - 12:00
Room: Pavilion East
Chair(s)Sayaka Tokita; Tokyo Keizai University

WB-01.1 [A] • AI for Science: Practice from Baidu PaddlePaddle

Xiaomeng Chai; Beijing University of Posts and Telecommunications, China
Min Zhang; Beijing University of Posts and Telecommunications, China
Hua Tian; Beijing University of Posts and Telecommunications, China

AI4S (AI for Science) is an interdisciplinary field dedicated to solving and studying complex scientific problems using AI methods. Currently, AI4S has made significant breakthroughs in life science, energy science, physics and computer science, Earth and Environmental Science. Numerous fundamental software for AI4S have emerged as a result. As a global technology leader deeply engaged in the field of AI, Baidu strongly supports the deployment and application of AI4S solutions through its deep learning platform, PaddlePaddle. This paper presents a case study of PaddlePaddle, outlining its experience in accelerating innovation in the field of science. It explores the specific practices employed by PaddlePaddle to aid the development of AI4S, intending to provide constructive suggestions on how to accelerate the popularization of AI4S on the ground through deep learning platforms. The ultimate goal is to contribute to China's solution for AI-enabled scientific development in the wave of the new round of industrial revolution.

WB-01.2 [A] • Revolutionizing the Cannabis Industry: In the AI Era

Caren H Weinberg; Ruppin Academic Center, Israel

This literature review attempts to outline the status of the cannabis industry ecosystem and its importance for the success of the entrepreneurial entities within it. As was true for an abundance of historical industries and many current ones, the cannabis industry is profoundly stigmatized. This continues to hamper its growth potential and makes it an outlier in traditional entrepreneurial ecosystems. It is believed that Artificial Intelligence (AI) may hold the key to revolutionizing the cannabis industry and reducing the impact of the stigmatization by providing it a legitimacy that it has not been afforded to date.

WB-01.3 [A] • Use of AI in Point-of-care Devices in Healthcare: Identifying the Critical Factors for Successful Applications

Muralidhara GV; XLRI Xavier School of Management, India
Harish Dhanwantri; GE Healthcare, United States
Raghavendra Rao; IBS Bangalore Off Campus Center of the IFHE, India

The application of machine learning and natural language processing technology in healthcare and its use in assisting doctors and healthcare professionals has been researched and documented by authors during the last few years. LIU and others reviewing the latest applications of AI in medicine state that with the assistance of AI, the time required for a diagnosis can be greatly reduced and the diagnostic efficiency can be significantly improved. They

provide examples of applications of AI in radiology, pathology, endoscopy, ultrasonography, and biochemical examinations. Jiang and others have outlined the major disease areas that use AI tools as cancer, neurology, and cardiology. They cite the use of IBM Watson that has made promising progress in oncology and achieved a high degree of accuracy in treatment recommendations. Ultrasound point-of-care devices have been in use for many years to support clinical decision-making at the point of care, including the emergency departments offering simple, fast, and precise solutions. This research focuses on studying the use of AI-driven technology in enhancing the utility of these ultrasound point-of-care devices. The research aims to identify the factors that impact the successful application of AI in this field through in-depth interviews with developers and users of such devices.

WB-02 PANEL: Meet the Editors
Wednesday, 8/7/2024, 10:30 - 12:00
Room: Pavilion West
Moderator Tim Anderson, PICMET Director of Technical Activities

Panelist(s) Gloria Barczak, Editor in Chief, *Journal of Product Innovation Management*
Jin Chen, Editor in Chief, *International Journal of Innovation and Technology Management*
Dilek Cetindamar, Department Editor, *IEEE Transactions on Engineering Management*
Gabriela Dutrenit, Former Editor in Chief (currently Department Editor), *Research Policy*
Nazrul Islam, Editor in Chief, *International Journal of Technology Intelligence and Planning*; Associate Editor, *Technological Forecasting & Social Change*
Harm-Jan Steenhuis, Editor in Chief, *Journal of Manufacturing Technology Management*
Steven Walsh, Editorial Board, *IEEE Transactions on Engineering Management*

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

WB-03 Knowledge Management
Wednesday, 8/7/2024, 10:30 - 12:00
Room: Broadway-I
Chair(s) Armando Elizondo-Noriega; Tecnologico de Monterrey

WB-03.1 [R] • System-dynamics Modeling of an Expertise-based Talent Management Strategy for Engineering Changes Analysts in a Car Manufacturing Plant

Álvaro A Castillo-Paz; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Gareth L Emmett; BMW Group, Germany
Jennifer Rouen; BMW Group, United Kingdom
Andreas Topp; BMW Group, Germany
Roberto Liñán; BMW Group, Mexico
Leunam Duarte-Pacheco; BMW Group, Mexico
José L Ceciliano-Meza; Tecnologico de Monterrey, Mexico
Juan F Piñal-Moctezuma; Tecnologico de Monterrey, Mexico

This paper develops a System Dynamics (SD) model to delineate the theoretical framework and operational mechanics of an Expertise-based Talent Management Strategy (TMS) for Engineering Changes Analysts (ECANs) within the automotive industry. The research emphasizes the conceptualization and design aspects of the model, which aims to facilitate the management and development of ECANs critical to the engineering changes process in car manufacturing. The study elaborates on the dynamic interactions and dependencies within the Engineering Changes Administration (ECA) department, focusing on how various levels of ECAN expertise—Novice, Competent, and Expert—affect the adaptation and effectiveness of engineering processes. By structuring the TMS to categorize ECANs according to their skills and responsibilities, the model provides a strategic approach to talent development, aiming to enhance the alignment of workforce capabilities with operational demands. The paper outlines the participatory methodology used in model construction, engaging key stakeholders from a leading OEM to ensure the model's practical relevance and accuracy. Theoretical insights derived from the model offer a comprehensive understanding of talent management dynamics, serving as a valuable tool for both academic research and practical application in complex manufacturing settings, where strategic talent management is pivotal for sustaining innovation and operational excellence.

WB-03.2 [R] • A System-dynamics-based Simulation to Model a Rotary Talent Management Strategy for Engineering Changes Analysts in the Automotive Industry

Álvaro A Castillo-Paz; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
Jennifer Rouen; BMW Group, United Kingdom
Gareth L Emmett; BMW Group, Germany
Andreas Topp; BMW Group, Germany
Roberto Liñán; BMW Group, Mexico
José L Ceciliano-Meza; Tecnologico de Monterrey, Mexico
Juan F Piñal-Moctezuma; Tecnologico de Monterrey, Mexico

This paper elaborates on the development and theoretical underpinnings of a System Dynamics (SD) model designed to simulate the Rotary Talent Management Strategy (TMS) for Engineering Changes Analysts (ECANs) in the automotive industry. Unlike traditional approaches that focus on numerical evaluations of talent management systems, our study concentrates on the methodological aspects of SD modeling and the conceptual definition of the Rotary TMS. We detail the construction of the SD model using Vensim software, emphasizing how it captures the dynamics of ECANs transitioning through different manufacturing divisions. The Rotary TMS is framed as a strategy to enhance cross-divisional expertise and adaptability, promoting a holistic understanding of the manufacturing process rather than specialization in isolated divisions. The paper discusses the integration of various theoretical inputs and practical considerations into the SD model, ensuring it accurately reflects the complexity and cyclic nature of talent rotation. By providing a clear depiction of the model's structure and the rationale behind its design, we aim to offer a comprehensive resource for implementing similar talent management strategies in dynamic and technologically intensive environments. This approach not only broadens the understanding of strategic talent management but also demonstrates the versatility of SD modeling in organizational research.

WB-03.3 [R] • Quantifying Relationships in Fuzzy Cognitive Maps Based on Content Analysis of Unstructured Research Texts

Ahmed Alibage; Portland State University, United States
Antonie J Jetter; Portland State University, United States
Elpiniki Papageorgiou; University of Thessaly, Greece

FCM projects often rely on knowledge-based approaches, such as expert interviews, which can be challenging to conduct because they require extensive expert participation. We propose a novel alternative to create FCM models based on expert knowledge that is already codified in research texts and other publications. In this approach, thematic network analysis identifies FCM concepts and signed causal connections, while computation of t-coefficient is used to determine the weights of the identified edges. We introduce and evaluate the approach in the context of a real-world system modeling project that is based on 47 carefully selected, peer reviewed research publications on Theory on High Reliability Organizations. We evaluate the approach and the FCM model based on three strategies: (1) comparing

edge weights, assigned with t-coefficient, against the commonly used-coefficient and cosine similarity index, (2) comparing the behavior of the FCM model that results from this work against known system behavior, and (3) comparing FCM model behavior against the system knowledge of safety experts in the offshore oil and gas industry. The work shows that this first application of t-coefficient in FCM modeling provides a practical, robust, and sufficiently sensitive means to extracting causal weights from manually coded text.

WB-03.4 [R] • Experimentation of Integrating Roadmapping and Sci-fi Prototyping Methods

Miwa Nishinaka; Kagawa University, Japan
Kunio Shirahada; Japan Advanced Institute of Science and Technology, Japan
Yusuke Kishita; The University of Tokyo, Japan
Dohjin Miyamoto; The University of Tokyo, Japan
Hirotaka Osawa; Keio University, Japan
Sachiko Kiyokawa; The University of Tokyo, Japan
Hideaki Takeda; National Institute of Informatics, Japan

In 2023, we proposed a hypothetical knowledge management framework that incorporates science fiction prototyping (SFP) into the traditional roadmapping (RM) method to make RM more innovative and create a future beyond what we can currently imagine. Our main objective is to create a new organizational knowledge co-creation method for generating innovative ideas by incorporating humanistic factors utilizing SFP into RM. In the current article, we present the exploratory study we conducted to examine the hypothetical framework. Experimental workshops were held in November 2023 to compare the integrated method, in which SFP is applied to RM, with the original RM method. We followed a crossover design in the workshops and analyzed the results qualitatively and quantitatively following the perspectives proposed in the hypothetical framework. The qualitative analysis revealed successful integration regarding diverse and broader perspectives. The quantitative analysis utilizing Wilcoxon signed rank tests showed that the scores of the integrated method were significantly higher than those of RM for variables evaluating the effectiveness of the integration, while not for variables related to participants' feelings and satisfaction with the workshops, and sustainability. These findings indicate that the integration was successful in terms of its effectiveness as a method, while participants' subjective feelings toward the workshops were not different in both methods. As for sustainability, which requires a long-term perspective, no apparent differences were observed in these short-term workshops.

WB-04 Technology Management Framework
Wednesday, 8/7/2024, 10:30 - 12:00
Room: Broadway-II
Chair(s) Amara Atif; University of Technology Sydney

WB-04.1 [R] • Theory-to-application Transition in Mathematics and Computer Science Studies

Rikuei Kaku; University of Tokyo, Japan
Kimitaka Asatani; University of Tokyo, Japan
Noriyuki Higashide; University of Tokyo, Japan
Ichiro Sakata; University of Tokyo, Japan

Basic and applied research have been a pair of popular yet vaguely defined concepts in scientific philosophy and technology management. This classification gets further challenged as once-theoretical studies like Artificial Intelligence became applicational in less than a decade. As such, a quantitative approach to evaluate the ongoing changes in and around the computer science domain has both theoretical and practical implications. This study applies Topic-Aware Level Score, a science-of-science measure of application to mathematics and computer science domains, and draws the following findings: On the theory side, methodological theories like graph algorithms and mathematical modeling are gaining application colors, but core and fundamental theories like equations and linear algebra remain steady as pure theories. On the application side, the most applied studies identified in this research have all been moving towards application in the past three decades, but some at a much faster pace than others. The study also identified neural networks as a representative case where the given study was completely theoretical in the 1990s but are now among the studies with highest application levels, making them potential showcases for technology incubation. This analysis of basic and applied research helps policymakers and research administrators to determine research directions and formulate funding strategies effectively.

WB-04.2 [R] • Enhancing Digital Resilience through AI in Industry 5.0: A Technology Management Perspective

Amara Atif; University of Technology Sydney, Australia
Muhammad A Qureshi; Torrens University, Australia

The proposed literature review aims to investigate the emerging concept of "Digital Resilience" within the context of Industry 5.0, focusing on integrating technology management strategies and continuous improvement practices in the era of artificial intelligence (AI). The research paper explores how the integration of Industry 5.0 and AI can help organisations establish feedback loops that enhance their digital resilience against disruptions. The review explores the intersection of Industry 5.0, characterised by technology, with the transformative power of AI on principles such as human-centricity, environmental stewardship, and social benefit. It assesses existing literature to identify key frameworks, models, best practices, challenges, and empirical evidence that support the establishment of feedback loops, emphasizing their role in fostering digital resilience and the synergies between technology management, continuous improvement, and Industry 5.0. The review further highlights the significance of understanding how organisations navigate the complex landscape of Industry 5.0, leveraging AI-driven technologies to improve operational efficiency and responsiveness. In conclusion, this review aims to provide a comprehensive synthesis of current knowledge, offering insights into the strategic integration of technology management, continuous improvement, and Industry 5.0 to navigate the complexities of the AI era.

WB-04.3 [R] • Research on the Feature of Patent Strategy of EUV Machine Manufacturer ASML: A Patent Analysis Utilizing KH Coder

Dongjian Wu; Ritsumeikan University, Japan
Manabu Sawaguchi; Ritsumeikan University, Japan
Masao Oda; Ritsumeikan University, Japan

When it comes to the topic of why ASML (a Dutch semiconductor equipment manufacturer) could succeed in the R&D of EUV (extreme ultraviolet) machine, it is figured out that ASML relied on its development partners for technical resources and shared technical issues in the aim to resolve it with outside organizations during R&D activities. Previous studies regarding this topic are mainly implemented as a comparative analysis, using the information and data of ASML and its competitors Canon and Nikon, the two Japanese semiconductor equipment manufacturers, from the perspective of co-authoring activities and outsourcing situation of these three companies. Therefore, it is obvious that the patent analysis has not been deeply implemented on the topic of the characteristics of EUV machine R&D activities of ASML. Thus, in this research, the patent information of ASML and the two Japanese companies will be extracted from J-PlatPat (Japan Platform for Patent Information), to create a patent map using KH Coder, a free software for qualitative data analysis, quantitative content analysis and text mining. Then the characteristics of the patent strategy that led to the ASML's success on EUV machine R&D will be discussed.

WB-05 Technology Adoption-3
Wednesday, 8/7/2024, 10:30 - 12:00
Room: Broadway-III
Chair(s) Jihwan Lee; Pukyong National University

WB-05.1 [R] • Exploring Ways to Communicate New Technology Concepts: A Comparison of Short Audiovisual Content on Drones and Flying Cars

Nanami Furue; Hitotsubashi University, Japan
Wataru Uehara; Hitotsubashi University, Japan
Yuichi Washida; Hitotsubashi University, Japan

Hiroaki Goto; Hitotsubashi University, Japan

Throughout the development of human science and technology, entirely new technologies have been consistently introduced. The utilization of these new technologies in real-world society requires not only increased technical feasibility by experts but also discussions among diverse stakeholders and valuable feedback from potential users. However, communicating the concept of new technologies can be challenging, leading to disjointed discussions and misguided feedback. This study focuses on the role of visual works, particularly short audiovisual content, as a means to visualize and present new technology concepts. It aims to explore the relationship between conveying innovative new technology concepts and the impressions they leave on recipients. Beginning with a review of previous research in science communication and marketing related to product concepts, the study then quantitatively measures differences in impressions for three audiovisual pieces on drones and flying cars, each produced as part of public projects in Japan. By clarifying the relationship between conveying new technology concepts and recipient impressions, the study seeks to offer insights into effective methods for visualizing and communicating new technology concepts.

WB-05.2 [R] • Embracing Smart Retailing Systems: An Integrated Model

Shiu-Wan Hung; National Central University, Taiwan
Jyun-Hao Jian; National Central University, Taiwan
Chia-Yi Hsu; National Central University, Taiwan

In recent years, Self-Service Technologies (SSTs) have emerged, providing information services and products derived from retail services. However, whether they are widely accepted by the public has become a topic worth discussing. Different from past research which focused on consumers' intention to use self-service sale system, this research established an integrated model of ability and willingness to technology acceptance. This study employed a questionnaire survey, collecting a total of 514 valid responses, and utilized structural equation modeling for research analysis. The results suggest that consumers' willingness has a stronger effect rather than ability to use smart retailing system, stressing the key role of willingness as an important dimension of the acceptance of smart retailing system. It is also worth noting that discomfort and insecurity could affect the switching cost caused by using smart retailing system. If the interactive quality of employee presence decreases, consumers' confidence in smart retailing system would be damaged. The research findings of this provide reference suggestions for future human-machine configurations in both academic and corporate contexts.

WB-05.3 [R] • Evaluating Adoption Factors for Robotic-assisted Surgery with the Analytical Hierarchical Process

Isin Sozen Sarigol; Izmir Institute of Technology, Turkey
Burak Dindaroglu; Izmir Institute of Technology, Turkey
Erman Aytac; Acibadem Healthcare Group, Turkey

The objective of this master's dissertation is to evaluate adoption factors for robotic-assisted surgery (RAS) using the Analytical Hierarchy Process (AHP) as its evaluation methodology. Robotic-assisted surgery is used in various surgical fields. It is mainly used as a tool in numerous disciplines' minimally invasive surgery procedures (MIS). Since it has so many different application areas and actors, the determination of its adoption factors and evaluation process of these factors' priorities for surgeons is a highly complex issue that includes multicriteria of decision-making and numerous surgeons. A comprehensive list of these possible adoption factors, recognized by conducting an extensive literature review, was picked and chosen. First, we had 310 factors mentioned in the literature that have a potential impact on the adoption process of the RAS. We have reduced these to 20 factors that are categorized under five different main criteria. By this, a unique AHP tree that is this thesis' contribution to the literature was developed. The research data was collected by an online survey from the surgeons of various disciplines working in Türkiye. Our final sample to evaluate priorities consisted of 41 surgeon responses in total. The evaluation process consists of three steps: analyzing individual-based pairwise comparison matrices, their consistency rations, and their priority vectors. We executed the same workflow for the aggregated analysis for disciplined-based and all aggregation. Results are examined in detail and concluded with insightful interpretations.

WB-06 Science and Technology Policy
Wednesday, 8/7/2024, 10:30 - 12:00
Room: Broadway-IV
Chair(s) Hung-Chun Huang; National Chi Nan University

WB-06.1 [R] • The AI Challenge for National Technology Strategy

Mel Horwitch; MIT-Sloan School, United States

The rise of national AI strategies is examined. AI is increasingly accepted as a potentially disruptive "general purpose technology." As such, AI prowess is viewed worldwide as an essential - if not fundamental - ingredient for a country's overall innovation and competitiveness capacity, for heightening geopolitical influence, and for enhancing international prestige. National AI strategies, by encouraging "responsible AI," are also designed to mitigate AI risk and to leverage AI to meet societal ends. A diverse set of the national AI strategies are analyzed and compared, including those of the US, the EU, China, Australia, Singapore, and Bangladesh. Three sets of national AI strategy dualities are then applied to understand and assess national AI strategies. These dualities are: (1) a specific objectives/broad objectives duality, (2) a distributed/centralized structure duality, and (3) an overarching aims duality, which encompasses (a) enhancing competitiveness-geopolitical influence-international prestige, (b) risk mitigation-achieving societal purpose, and (c) a blend of both of these two latter components of the third duality. Implications for managing such national AI strategies are addressed and general implications for national AI strategies and modern macroinnovation generally are discussed.

WB-06.2 [R] • A Comparative Study of China and US's Future Industry Development Strategy and Typical Future Industry Innovation Capability

Yun Liu; University of Chinese Academy of Sciences, China
Yuduo Wu; University of Chinese Academy of Sciences, China
Dong Guo; University of Chinese Academy of Sciences, China

Future industry is an emerging industry which is driven by cutting-edge scientific and technological innovation, aims at meeting the needs of escalating economic and social development, has great development potential and can provide important support for future economic and social development. The developed countries and emerging economies have made forward-looking layout in the future industrial fields in order to maintain new advantages in future competition. This paper uses comparative case analysis to study China and the US's future industrial development strategy and typical future industrial innovation ability. The findings are as follows: (1) AI, quantum, robotics, biotechnology and advanced materials are the key future industries of China and US; (2) Both China and US provide guidance and support for future industrial development by issuing a series of policy documents for future technologies and industries, and focus on key sub-sectors of future technologies and industries, issue special action plans, development plans and support policies, and actively explore new R&D and production organization models to support future industrial development; (3) The US has stronger innovation capability in future industries such as quantum, which is mainly due to the better whole chain R&D and industrialization system and industrial innovation ecosystem.

WB-06.3 [R] • Policy Instrument Model of Future Industry

Fei Li; Zhejiang University, China
Ziyan Xu; Zhejiang University, China
Jiawen Liu; Zhejiang University, China
Yu Qie; Jinhua Institute of Zhejiang University, China

The future industry revolves around promoting the emergence of new products and new business models, driven by leading-edge technology groups within the industry. This, in turn, ignites a new round of industrial reform and development. This trend is characterized by its high growth potential, strategic importance, and pioneering nature, making it the focal point of global economic competition. Currently, countries around the world are expediting

their strategic positioning and advancement with the future industrial landscape. Comparative analysis of the differences between the main structures and policy systems of different countries in promoting future industrial development is crucial to further revealing the principles of future industrial development. This study takes the artificial intelligence industry as a case study and examines policy documents related to artificial intelligence from the United States, China, the European Union, and the United Kingdom spanning the years 2021 to 2023. Using text mining and content analysis methods, it comparatively analyzes the artificial intelligence industry policy structures of different countries from the perspective of policy tools, constructs a model of the future industrial policy framework, and analyzes the rationales behind the formation and adoption of distinct policy paths. It aims to reveal the rules of future industrial development and provide a foundation and methodological insights for crafting and refining future industry-related policies across diverse nations.

WB-07 Strategic Management of Technology-2
Wednesday, 8/7/2024, 10:30 - 12:00
Room: Park
Chair(s) Hideki Hayashida; Tokyo University of Agriculture and Technology

WB-07.1 [R] • Is Temporal Leadership Always Effective?

Junna Meng; Tianjin University, China
Man Zhao; Tianjin University, China
Anmin Wang; Tianjin University, China
Zhuochen Sun; Tianjin University, China

In order to explore the mechanism of the influence of temporal leadership on the procedural rationality of decision-making on rural public health resources investment in local governments, this study established a regression model about groupthink as a mediating variable and relationship closeness as a moderating variable. The results of the study are as follows. Temporal leadership has a significant negative impact on the procedural rationality of decision-making. Groupthink in the decision-making team plays a fully mediating role in the relationship between temporal leadership and the procedural rationality of decision-making. And the relationship closeness of the team members plays a positive moderating role between groupthink and the procedural rationality of decision-making. From the perspective of technology management, this study not only delves into the relationship between leadership style and decision-making processes but also further reveals the mediating role of groupthink in decision-making and the influence of team relationships on the decision-making process. These findings have important implications for team decision-making, leadership development, and project resource allocation in the field of technology management.

WB-07.2 [A] • Information System for Modern IT Governance and Management - ITGM

Jorge E Barrera Niño; National University of Colombia, Colombia
Sergio M Borja; Seoul National University, Korea, South

A very high percentage of IT innovation projects don't reach their objectives mainly because companies cannot adequately manage the change caused by the overwhelming boom of artificial intelligence, robotics and other digital transformation technologies. Artificial Intelligence and the services which it includes for the management of text, images, videos, audio and code seek every day to integrate into enterprise activity. To respond timely to its change needs, the modern company needs an information system that allows it to know at any time in its informatic environment What it has, What It Wants, What has it achieved and how to manage its ability level to achieve proposed objectives; this paper proposes the system named ITGM, which comes to life in a company by implementing the framework called ICI-W for the initials of Informatic Collective Intelligence that consists of EAM Enterprise Architectures Methodology presented at PICMET '22, a specialized software and a set of exercises integrated as the seed of functional implementation. ICI-W adapted a Language of Comprehension and Understanding aimed at all IT stakeholders with the objective of significantly reducing the current percentage of projects that fail. ICI-W as a solution is immediately applicable without prerequisites.

WB-07.3 [R] • The Trickle-Down Effect of Trust in Leader among Top Executives on TMT Conflict Moderating Roles of Environmental Dynamism

Cheng Ning Song; Sun Yat-sen University, Taiwan
Hao-Chieh Lin; National Sun Yat-sen University, Taiwan
Chiung-Man Tsai; Ministry of Health and Welfare, Taiwan

This study applies the trickle-down effect theory to examine the effects of trust in leader and TMT trust on TMT conflict in hospitals. The moderating roles of environmental dynamism were also explored. Analytical results based on the survey responses of 486 executives from 139 hospitals show that TMT trust is a prominent mediator in bridging trust in leader and TMT task and relationship conflict. Nonetheless, the direct effect of trust in leader on TMT trust and the mediating effect of TMT trust are diminished under a high level of environmental dynamism. By exploring both the vertical and horizontal trust on both TMT task and relationship conflict in dynamic environments, our study complements prior researches, which typically underlined team trust while ignored the influence of contextual environments. By directly identifying TMT socio-cognitive characteristics (e.g., trust and conflict) in hospitals, the study also closes a significant gap in the upper-echelons literature, which tends to examine TMT demographic compositions as proxies of psychometric characteristics in business contexts.

WB-07.4 [R] • The Impact of Market Competition on Process Innovation in Chinese High-tech Companies: the Moderating Effect of Executive Incentive

Xu Mao; Tongji University, China
Song Chen; Tongji University, China
Jiaying Xu; Tongji University, China

In order to study the role of executive incentive in the relationship between competition and process innovations in enterprises, this paper takes 1398 high-tech manufacturing companies listed between 2013 to 2018 in Shanghai and Shenzhen as research sample, grouped as the total sample, the sample of SOEs, and the sample of non-SOEs with correlation analysis and negative binomial regression analysis. Through research on the total sample of enterprises, it is found that market competition has a positive effect on process innovations and executive compensation incentives have a negative moderating role in the relationship between market competition and process innovations, but the moderating role of executive equity incentives is not significant. Further research finds that the ownership has a positive moderating effect on the relationship between market competition and process innovations, and also affects the moderating role of executive equity incentives. In addition, executive equity incentives have a positive moderating effect on market competition and process innovation in Chinese SOEs.

WD-01 AI in Technology Management-6
Wednesday, 8/7/2024, 14:00 - 15:30
Room: Pavilion East
Chair(s) Sayaka Tokita; Tokyo Keizai University

WD-01.1 [A] • Enhancing Product Designing with the Help of Artificial Intelligence

Dhyeykumar Nikalwala; San Jose State University, United States
Minnie Patel; San Jose State University, United States

In the ever-changing world of business, making a successful product design requires quickly trying out new ideas and listening to what users think. With the integration of Artificial Intelligence (AI), the process of rapidly generating content from existing data becomes easier, accelerating the creation of innovative product concepts. To use this cutting-edge technology to build novel products a framework is essential. The paper aims to propose a novel framework that caters to a customer-centric integration of AI in Product Design. The paper goes beyond theoretical explanation, implementing the framework to iteratively design three diverse products. The implementation also highlights the potential opportunities and challenges of using an AI-enabled framework. Finally, the paper concludes with the critical insights obtained with the implementation of the framework.

WD-01.2 [R] • Content Creation by Generative AI and Operator Perception: A Focus on Operator's Profit-driven Motivation

Sayaka Tokita; Tokyo Keizai University, Japan

In recent years, the widespread adoption of generative AI, exemplified by platforms like ChatGPT and Google Bard, has made AI more approachable. This technology allows users to create content seamlessly through prompt inputs, eliminating the need for specialized skills. However, prevailing research indicates a general tendency among individuals to express negative sentiments toward AI-generated content, often attributed to the perceived absence of intentionality in AI. Despite this, contemporary generative AI, an integral part of our daily lives, inherently involves human operators. By explicitly recognizing the human inputting prompts, there exists a potential for perceiving the operator's intentionality. This raises the question of whether the evaluation of AI-generated content might undergo a shift if such intentionality is discerned. This study delves into the investigation of operator intentionality perception. In Study 1, we explore how content evaluation varies when indicating whether it was generated by AI. Study 2 investigates the perception of the profit-driven motives of content creators when AI is utilized in the creation process compared to when it is not.

WD-01.3 [R] • Synergizing Fiction and Science for Technology Foresight: A Novel Approach Using Combined Large and Small Pre-trained Language Models

Jin Chen; Tsinghua University, China
Keren Zhang; Tsinghua University, China
Qian Chen; Tsinghua University, China
Ziqin Zhu; Tsinghua University, China
Jiawei Lin; Chinese Academy of Sciences, China
Yilun Zhang; Shanghai Jiao Tong University, China

Science fiction has long stood as an abundant source of inspiration, often preempting technological breakthroughs before they occur. However, these predictions are usually constrained by the current level of understanding and analysis. Our research introduces a groundbreaking approach that skillfully integrates the visionary ideas of science fiction with the rigorous analysis of scientific principles to improve the accuracy of predicting technological trends. This method combines the imaginative scope of science fiction with concrete scientific progress, establishing an advanced strategy for predicting technological futures. By moving beyond mere theoretical speculation, our in-depth analysis and predicting model utilize a wide range of cutting-edge technological advancements. The integration of both comprehensive and specialized pre-trained language models is central to our approach. We employ the extensive capabilities of the Llama2 large language model to create context-aware prompts that adeptly encapsulate the technological visions found in science fiction. These visions are then complexly processed through sophisticated, more focused pre-trained models such as BERT, XLNet, and RoBERTa, transforming them into rich semantic vectors. This multi-layered analysis indicates the complex semantic and structural aspects in the fictional narratives. The result is an optimized supervised learning classification model, capable of accurately assessing the viability and practicality of the technologies depicted. Our study offers a fresh perspective on the analysis and prediction of technological trends, illustrating an integration of imaginative fiction and the systematic rigor of scientific research, thereby paving new avenues for understanding future technological innovations.

WD-02 Innovation Management-4

Wednesday, 8/7/2024, 14:00 - 15:30
Room: Pavilion West
Chair(s) Tom Gillpatrick, Portland State University

WD-02.1 [R] • The Influence Mechanism of CVC on Enterprise Innovation Performance and Specialization

Yurui Cheng; Tongji University, China
Song Chen; Tongji University, China
Xunshuo Bian; Tongji University, China
Mao Xu; Tongji University, China

Specialization is the key to cultivate innovative enterprises. As one of the external equity investment sources, investment cases of corporate venture capital (CVC) have been growing in China. Whether CVC can promote enterprise specialization more than traditional venture capital (IVC) remains to be verified. This paper analyzes the influence of CVC on firm specialization, as well as the moderating effect of market competition and mediating role of innovation inputs in this relationship with samples of listed companies on Growth Enterprises Market board in China from 2015 to 2020. By employing a multivariate regression analysis method, the results show that compared with the enterprises without CVC inputs, the enterprises with CVC participation have a higher specialization level. The degree of market competition has a significant moderating effect on the relationship between CVC participation and firm specialization. The greater the degree of market competition, the more significant the promoting effect of CVC participation on firm specialization. Furthermore, innovation performance plays a mediating role in the relationship between CVC participation and firm specialization. Therefore, as a new idea to realize the specialization and innovation of enterprises, the government should strongly support the development of CVC, and encourage start-ups to take the initiative to introduce CVC, so as to improve enterprises' capability to leverage external resources and innovation efficiency and achieve development through specialization.

WD-02.2 [R] • The Contribution of Living Care Labs to Impact-oriented Process Design for the Development of Digital Assistance Systems in the Context of Nursing

Irmtraud Ehrenmueller; University of Applied Sciences Upper Austria, Austria
Rainer P Hasenauer; University of Economics and Business Vienna, Austria
Johannes Kriegel; University of Applied Sciences Upper Austria, Austria

The shortage of skilled workers in the nursing context is shaping Central European societies and thus influencing the securing of the societal expected level of care and nursing services. As an essential solution to mitigate the impending collapse of caregiving, the development and use of digital assistance systems to relieve the burden on nursing staff is being discussed. To this end, there are many different technological solutions that are being developed both in established organizations and in start-ups. This paper deals with this question: what are the most important aspects to develop digital assistance systems effectively to secure the socially relevant extent of care?

WD-02.3 [A] • Demonstrating the Potential Value of Bibliometrics in Divergent Design Thinking Phases for the Development of Innovative Technologies

Alireza Dadashi; German Aerospace Center (DLR), Germany
Kai Wicke; German Aerospace Center (DLR), Germany
Gerko Wende; German Aerospace Center (DLR), Germany

The integration of bibliometrics into an innovation process such as design thinking has the potential to enhance innovation engineering management by providing a comprehensive understanding and valuable insights of the research landscape in a particular domain to support divergent problem and solution phases. This research paper examines and demonstrates the potential benefits and practicability of methodically and operatively incorporating bibliometric scanning into the design thinking process. Thereby, an adapted approach consisting of bibliometric problem and solution scanning is presented and applied to the fields of fuel tank maintenance and robot locomotion in confined spaces. The approach generated a general overview of scientific production based on total publications as well as average citations and identified key concepts and collaborations in the respective fields through co-occurrence and co-authorship network analyses. Two hypotheses regarding the content-related advances respectively the applicability from the innovation team perspective were developed and tested. The results supported both hypotheses and revealed that bibliometrics can complement and enhance the design thinking process by providing data driven knowledge to divergent problem understanding and solution ideation phases. By leveraging the insights obtained from bibliometric scanning, innovation teams can efficiently build on existing knowledge, uncover new opportunities and make more informed and comprehensible decisions to ultimately cre-

ate more impactful solutions.

WD-05 Intellectual Property
Wednesday, 8/7/2024, 14:00 - 15:30
Room: Broadway-III
Chair(s) Yaeko Mitsumori; Osaka University

WD-05.1 [R] • Data Analysis of the Drug Pipeline of Bangladesh: Preparation for the TRIPS-compliant Product Patent Regime

Yaeko Mitsumori; Osaka University, Japan
Monirul Azam; Södertörn University, Sweden

Unlike other least developed countries (LDCs), Bangladesh has a strong pharmaceutical industry. The country was able to develop its pharmaceutical industry partly because of the pharmaceutical patent waiver issued to the LDCs under the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). The country is scheduled to be a developing country in 2026 and hence might not continue its pharmaceutical patent waiver unlike other LDCs after 2026. It is vital for the pharmaceutical firms in Bangladesh to prepare for the TRIPS-compliant patent regime and to initiate a process of change for transforming from mere imitation of technologies to innovative industry and capacity building for developing new drugs in the future. Considering limited technical and financial capacity for developing new drugs among the pharmaceutical firms in Bangladesh, this study analyzes new drug development tendencies among the large pharmaceutical firms in Bangladesh using the commercial database Cortellis by Clarivate. It compares the analytical results on Bangladesh with those on other developing countries (such as India) that changed its patenting system from a process patent structure to a product patent system. This study will give meaningful knowledge and information to other LDC countries which might graduate from LDC status in the future.

WD-05.2 [R] • Role of Technology in the Preservation and Protection of Traditional Knowledge

Rishika Seal; Indian Institute of Technology, India
Gouri A Gargate; Indian Institute of Technology, India

In the current era of knowledge economy, intangible assets play a major role in every aspect of life. Traditional knowledge, which is also known as Indigenous Knowledge, is one of such intangible assets of which identification, protection, and exploration is a major concern for many economies in the world. This paper focuses on the preservation aspect of traditional knowledge. The protection and preservation of traditional knowledge through documentation has been undoubtedly established through various research and time-tested approaches. It is now the era to combine the most lucrative and promising tactics with the existing methods of protection of traditional knowledge - technology. The utilization of technology in safeguarding and conserving traditional knowledge may signify a transformative approach to cultural preservation. The part of technology that is currently being used for the digital archives and databases to provide secure repositories for organizing and storing ancestral wisdom employing metadata standards for efficient retrieval is very insignificant compared to the unimaginable heights that can be achieved through the proper use of the available resources of technology in the protection of traditional knowledge. One of the substantial advancements in technology has been the advent of the concept of blockchain. The immutability of blockchain ensures that once knowledge is recorded on the ledger, it cannot be altered or tampered with. Blockchain technology can implement encrypted access controls, allowing communities to manage permissions and control who has access to specific aspects of their traditional knowledge. This empowers communities to maintain control over their cultural heritage. The authors discuss the use of block chain technology for traditional knowledge preservation and exploration. Exploratory research and non-empirical methodology are applied for the research.

WD-05.3 [R] • Patent Pools in the Automobile Industry: A Case Study of Internet of Things

Sherin Priyan; Indian Institute of Technology, India
Gouri Gargate; Indian Institute of Technology, India

Patent pools are a form of technology licensing model that eases the transaction cost between licensors and licensees. The authors in this paper have presented a case study on the patent pool models in the automotive industry, emphasizing the role of standard essential patents in the smart technology used in vehicles. This is of particular importance in the present times due to the extension of telecommunication technologies to the automotive industry such as smart cars. The authors have conducted this study by analysis of the basic, core, and essential patents to measure the innovative potential in the automobile industry. This is essential to study the effectiveness of the patent pool which depends on the number of essential and complementary patents licensed in the pool. This paper uses patent analytics to study the effect of the interoperability of standards in the industry. The authors have observed that joint licensing models between telecommunications and automotive industries can be more effective with the use of patent pools. The authors have discussed a comprehensive framework to incorporate patent pools, to accommodate incentives given to the standard essential patent holder while also maintaining the innovation capabilities of the industry.

WD-05.4 [R] • IP Evaluation and Technology Transfer

Gouri A Gargate; Indian Institute of Technology Kharagpur, India

Technology has paved the way for tremendous growth. With the invention of Industry 4.0, technology has no bounds. This boon of technological advancement seems boundless hence diverse to manage. Academic institutions are the hub of technological development. These institutes rigorously work towards bringing intellectual property (IP) and inventions that would contribute to society's development. Academic Institute being the source of technology birth, needs to be prioritized, concerning challenges faced in the management of technology. Various processes like Intellectual property due diligence, IP Audit, and IP valuation affect the technology and its impact on the economic, social, political, and managerial and technical aspects. Academic institutes which have efficient IP management systems produce excellent results and technology transfer is on the higher threshold. In this paper, the process of IP management at an academic institute level is demonstrated by applying the IP audit model. Further various parameters would be mentioned for IP evaluation, which would be intrinsic for evaluating technology and facilitating technology transfer. This study focuses on technology management at an academic institute level, one of the milestones of research and development concerning technology.

WD-06 Information Management
Wednesday, 8/7/2024, 14:00 - 15:30
Room: Broadway-IV
Chair(s) Jeff R Carpenter; Portland State University

WD-06.1 [R] • A System-dynamics-based Model to Study the Implementation of Big Data with ETL Process in the Automobile Manufacturing Industry

Mario A Negrete-Rodriguez; Tecnologico de Monterrey, Mexico
Cesar M Martinez-Soto; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
David Güemes-Castorena; Tecnológico de Monterrey, Mexico

Industry 4.0 marks a transformative paradigm, heralding a new era for the production and service sectors by integrating Big Data technologies. This progression unlocks latent knowledge within vast datasets, empowering decision-making through advanced analytics. However, the literature lacks a comprehensive understanding of the impact of such integration on organizational structures. Despite Big Data's maturation, its economic influence on industry operations is not fully understood and warrants further investigation. Understanding the implications of technology adoption is crucial to minimize the risks associated with capital investments. This study proposes a System-Dynamics-based model of Big Data architecture utilizing vehicular sensor data warehouses. The model delineates the application of the Extract, Transform, Load (ETL) process via Amazon Web Services (AWS), employing the Glue service for data integration and Quicksight to visualize insights. This approach aims to

understand the advantages and disadvantages of Big Data in the automobile manufacturing industry. Also, it provides a strategic foresight into technology investment and enhances the analytical capabilities within the manufacturing domain.

WD-06.2 [R] • A System-dynamic-based Model to Study the Effect of Singular AWS Bucket Management Big Data Architecture into the Automotive Industry

Cesar M Martinez-Soto; Tecnologico de Monterrey, Mexico
Mario A Negrete-Rodriguez; Tecnologico de Monterrey, Mexico
Armando Elizondo-Noriega; Tecnologico de Monterrey, Mexico
David Güemes-Castorena; Tecnológico de Monterrey, Mexico

Industry 4.0 is a paradigm that relies on the latest production and service evolution stage, with Big Data technology playing a pivotal role. This data volume enables interpreting significant insights through latent data mining to enhance decision-making capabilities. Although the use of Big Data technology is becoming common and adopted in manufacturing facilities, more research is needed on the impact of implementing this paradigm in organizations. Regardless of Big Data's maturation, its extensive economic influence on industrial performance is yet to be fully understood. This gap highlights the necessity of several analyses to mitigate the risks associated with technological investments. This paper proposes a System-Dynamic-based model to study the economic impact of Big Data architecture in the automotive industry. The proposed model considers sensor data from various vehicles into a singular AWS bucket. This architecture facilitates comprehensive data analysis and reporting via AWS Quicksight service using the structure of a Redshift data warehouse. The proposed model serves as a strategic tool for technological assessment and a method for effective Big Data utilization in the automotive sector.

WD-07 Technology Roadmapping
Wednesday, 8/7/2024, 14:00 - 15:30
Room: Park
Chair(s) Nathasit Gerdsri; Mahidol Univeristy

WD-07.1 [R] • Comparing an Expert-based Study with a Bibliometric and LDA Analysis to Support Roadmapping

Andre Gomes; Federal University of Minas Gerais, Brazil
Maicon Oliveira; University of Sao Paulo, Brazil
Jonathan Freitas; Federal University of Minas Gerais, Brazil
Nicky Athanassopoulou; University of Cambridge, United Kingdom
Carol Worthman; Emory University, United States
Rory O"Connor; University of Glasgow, United Kingdom
Robert Phaal; University of Cambridge, United Kingdom

This study aims to compare the convergence between a qualitative expert-based analysis developed within a roadmapping project and a quantitative-based analysis using bibliometric techniques. It addressed articles selected by 31 international experts in a roadmapping project commissioned by an organization focused on young people's mental health. The experts selected pertinent articles to support the roadmapping strategic landscape. In total, 209 references were analyzed using bibliometric techniques, topic modeling, and Latent Dirichlet Allocation (LDA). Most of the results from the expert analysis converged with the bibliometric study, with some additions coming from the quantitative analysis. This study shows that a quantitative approach, based on data mining techniques, can provide a starting point and enhance the discussion necessary for creating technology roadmaps by confirming or providing a different perspective than the ones obtained from workshops with specialists.

WD-07.2 [R] • Which Technologies Will Drive the Battery Electric Vehicle Industry?: A Keyword Network Based Roadmapping

Karuna Jain; Indian Institute of Technology, India
Madhur Srivastava; Indian Institute of Technology, India

Battery Electric Vehicles (BEVs) have unraveled as a potential solution to address the global pollution crisis and alter the global oil trade structure. With various evolving technologies and improving the efficiency of BEVs, it is imperative to analyze the developmental trends and identify the technologies at the cutting edge that will shape the development of the future BEV industry. Using text mining of patent abstracts, we develop keywords-based technology maps for technologies converging in a BEV. The resulting maps reveal the development of various battery chemistries with potential BEV applications. This evidence-based approach will help policymakers at the macro level and decision-makers at the micro level to identify and forecast the futuristic realm for investments in the proximate technologies for competence development and manage technology-related decisions for acquisition and exploitation.

WD-07.3 [A] • Unleashing Strategic Agility: Roadmapping Owner-Led Creative SMEs

Serge Y Bruylants; KOLAR Design, United States
Ronald Vatananan-Thesenvitz; Bangkok University, Thailand

Roadmapping is a strategic alignment tool commonly used in large organizations, but its potential for small and medium enterprises (SMEs) has received little attention. This research investigates the potential benefits and challenges of adopting roadmapping in SMEs to improve their strategic planning processes. This application paper examines the case of an owner-entrepreneur-led creative company to understand how SMEs can effectively use roadmapping to align technology development with business strategies and identify strategic opportunities. By engaging the owner-entrepreneur and critical stakeholders in the roadmapping process, the research aims to identify practical insights into the adaptability and effectiveness of strategic roadmapping for SMEs in the creative industries. The findings suggest that roadmapping can facilitate strategic decision-making, improve technology development alignment, and promote a proactive approach to identifying and exploring strategic opportunities in SMEs. The results also contribute to the academic understanding of strategic planning in SMEs and provide actionable guidance for owner-entrepreneurs and managers seeking a roadmapping approach for sustained growth and competitiveness.

WD-07.4 [A] • Responsive Scenario-based Roadmapping: Applying System Dynamics to Enhance Scenario-based Roadmapping

Pawat Tansurat; Mahidol University, Thailand
Nathasit Gerdsri; Mahidol University, Thailand

As the business environment has been anticipated to be more dynamic, uncertain, and complex, it is more difficult for technology managers to set up their technology plan or roadmap. The recent research on scenario-based roadmapping aims to enhance the robustness of the TRM process in order to cope with dynamic environments and uncertainties. However, the current practices need to be more responsive to deal with dynamic conditions. This paper proposes the analysis framework of responsive scenario-based roadmapping by integrating system dynamics (SD) into the roadmapping process. The SD is for analyzing a complicated system, building scenarios, and making a "responsive" process for scenario-based roadmapping. Moreover, our framework integrates the TRM status signal (STRM), which is essential for evaluating the status of a roadmap. If the impact is severe, the current roadmap needs to be revised. A "step-by-step" approach is provided in this paper. With the proposed approach of responsive scenario-based roadmapping, the process of technology roadmapping will be more responsive to deal with uncertain circumstances, mitigate foreseeable risks, and identify potential opportunities in advance.

WE-01 AI in Technology Management-7
Wednesday, 8/7/2024, 16:00 - 17:30
Room: Pavilion East
Chair(s) Jihwan Lee; Pukyong National University

WE-01.1 [R] • AI at Work: Performance Paradigms in the Age of Automation from the OCDE

Jessica Lopez-Garcia; Autonomous University of Baja California, Mexico

David Romero-Gomez; Autonomous University of Baja California, Mexico
Manuel Castañón-Puga; Autonomous University of Baja California, Mexico
Eduardo Ahumada-Tello; Autonomous University of Baja California, Mexico

This paper explores the multifaceted impact of Artificial Intelligence (AI) on the workplace, focusing on worker performance, job satisfaction, and the nuanced perceptions of job security across different demographic groups. Through an analysis of data from OECD 2022's AI surveys of employers and workers, we investigate three hypotheses: the positive impact of AI adoption by employers on worker performance, the enhancement of work performance and job satisfaction through AI-related training and upskilling, and the varied perceptions of AI's impact on job security and working conditions among different demographic groups. Our findings reveal that, contrary to common concerns, AI's integration into the workforce can improve decision-making, efficiency, and even employee happiness, if employees are adequately trained and engaged in AI's implementation process. The study underscores the importance of strategic AI integration and training to harness its full potential for enhancing organizational performance and employee well-being.

WE-01.3 [R] • Paradoxes and Coping Practices in AI Servitization: An Exploratory Study of Four Chinese Manufacturers

Xinyi Lin; School of Management, Zhejiang University, China
Dong Wu; Zhejiang University, China
Coreynen Wim; School of Management, Zhejiang University, Belgium

New digital technologies are rapidly changing how companies do business. The latest wave of artificial intelligence (AI) technologies is further boosting this process, especially among high-tech manufacturers, leading to new opportunities for new service-oriented business models. In this paper, we refer to this process as "AI servitization" (i.e., artificially intelligent servitization). Moreover, while AI offers many opportunities, it also brings new challenges for companies. The purpose of this paper is to further explore these issues. Based on a comparative case study of four Chinese high-tech manufacturing firms, we develop theory on AI servitization and its associated paradoxes and coping practices. Methodologically, we first perform within-case analyses, zooming into each manufacturer in detail, followed by a cross-case analysis where we compare the cases on the study's selected key issues (i.e., types of services and AI technologies, paradoxes, and coping practices). Theoretically, we propose a two-dimensional framework considering manufacturers' service focus (i.e., product-oriented vs. customer process-oriented) and the architecture (i.e., modular vs. integral) of their AI-based products and associated platforms, unveiling four "ideal" types of AI servitization. Next, we discuss four types of paradoxes - namely, economic, technological, organizational, and institutional - encountered by the studied firms as well as the practices that they deploy to cope with them. The insights generated from this study offer practical implications for managers to pinpoint their current AI service position and think of future innovation pathways, and for researchers to further develop the research field of AI servitization.

WE-01.4 [R] • Entry Timing, Pre-entry Knowledge Diversity, and Innovation Performance in AI Technology

Xinyi Lin; School of Management, Zhejiang University, China
Dong Wu; Zhejiang University, China

With the breakthroughs in algorithms, computing power, and big data, artificial intelligence (AI) technology has garnered widespread attention in both academic and industrial spheres. The existing literature on entry timing predominantly focuses on the traditional manufacturing industry, treating knowledge as merely a resource or capability foundation, and often overlooks the dynamic knowledge capabilities specific to the AI industry, where existing knowledge can be self-learned, and new knowledge can be autonomously generated. Through a dynamic knowledge capability lens, this paper seeks to elucidate the relationship between entry timing and AI-based innovation performance within the AI industry, as well as the moderating impact of pre-entry knowledge diversity. In this study, we analyze data from 891 AI firms in China, obtained using an AI-related keywords database, and compile 2,101 panel data points from 2018 to 2020 for regression analysis. The findings reveal a U-shaped relationship between entry timing and AI-based innovation performance, which is negatively moderated by pre-entry knowledge diversity. This paper dissects the dynamic knowledge capability mechanism that underlies entry timing in the AI industry and provides a practical framework for firms with varying levels of pre-entry knowledge diversity.

WE-02 Innovation Management-5
Wednesday, 8/7/2024, 16:00 - 17:30
Room: Pavilion West
Chair(s) Ronald Vatananan-Thesenvitz; Bangkok University

WE-02.1 [R] • Conceptualizing Data-driven Frugal Innovation: A Case from the Philippines

Michael P Cañares; Step Up Consulting, Philippines
Ronald Vatananan-Thesenvitz; Bangkok University, Thailand

Frugal innovation presents a compelling strategy for tackling socio-economic challenges in emerging economies. Characterized by its focus on cost-effectiveness and resource efficiency, frugal innovation has yielded practical, affordable, and environmentally sustainable solutions for underserved populations. However, integrating data-driven methodologies within this paradigm holds significant potential for further advancement. This research paper aims to understand the data-driven frugal innovation (DDFI) concept by exploring its emergence, challenges, and implications to inform policy and practice in pursuing impactful and sustainable development. The study developed a theoretical framework based on insights from DDFI publications that became the foundation for investigating a case of DDFI in the Philippines. The results of 21 surveyed DDFI innovators indicate the presence of a significant institutional void (e.g., market gap, lack of service arrangements, or absence of relevant regulations), where data can offer substantial benefits, is a primary consideration for developing DDFI. Beyond this void, innovator expertise, access to funding and technology, effective partnerships across diverse stakeholders, and transparent development processes emerge as critical factors driving DDFI development. Notably, the findings reveal that frugality in terms of data, technology, and funding does not hinder development.

WE-02.2 [R] • External Technological Knowledge Acquisition in Developing Country Firms

Khaleel Malik; The University of Manchester, United Kingdom

This paper analyses how the acquisition of external technological knowledge should improve the innovation capabilities of firms in developing countries, as this is underdeveloped in the innovation management literature. We draw on empirical evidence from past research projects undertaken by UK and Asia-based researchers presenting insights from eight firms (3-5 interviews per firm) that received technologies from inter-firm collaborators based in advanced economies. All eight firms, based across Bangladesh, Sri Lanka and Thailand, acted as receivers of new knowledge via international technology transfer (ITT) agreements. Complemented with theory insights we confirm that receiver firms face challenges around skills gap/lack of absorptive capacity; lack of training (e.g. with new technologies); language barriers; and lack of on-site installation/commissioning support from sender firms. We show why it is important that developing country firms require good support, not only from the technology-sending firms but also from government policy measures to help effectively acquire and absorb external knowledge. Hence, senior management needs to more prudently pre-plan ITT agreements and invest in more business skills training for staff to overcome ITT barriers and encourage the development of future innovation capabilities. This is crucial for developing country firms' international competitiveness and growth.

WE-02.3 [R] • Semi-integral Architecture: Sustainable Infrastructure Concept

Atsunori Someya; Metropolitan Expressway Company Limited, Japan
Manabu Sawaguchi; Ritsumeikan University, Japan

In recent years, the percentage of infrastructure in Japan that is more than 50 years old has increased at an accelerating rate. This is due to the fact that most infrastructure, such as roads, was built after the period of high economic growth. In order to continue to use these existing infrastructures in the future, it is essential to create innovations in maintenance and repair. In

this paper, we focus on bridges, as a typical constituent of road infrastructure, and propose a new concept of product architecture called "semi-integral type" based on the characteristics of bridges as a clue to solve such problems. Infrastructures such as bridges are used for a long period of time with maintenance and repair, unlike "modular type" personal computers and home appliances, or "integral type" automobiles with internal combustion engines. Semi-integral type is a concept that promotes an understanding of sustainable infrastructure that aims to extend the life and improve the functionality of existing infrastructure through partial improvement and expansion of existing structures. This concept is expected to contribute to the creation of innovation, technological strategies for companies, and the circular economy through the effective use of resources and longevity.

WE-03 Strategic Management of Technology-3
Wednesday, 8/7/2024, 16:00 - 17:30
Room: Broadway-I
Chair(s) Hugo C Gomez-Guzman; PepsiCo (retired)

WE-03.1 [A] • Application of Network Analysis for Strategic Research and Development Management

Hideki Hayashida; Tokyo University of Agriculture and Technology, Japan
Hiroki Funashima; Kindai University Technical College, Japan

Using the development of organoid technology as an example, we combined open patent data with network analysis to analyze what kind of information network would promote R&D. The results of the analysis revealed that it is now possible to look at the position of research groups from a bird's eye view, and to identify research institutions in structural hole positions. This analysis suggested that identifying research institutions in structural hole positions and conducting joint research with research institutions rich in information could accelerate research and create strategic research and development management beneficial to practitioners.

WE-03.2 [R] • Tensions in Digitalization in Higher Education: Learning from the Past to Guide Digital Transformation

Fredrik Liljeblad; KTH Royal Institute of Technology, Sweden
Joakim Lilliesköld; KTH Royal Institute of Technology, Sweden
Ermal Hetemi; Linnaeus University, Sweden

This study examines the critical role of university IT departments in the digital transformation of higher education institutions. Despite their expertise, these departments often face challenges in facilitating digital transformation. Through a historical case study of a prominent research university, this paper explores the evolution of technology and organizational logic within the university's IT governance and its shortcomings in supporting digital transformation. It presents an in-depth analysis of the co-evolution of technological advancements and the organization responsible for technology support and maintenance. The paper traces the transition from the early era, dominated by academic logics, to contemporary IT organizations driven by bureaucratic and internal market logics. It further investigates the preference for specific technological solutions under different organizational logics. Crucially, the paper highlights a misalignment between the traditional logic of IT organizations and the demands of digital transformation, demonstrating that conventional IT approaches and logics are insufficient for addressing the challenges of digital transformation.

WE-03.3 [A] • A Systems Approach to Prepare Military Functions for Climate Change

Elizabeth M Pacyna; Portland State University, United States
Gary O Langford; Portland State University, United States
Herman J Migliore; Portland State University, United States
Charles M Weber; Portland State University, United States

Despite prolonged governmental disagreement on the topic of climate change, military departments have recently devised strategies with a climate-centric focus to enhance the resilience and sustainability of operations in anticipation of rapid environmental changes. While these strategies represent progress in acknowledging the serious impacts of climate change, limited understanding and disjointed efforts have resulted in unvalidated plans that mask true progress by prioritizing completion of tasks over measurement of performance. This paper advocates for improving strategies through a systems approach by using an interpretive integrative framework to evaluate environmental impacts on military operations. The outcomes will aid organizations to better identify and monitor necessary actions essential for climate change preparation and mitigation, resulting in sustainable operations and resilient forces prepared for geostrategic challenges, deteriorated security conditions, and increased demand for military resources.

WE-04 Information Communication Technologies-1
Wednesday, 8/7/2024, 16:00 - 17:30
Room: Broadway-II
Chair(s) Dilek Cetindamar; University of Technology Sydney

WE-04.1 [R] • Blame Shifting, Shopping Intensity, and Revisit Likelihood in Data Breaches

John N Angelis; University of Lynchburg, United States
Rajendran Murthy; Rochester Institute of Technology, United States

Data thefts have increased in frequency and cause a loss of customer trust and business. Previous research has studied how the public assigns blame for the crime, and how this affects the likelihood that the public will revisit the firm. In addition, the negative emotional response of the public to data breaches has been frequently studied. However, previous research has been inconclusive on whether frequent shoppers will be more likely to shift blame away from the business, and whether they will be more likely to return. Our survey of 315 individuals provides insight into how frequent customers differ from the general public. Specifically, the relationship between placing greater proportion of blame on data breach victims (relative to the hacked business) and revisit intention is moderated by prior shopping intensity. Those who placed greater blame on the data breach victims were more likely to return to the breached business. Frequent shoppers are indeed more likely to return to the breached business. We put this result in context with the literature on customer loyalty and recommend that businesses monitor public sentiment carefully and match their crisis response to their target customer audience.

WE-04.2 [R] • Setting an Agenda for Technology Professionals to Overcome the Challenges of Earthquakes

Dilek Cetindamar; University of Technology Sydney, Australia

This paper aims to explore the challenges and opportunities associated with earthquakes and how technology and engineering management professionals might contribute to enhancing the resilience of countries in the face of earthquakes. The study presents the Great East Japan Earthquake (2011) and Turkey-Syria Earthquake (2023). The exploration of these earthquakes provides valuable insights into the challenges experienced at social, environmental, and economic levels. By summarizing the key roles of information system technologies in earthquakes, the paper invites technology professionals who could consider how their research could develop and implement technologies so that countries might build strong earthquake resilience.

WE-04.4 [R] • A Study of Subscription Gifting as Donation on Twitch Social Live Streaming Service under COVID-19 Pandemic Situation

Hisayuki Kunigita; Japan Advanced Institute of Science and Technology, Japan
Youji Kohda; Japan Advanced Institute of Science and Technology, Japan

On social live streaming services such as Twitch, live broadcasting by digital game players, or streamers, has become more and more active, and the number of viewers has sharply increased since the spring of 2020 because of the COVID-19 pandemic. Twitch offers subscription gifting as a way for viewers to donate to streamers. A viewer purchases a subscription to a streamer's channel and gifts it to another viewer. The subscription fee is divided between Twitch and the streamer at a specific ratio. Subscription gifting increased sharply

for each streamer in the spring of 2020 than before. This paper focuses on the increase in subscription gifting and provides a correlation analysis between subscription gifting and social density in the virtual world during the pandemic in the spring of 2020 using real Twitch data from TwitchTracker.com. We hypothesize that the increase in social density due to the sharp increase in the number of viewers during the pandemic has led to this significant increase in subscription gifting. We anticipate that the results of our analysis can contribute to the design of new services in the post-pandemic new normal with a better understanding of human behavior in emergency situations.

WE-05 Entrepreneurship/ Intrapreneurship
Wednesday, 8/7/2024, 16:00 - 17:30
Room: Broadway-III
Chair(s) Nasir Sheikh; Portland State University

WE-05.1 [R] • What Factors Influence Entrepreneurial Decision-making?: Insights from Technology-intensive Firms in Taiwan

Yi-Fan Lung; National Tsing Hua University, Taiwan
Mei-Chih Hu; National Tsing Hua University, Taiwan

Researchers in entrepreneurship have extensively discussed the factors that influence entrepreneurial decision-making. However, it remains unclear whether the interactions among these factors may influence an entrepreneur's decision to pursue a venture. To bridge this gap, this research specifically examines how external and internal factors interact and collectively shape an entrepreneur's decisions about exploiting opportunities. Using research methods from inductive to deductive, the research first applies the Delphi method to identify ten factors perceived by entrepreneurs that influence their decision-making. Next, by utilizing the DEMATEL (DEcision-MAking Trial and Evaluation Laboratory) and ISM (Interpretive Structural Modeling) methods, the research determines the causal relationships and hierarchical significance of these factors. The results identify a significant causal path: (external—internal—external), suggesting that an entrepreneur undergoes an internal perceptual process to sense the impact of external information, which further influences how entrepreneurs perceive resources and ultimately shapes their entrepreneurial decisions. Moreover, external factors are identified as the main influencing factors, while the perception of resources, though valued by entrepreneurs, is susceptible to influence. Innovative firms and entrepreneurs must assess whether environmental contexts represent a "window of opportunity" and subsequently consider their needs, abilities, and motivations to effectively leverage resources when starting a new venture.

WE-05.2 [R] • The Effect of Technostress to Employee's Job Burnout in Organization within Thailand

Jul Thanasrivanitchai; Kasetsart University, Thailand
Thanawan Torasamphan; Kasetsart University, Thailand

This paper investigated the relationship between Technostress and Job Burnout in an organization in Bangkok, Thailand. Most of the previous research investigated other factors that affect Job Burnout. As nowadays, many advanced technologies are used in organizations much more than in former times. The noteworthy technological changes occurring in today's organization, exacerbated by the COVID-19 outbreak which help us work from home productivity. Consequently, this research studied the stress that is caused by technologies and guides organizations to shrink the occurrence of technostress. The results of this study confirmed that Technostress components that significantly affect Job Burnout are Techno Invasion, Techno Insecurity and Techno Uncertainty. Our findings suggest that the organization must have an appropriate response plan to cope with the Techno Invasion, Techno Insecurity and Techno Uncertainty that will occur to the employees and reduce the risk of causing a burnout condition which may lead to employee resignation.

WE-06 Technology Management in the Semiconductor Industry
Wednesday, 8/7/2024, 16:00 - 17:30
Room: Broadway-IV
Chair(s) Leonard B Weitman; Weitman Consulting

WE-06.1 [R] • Forecasting Trend of Technological Momentum for Semiconductor Industry

Tsung-Han Ke; National Chi Nan University, Taiwan
Hung-Chun Huang; National Chi Nan University, Taiwan
Hsin-Yu Shih; National Chi Nan University, Taiwan

The relationship between technology and society is multifaceted. This study acknowledges the influence of both human actors and internal system dynamics on technological progress. While some scholars emphasize either technological determinism or social constructivism, this research adopts a balanced perspective informed by the work of Hughes [1]. Hughes highlights the agency of individuals, governments, and corporations in shaping technology, but also introduces the concept of momentum in sociotechnical systems. This momentum suggests an autonomous evolutionary force within the system, independent of direct human control. To explore this concept, the study utilizes econometric analysis of time series data on patents granted in the semiconductor industry. The goal is to unveil and forecast the trajectory of technological momentum within this industry. By analyzing these trends, the research aims to provide a deeper understanding of the interplay between human influence and the inherent momentum of sociotechnical systems.

WE-06.2 [R] • Technological Intricacy and Technological Regime Changes

Hung-Chun Huang; National Chi Nan University, Taiwan
Hsin-Yu Shih; National Chi Nan University, Taiwan
Tsung-Han Ke; National Chi Nan University, Taiwan

The evolution of technology demonstrates changes in technological efficiency and reflects mutations in firms' behaviors. Over the past four decades, the semiconductor industry has undergone changes characterized by fragmentation opportunities, transient appropriability, and segmental cumulativeness. However, the understanding of which firm behaviors drive these industry changes remains insufficient. This study aims to investigate how the technology-intensive industry evolves. The perspective of the technology network provides an analytic framework for understanding this knowledge-based industry. The implications of current industry features suggest that firms should strategize within specific technological niches.

WE-06.3 [R] • Constructing Financial Support Ecosystem of Innovation Momentum for Semiconductor Industry

Tsung-Han Ke; National Chi Nan University, Taiwan
Hung-Chun Huang; National Chi Nan University, Taiwan
Hsin-Yu Shih; National Chi Nan University, Taiwan

Based on the "social construction of technology" perspective, this study explores the intricate interaction between technological ecosystems and capital markets. It argues that technological innovation fosters the emergence of socio-technical systems with internal dynamics and external environmental influences. Notably, the capital market plays a crucial role within these systems. To ensure efficient operation, information on technological advancements and financial markets needs to circulate freely. This research employs econometric analysis to investigate the co-movement between technological trajectories, the Philadelphia Semiconductor Index (SOX), and the Nasdaq Composite Index (IXIC). By analyzing these key market indicators, the study aims to shed light on the interplay between technological management ecosystems and the macro-economic environment. This analysis contributes to a deeper understanding of how technological developments shape ecosystems and how these ecosystems, in turn, interact with capital market dynamics.

HA-01 PLENARY: PLENARY-4

DATE: THURSDAY, 8/8/2024
TIME: 08:30-10:00

SESSIONS

ROOM: PAVILION
CHAIR: HARM-JAN STEENHUIS;
HAWAII PACIFIC UNIVERSITY

HA-00.1 [K] • Digitalization Processes and Industry 4.0 in Mexican Multilatinas

Gabriela Dutrénit; Universidad Autónoma Metropolitana (UAM), Mexico

There is already extensive literature on processes of technological capability accumulation (TCA) at the company level. These capabilities differ between companies and are the basis of their innovative activity and competitiveness. The literature on developing countries and emerging economies shows that companies tend to adopt adaptive TCA strategies, rather than strategies aimed at leading processes to move the technological frontier based on R&D activities. The productive structure of these countries is heterogeneous; there are companies that compete near the frontier of knowledge and technology, while others are far behind. Many of the most modern companies are multilatinas, that is, multinationals that have their headquarters in Latin America, for example in Mexico. These multilatinas are large companies (more than 10,000 employees), with many production plants (generally more than 10 plants) located in different countries and continents. Many of these companies are connected to global value chains. The objective of this presentation is to analyze both internal factors and the incidence of the economic, environmental, cultural, sociopolitical and scientific and technological spheres, including science, technology and innovation policies, in the TCA processes of Mexican multilatinas. The processes of digitalization and introduction of industry 4.0 are particularly explored, differentiating the drivers of multilatinas that are or are not connected to global value chains. Based on a multiple case study methodology, a set of multilatinas in the auto parts and cable production industries for the generation, transmission and distribution of electrical energy are compared.

HA-00.2 [K] • The 7 Deadly Sins of Business Transformation

Mohan Nair; Emerge Inc, United States

When markets transform, companies caught unprepared are left behind. But those who recognize that change is in the air, who are prepared for market shifts, not only prevail but soar to new competitive heights. Transformation is usually equated with digital transformation for businesses which want to accelerate their capabilities, especially in the world of AI. But the real change is one that is prepared years before such structural changes and is a set of capabilities that must be created, energized or even purchased to create the eyesight and insight to see in the fog of future. AirBnB, Disney, and Uber were not created from disruption. They were created from a transformative mindset employed during a structural change in the market resulting in a new recipe unseen by the majority. Now they are the majority. This presentation will focus on the "seven deadly sins of business transformation" and cover the virtues of businesses which used technology while creating a business model recipe to enact their vision. Focusing on the "seven deadly sins" that businesses must avoid in order to survive and thrive during market fluctuations, this presentation will offer a way to view transformation and guide through anticipating, understanding and riding the waves. It will: • Examine the new principles of transformation in business. • Explain the value of purpose/cause in organizations. • Explore market momentum and how to identify it. • Focus on value propositions and "values propositions." • Elaborate on the role of a performance platform in the achievement of an organization.

HB-01AI in Technology Management-8
Thursday, 8/8/2024, 10:30 - 12:00
Room: Pavilion East
Chair(s)Antonie J Jetter; Portland State University

HB-01.1 [R] • Sustainable Enterprise Architecture: A Critical Imperative for Substantiating Artificial Intelligence

Nampuraja Enose Kamalabai; LUT University, Finland
Ilkka Donoghue; LUT University, Finland
Lea Hannola; LUT University, Finland

The industry is at an interesting inflection point with Artificial Intelligence (AI) rapidly emerging as an integral part of business strategy and operations. Recognizing this central role of AI, there is an increasing demand on Enterprise Architectures to play a pivotal role in sustainably integrating AI environments and driving organizations' transformation agenda. This has opened significant opportunities and challenges for the enterprise architecture (EA) function in harnessing the full potential of AI. A critical analysis therefore explicates the need for a rapid refresh of traditional enterprise architectures by architecting sustainability principles into its design and instilling a holistic view to guide its evolution. This paper therefore seeks to analyze the existing enterprise architectural principles and strengthen its core by applying sustainable architectural principles that guide to a holistic architectural blueprint. Notwithstanding to define and strengthen architectural design, this approach believes in tapping into digital architecture best practices that enables secure access of data using open interfaces to ensure interoperability on an adaptive design with resiliency. The principles would provide the basic guidelines in defining organizations' AI strategy and provide the basis for architectural design decisions on setting about organizations' AI mission.

HB-01.2 [A] Training Practitioners for Real-time Product Development Using Generative Artificial Intelligence

Antonie J Jetter; Portland State University, United States
Ameeta Agarwal; Portland State University, United States
Dahm M Hongchai; Portland State University, United States
Charles M Weber; Portland State University, United States
Yufei Tao; Portland State University, United States

A workshop to train practitioners in real-time new product development (NPD) using generative artificial intelligence (AI) was conducted. Three teams of graduate students in Engineering and Technology Management (many with work experience as managers and engineers) were given minimalist instructions to develop a product concept and a preliminary marketing plan for a product of their choosing within six hours using ChatGPT, search engines, and other Internet-based tools. The product was to be novel, and the plan was to include customer identification, market analysis, generating personas, and a 15-minute presentation at the end of the workshop. The goal was to "inspire a sales force." A panel of judges, which included the authors and an external marketing professional, determined the strengths, weaknesses, and viability of the development efforts of the teams. The results of the workshop validated the utility of AI in NPD for multiple industries. The panel rated the output of the effort of the teams as "highly creative" and potentially viable in the real world. The most significant contribution of the workshop was demonstrating the speed at which product development activity could be performed.

HB-01.3 [R] • Assessment of EV Adoption Perspectives

Bilgehan Yildiz; University of San Francisco, United States

The escalating concern over energy sustainability and environmental impact has thrust Electric Vehicles (EVs) into the spotlight, prompting governments to address climate change through policies and regulations. Despite concerted efforts, the transition to EVs faces multifaceted challenges involving diverse stakeholders such as governments, policy makers, EV manufacturers, and Non-Governmental Organizations (NGOs). This research aims to bridge the gap in existing literature by developing a comprehensive evaluation model to assess the criticality of EV perspectives that are hindering EV adoption. This study compiles data on EV adoption barriers, categorizing them into high-level Social, Technical, Environmental, Economic, and Political (STEEP) perspectives, perceived as critical by decision makers in the adoption process. Utilizing a Hierarchical Decision Model (HDM), the research constructs a generalized assessment framework. Stakeholder input was systematically collected, and expert qualitative assessments were quantified using pairwise comparison. This approach offers a structured and comprehensive understanding of the challenges hindering EV adoption, facilitating informed decision-making for policymakers and industry stakeholders. Results indicate that the Economic perspective plays a pivotal role in EV adoption. This research

provides valuable insights for policymakers, automotive manufacturers, and other stakeholders involved in the transition towards sustainable transportation solutions.

HB-02Innovation Management-6
Thursday, 8/8/2024, 10:30 - 12:00
Room: Pavilion West
Chair(s) Leonard B Weitman; Weitman Consulting

HB-02.1 [R] • Exporting the Innovative Momentum: The Case in the Semiconductor 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

The semiconductor industry has evolved in technological intricacy, which has rarely been examined. The current study argues that technological development follows the ontological rule to improve the existing features. A longitudinal study is required to explore the changes in the technological trajectory. It adopts two major approaches to measuring the chaos of the technological trajectory: Lyapunov exponents and the Chow test. The innovation trajectory has changed from the order phase to the chaotic phase. Since 2018, many countries have faced a shortage of IC chips, prompting discussions on self-reliance in chip production as part of national development policies. This issue serves as an incentive to understand the evolution of the semiconductor industry and its current state. The implications of this study can help authorities initiate relatively industrial policy and provide incumbents to thoughtfully consider their technological network strategy and latecomers to precisely posit their technological niche.

HB-02.2 [R] • Cross-market Innovation: The Dynamics of Latecomer Catching-up Model from Emerging Chinese Electric Vehicle OEMs

Lewis Wei Liu; Tsinghua University, China
Xianjun Li; Tsinghua University, China
Yu Xiong; Tsinghua University, China
Kun Feng; Jilin University, China
Yu Fu; Tsinghua University, China

Mainstream technology catching-up studies only focus on how latecomers assimilate the acquired technology from the developed countries in their home country, paying little attention to their technology innovation activities directly in the developed countries and interactions with the home country to overcome first-mover advantages and catching-up with incumbents. This study examines the practices of the rapidly rising Chinese new entrants of electric vehicle (EV) OEMs, discovers the mechanism and path of Cross-Market Innovation (CMI), establishes its structural model based on multiple case analysis, proposes a three-stage progressing path and three integration mechanisms, and provides new ideas for latecomers to leverage advantages from innovation systems of both developed and developing countries to achieve the change of technological leadership. These new EV players directly go to the USA to innovate on top of acquiring new technologies in the developed country, and leverage both first-mover and follower advantages, quickly becoming leading technologically in the areas of emerging technology innovation. The study suggests that latecomers could utilize CMI as their technology catching-up strategy and achieve technological leadership change both at home and in developed countries. The CMI model has been tested through the structural equation model (SEM) through a structured questionnaire and the Tobit regression analysis using technology patents.

HB-02.3 [R] • Comparative Analysis of Chinese and American Photovoltaic Technology Trajectories Based on Patent Citation Networks

Yu Fu; Tsinghua University, China
Xianjun Li; Tsinghua University, China
Yu Xiong; Tsinghua University, China
Kun Feng; Tsinghua University, China
Lewis Liu; Tsinghua University, United States

The paper conducts a comparative analysis of Chinese and American photovoltaic (PV) technology trajectories using patent citation networks. It explores the evolution of PV technologies in both countries, identifying key technological trends and trajectories through analysis of patent data. The study finds distinct technological developments in China and the U.S., which may offer insights into the future direction of PV technology and implications for industry and policymaking in both nations. This comprehensive analysis contributes to understanding the dynamics of PV technology evolution and competition between these two global leaders in the field.

HB-02.4 [R] • IOT for Solid Waste Management in India: A Road Towards Sustainability

Piu Das; Indian Institute of Technology Kharagpur, India
Gouri Gargate; Indian Institute of Technology Kharagpur, India

In India, the quantum of waste generation is continuously increasing with each passing day because of rapid urbanization and the changing lifestyle of the huge population of this country. Managing the huge pile of garbage in every city has become a tough task for the stakeholders. The Internet of Things (IoT) provides a communication framework in which smart devices are used to augment common things. With several pieces of research around this issue, it can be observed that IOT can bring an effective mechanism for solid waste management (SWM). On a theoretical analysis, the biggest turning point that IOT can bring is by providing a technological setup for monitoring the existing SWM in India. Shifting to an IOT-based mechanism in SWM may impose an initial investment in the development of such setup and training of stakeholders. Primarily, it can be noted that the impact of IOT will highly be affected by the acceptance of it by the generators of waste and methods adopted by management to address the same. In this paper, the authors will focus on the probable advantages and challenges that the incorporation of IOT can bring to the conventional SWM in India. Doctrinal research methodology has been followed for this research.

HB-06 Technology Management in the Biotechnology Sector-2
Thursday, 8/8/2024, 10:30 - 12:00
Room: Broadway-IV
Chair(s) Rasnia Tabpla; Portland State University

HB-06.1 [R] • The Development in the Regenerative Medicine Industry: Analysis on Global Technology Trends and Local Academic-industry Cooperation Modes

Kae-Kuen Hu; National Taiwan University, Taiwan
Ruey-Shan Guo; National Taiwan University, Taiwan
Shu-Hsing Hsu; National Taiwan University, Taiwan
Chen Peng; National Taiwan University, Taiwan
Chia-Min Lin; National Taiwan University, Taiwan
Li-Ling Cho; National Taiwan University, Taiwan

Cell therapy is an emerging therapy that uses the differentiation and proliferation properties of stem cells to repair organ or tissue damage to treat specific diseases. In terms of regenerative treatment using stem cells, vigorous clinical trials are currently underway, and future industrialization is expected. The purpose of this study is to understand the feasibility of regenerative medicine industry by using USPTO data to analyze the global patent trends of four important technologies: mesenchymal stem cells, exosomes, iPSC and CAR-T. Subsequently, interviews were conducted with experts from the Taiwan Cellular Medicine Association, experts from the Stem Cell Society, physician supervisors of hospital cell therapy centers, and heads of cell preparation biotechnology companies, and other stakeholders to analyze the industry-university cooperation model of the regenerative medicine industry through the quadruple helix value creation model. The role played by the principal investigator, how social ties, e.g. "Simmelian Ties", have become the key success factor of industry-university cooperation, and how external factors such as "Boundary Work" affect the operation of industry-university cooperation, and provide feasible suggestions for practice.

HB-06.2 [R] • The Treatment Options Associated with the Use of Brain-computer Interfaces from a Security Risk Perspective

Yunrui Zheng; National Academy of Innovation Strategy, China
Qi Wu; National Academy of Innovation Strategy, China
Yuanhui Deng; National Academy of Innovation Strategy, China
Peng Zhang; Beijing Tiantan Hospital, China

Brain-computer interface (BCI) technology is progressing rapidly and may eventually be implemented widely. Although some emerging research has recognized the significance of BCI, its technical risk has not progressed much. There have been only a few research in the review that identified the scope and types of BCI risks through discussion and opinion pieces. Significantly, as invasive BCI technology may cause harm to people's physical and mental health, this study focuses on how to make patients choose their treatment options more reasonably to minimize security risk. By using the stochastic choice type rational inattention model, we constructed a two-stage framework for patient treatment options according to their characteristics. The result of the first stage shows that patients have the same probability of choosing between invasive and noninvasive BCI treatment options when the information cost is infinite, and when the information cost is zero, patients will only be able to choose between the benefits of two treatment options. In the second stage, we map out a risk matrix based on the probability and severity of security risk events from clinical experiences, thus allowing different patients to choose their own suitable BCI treatment to control the security risk of BCI technology.

HD-01 PANEL: PICMET '24 Debrief and Future PICMET Planning
Thursday, 8/8/2024, 14:00 - 15:30
Room: Pavilion East
Panelist(s) Dundar F Kocaoglu; Portland State University
Timothy R Anderson; Portland State University
Charles M Weber; Portland State University
Kiyoshi Niwa; The University of Tokyo
Dilek Cetindamar; University of Technology Sydney
Harm-Jan Steenhuis; Hawaii Pacific University
Tom Gillpatrick; Portland State University
Tan Le; Portland State University

We invite the entire PICMET community to join us for this interactive session. The PICMET Organizing Committee will be present to hear feedback about this year's conference and discuss future PICMET conferences.

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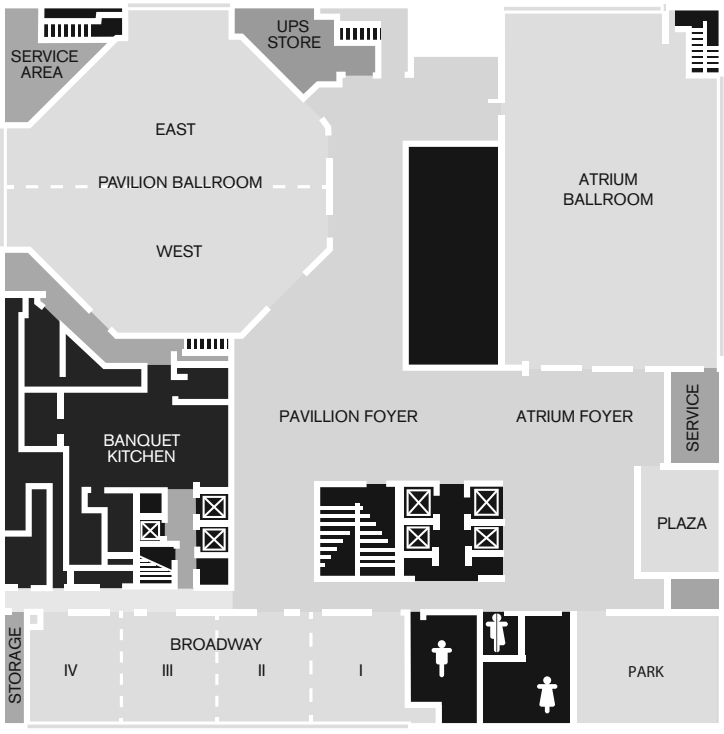
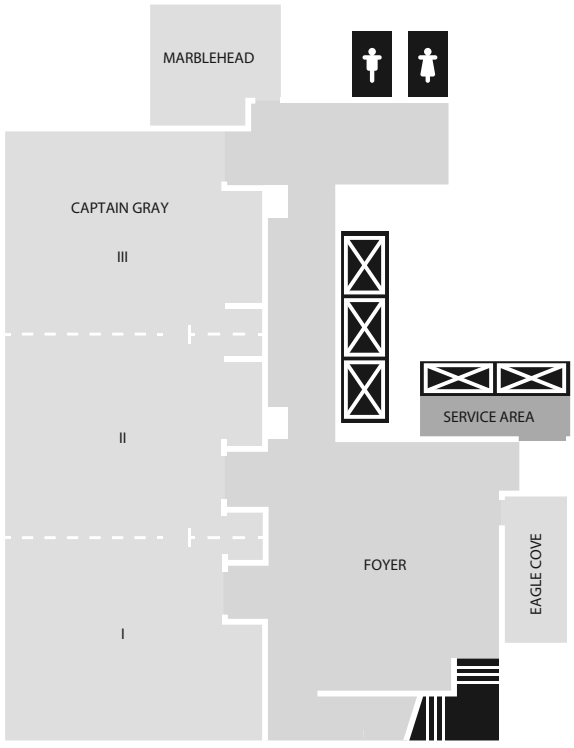
Hotel Floor Layout

Hilton
PORTLAND DOWNTOWN

Plaza Level



The Duniway



23rd Floor Skyline Level