CONFERENCE PROGRAM

2026 8th International Conference on Management Science and Industrial Engineering (MSIE 2026)

April 23-25, 2026

Krabi, Thailand

Hosted by

PRINCE OF SONGKLA UNIVERSITY

Supported by

ATeC Association of Taiwan Electronic Commerce

MAPÚA UNIVERSITY

มหาวิทยาลัยขอนแก่น KHON KAEN UNIVERSITY

https://www.msie.org/

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WELCOME MESSAGE

Dear delegates,

On behalf of the organizing committees, it is our honor to extend a heartfelt welcome to all attendees of 2026 8th International Conference on Management Science and Industrial Engineering (MSIE 2026), taking place in Krabi, Thailand during April 23-25, 2026.

MSIE 2026 is hosted by Prince of Songkla University, Thailand, and supported by National Chiayi University, Association of Taiwan Electronic Commerce, Mapúa University, Chaoyang University of Technology and Khon Kaen University. MSIE 2026 aims to provide a premier platform for global researchers, industry experts, and practitioners to exchange cutting-edge insights and explore future directions. With a diverse range of topics and presentations, MSIE 2026 promises to be a stimulating and enriching experience for all participants.

After more than one year's preparation, we received more than 240 submissions from Thailand, China, Peru, Italy, Indonesia, South Korea, France, United States, Japan, Philippines, India, Vietnam and other countries. More than 150 Technical Program Committee Members participated in the review process. Thanks for their great efforts and excellent work.

There are 3 keynote speeches, 7 invited speeches and 20 technical sessions in MSIE 2026 conference program. We believe that over the three days you'll get the theoretical grounding, practical knowledge and personal contacts that will help you build long-term, profitable and sustainable communication among researchers and practitioners working in a wide variety of scientific areas with a common interest in management science, industrial engineering and artificial intelligence.

We sincerely would like to thank all the authors as well as the technical program committee members and reviewers. Their high competence, enthusiasm, time and expertise knowledge enabled us to prepare the high-quality final program and helped to make the conference become a successful event.

MSIE 2026
Conference Chair
Prof. Parames Chutima
Chulalongkorn University, Thailand
April, 2026

ONSITE CONFERENCE NOTICE

1 Conference Venue

Holiday Ao Nang Beach Resort, Krabi

1.Kid's Club 09.00 - 17.00 hrs.
2.Fitness 24 Hours.
3.Meeting Room
4.Kid Pool 08.00 - 20.00 hrs.
5. Playground
6.Island Bar 10.00 - 19.00 hrs.
7.Family Pool 08.00 - 20.00 hrs.
8.Plaza 09.00 - 22.00 hrs.
9.Wave Bar 11.00 - 22.30 hrs.
10.Inn Asia 06.30 – 10.30 18.00 - 23.00 hrs.
11.Tour Desk 09.00am - 09.00pm
12.Reception 24 Hours.
13.Lagoon Bar 10.00am - 07.00pm
14.Couple Pool 08.00am - 08.00pm
15. Car Parking (Guest only)
16. Assembly Point (จุดรวมพล)
17. Motorbike Parking (Guest Only)
18. Smoking Area (For Guest)

Holiday Ao Nang Beach Resort, Krabi

Address: 123 Moo 3 Ao Nang, Muang, Krabi - 81180, Thailand

https://holidayresortkrabi.com/

2 Conference Rooms

Rooms	Activities	Time (GMT+7)
Lobby	Registration	13:00-17:00 April 23rd
Ao Nang Orchid I	Opening Remark & Keynote Speeches & Invited Speeches & Session 1 & Session 3	9:00-17:40 April 24th
Ao Nang Orchid II	Session 2 & Session 4	14:10-17:40 April 24th
	Session 9 & Session 10	9:00-12:00 April 25th

3 Onsite Presentation

• Timing: a maximum of 15 minutes total, including speaking time and discussion. Please make sure your presentation is well timed.
• Each speaker is required to meet her / his session chair in the corresponding session rooms 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.
• It is suggested that you email a copy of your presentation to your personal in box as a backup. If for some reason the files can't be accessed from your flash drive, you will be able to download them to the computer from your email.
• Please note that each session room will be equipped with an LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft Power Point and Adobe Reader.
• Poster Presenters should bring your poster to the conference venue and put it on designated place.

4 Name Badge

For security purposes, delegates, speakers, exhibitors and staff are required to wear their name badge to all sessions and social functions. Lending your participant card to others is not allowed. Entrance into sessions is restricted to registered delegates only. If you misplace your name badge, please ask the staff at the registration desk to arrange a replacement.

5 Gentle Reminder

• Please ensure that you take all items of value with you at all times when leaving a room. Do not leave bags or laptops unattended. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants.
• Accommodation is not provided. Delegates are suggested make early reservation.
• Please show the badge and meal coupons when dining.
• Weather Information for Krabi (23–25 April)
Krabi is expected to be hot and humid during 23–25 April, with a high possibility of short-duration rainfall.
The daytime temperature will range from 30°C to 33°C, and the nighttime temperature from 23°C to 26°C, accompanied by strong ultraviolet radiation.
Participants are advised to take appropriate sun protection and rainproof measures for outdoor activities.

ONLINE CONFERENCE NOTICE

1 Platform: Zoom

Download Link: https://zoom.us/download

2 Sign In and Join

***Join a meeting without signing in.**

A Zoom account is not required if you join a meeting as a participant, but you cannot change the virtual background or edit the profile picture.

***Sign in with a Zoom account.**

All the functions are available.

3 Time Zone

GMT+7 (Thailand Local Time)

***You're suggested to set up the time on your computer in advance.**

4 Online Room Information

Zoom 1 ID: 865 0939 9828

Zoom 1 Link: https://zoom.us/j/86509399828

Zoom 2 ID: 833 5304 3204

Zoom 2 Link: https://zoom.us/j/83353043204

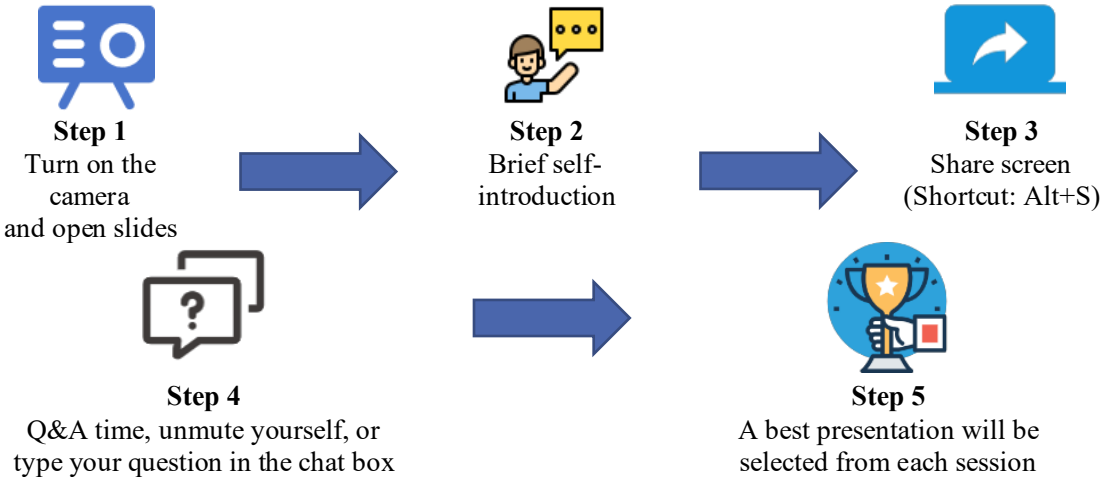
You can scan QR code to enter:

Zoom 1 Zoom 2

1. You can download the virtual background here.
2. Prior to the formal conference, presenter shall join the test room to make sure everything is on the right track
3. Note: Please rename your Zoom Screen Name in below format before entering meeting room.

Role	Format	Example
Conference Committee	Position-Name	Conference Chair-Name
Keynote/ Invited Speaker	Position-Name	Keynote/Invited Speaker-Name
Author	Session Number-Paper ID-Name	S1-EM0001-Name
Delegate	Delegate-Name	Delegate-Name

5 Presentation Process by Zoom Meeting



6 About Presentation

• Every presenter has 15 minutes, including Q & A. Each presentation should have at least 10 minutes.
• The best presentation certificate and all authors' presentation certificates will be sent after conference by email.
• It is suggested that the presenter email a copy of his / her video presentation to the conference email box as a backup in case any technical problem occurs.

7 Environment & Equipment Needed

• A quiet place; Stable Internet connection; Proper lighting and background
• A computer with internet and camera; Earphone

8 Conference Recording

• We'll record the whole conference. If you do mind, please inform us in advance. We'll stop to record when it's your turn to do the presentation.
• The whole conference will be recorded. It is suggested that you should dress formally and we appreciate your proper behavior.
* The recording will be used for conference program and paper publication requirements. It cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose.

SIMPLE PROGRAM

April 23rd, 2026
(GMT+7)

Onsite Registration

Registration Time: 13:00-17:00
Venue: The lobby of Holiday Ao Nang Beach Resort, Krabi
Address: 123 Moo 3 Ao Nang, Muang, Krabi - 81180, Thailand
1. Arrive at the lobby of Holiday Ao Nang Beach Resort, Krabi; **2. Inform the conference staff of your paper ID;** **3. Sign your name on the Participants list;** **4. Sign your name on Lunch & Dinner requirement list;** **5. Check your conference kits: (1 conference program, 1 lunch coupon, 1 dinner coupon, 1 name card, 1 bag, 1 U disk);** **6. Finish registration.**

Online Test
Time Zone: GMT+7

Zoom 1 ID: 865 0939 9828 **Zoom 1 Link: https://zoom.us/j/86509399828**	
Zoom 2 ID: 833 5304 3204 **Zoom 2 Link: https://zoom.us/j/83353043204**	
Zoom 1	
9:00-9:10	Prof. Yang Xu, Peking University, China
9:10-9:20	Prof. Kasin Ransikarbum, Ubon Ratchathani University, Thailand
9:20-9:30	Prof. Alessandro Lampo, University of Saint Joseph, Macao, China
9:30-9:40	Prof. Xiangjie Kong, Zhejiang University of Technology, China
9:40-9:50	Assoc. Prof. Naikan Ding, Wuhan University of Technology, China
9:50-10:00	Assoc. Prof. Raja Kumar Murugesan, Taylor's University, Malaysia

	Zoom 1	Zoom 2
10:00-10:20	Session 5	Session 6
10:20-10:40	Session 7	Session 8
10:40-11:00	Session 11	Session 12
11:00-11:20	Session 13	Session 14
11:20-11:40	Session 15	Session 16
11:40-12:00	Session 17	Session 18
12:00-12:20	Session 19	Session 20

If you want to do online zoom test after 12:20, please contact your conference secretary.

April 24th, 2026-Onsite (GMT+7)

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Online Zoom Link: https://zoom.us/j/86509399828
Time Zone: GMT+7</td></tr>
<tr><td>9:00-9:10</td><td colspan="2">Opening Remark I</td><td>Prof. Parames Chutima, Chulalongkorn University, Thailand</td></tr>
<tr><td>9:10-9:20</td><td colspan="2">Opening Remark II</td><td>Prof. Taeho Park, San Jose State University, USA</td></tr>
<tr><td>9:20-10:00</td><td colspan="2">Keynote Speech I</td><td>Prof. Maged M. Dessouky, University of Southern California, USA</td></tr>
<tr><td>10:00-10:40</td><td colspan="2">Keynote Speech II</td><td>Prof. Tokuro Matsuo, Fujita Health University, Japan</td></tr>
<tr><td>10:40-11:00</td><td colspan="3">Group Photo & Coffee Break</td></tr>
<tr><td>11:00-11:20</td><td colspan="2">Invited Speaker I</td><td>Prof. Yasser Dessouky, San Jose State University, USA</td></tr>
<tr><td>11:20-11:40</td><td colspan="2">Invited Speaker II</td><td>Prof. Athakorn Kengpol, King Mongkut's University of Technology North Bangkok, Thailand</td></tr>
<tr><td>11:40-12:00</td><td colspan="3">Award Ceremony</td></tr>
<tr><td>12:00-13:30</td><td colspan="3">Lunch Time</td></tr>
<tr><th colspan="4">Afternoon Sessions</th></tr>
<tr><td colspan="4">Onsite Sessions
Onsite Rooms: Ao Nang Orchid I & Ao Nang Orchid II
Zoom 1 Link: https://zoom.us/j/86509399828
Time Zone: GMT+7</td></tr>
<tr><td colspan="4">< Ao Nang Orchid I ></td></tr>
<tr><td>13:30-14:10</td><td colspan="2">Keynote Speech III</td><td>Prof. Yang Xu, Peking University, China</td></tr>
<tr><td></td><td colspan="2">< Ao Nang Orchid I ></td><td>< Ao Nang Orchid II ></td></tr>
<tr><td>14:10-15:55</td><td colspan="2">Session 1
Lean Manufacturing and Process Optimization

Session Chair: Prof. Peng-Cheng Sung, Chaoyang University of Technology

EM0075, EM0088, EM0079, EM0081, EM0100, EM0129, EM0065</td><td>Session 2
Application of AI in Digital Manufacturing Systems

Session Chair: Prof. Yasser Dessouky, San Jose State University, USA

EM0087, EM0037, EM0085, EM0196, EM0134-A, EM0176</td></tr>
<tr><td>15:55-16:10</td><td colspan="3">Coffee Break</td></tr>
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16:10-17:40	**Session 3** **Digital Logistics and Warehouse Management** **Session Chair: Prof. Athakorn Kengpol, King Mongkut's University of Technology North Bangkok, Thailand** EM0195, EM0059, EM0167, EM0041, EM0145	**Session 4** **Ergonomics, Health Assessment and Human Resource Management** **Session Chair: Prof. Yogi Tri Prasetyo, Yuan Ze University** EM0045-A, EM0112, EM0133, EM0189, EM5038, EM5014
17:40-19:00	**Dinner Time**	

April 24th, 2026-Online
(GMT+7)

Afternoon Sessions		
Online Invited Speeches & Online Sessions Zoom 1 Link: https://zoom.us/j/86509399828 Zoom 2 Link: https://zoom.us/j/83353043204 Time Zone: GMT+7		
	< Zoom 1 >	**< Zoom 2 >**
14:20-14:40	**Invited Speech III** **Prof. Kasin Ransikarbum** Ubon Ratchathani University, Thailand	**Invited Speech IV** **Prof. Alessandro Lampo** University of Saint Joseph, Macao, China
14:40-16:25	**Session 5 (Online)** **Equipment Management and Preventive Maintenance Strategies in Advanced Manufacturing Systems** **Session Chair: Prof. Kasin Ransikarbum, Ubon Ratchathani University, Thailand** EM0067, EM2002, EM0043, EM0064, EM0153, EM0193	**Session 6 (Online)** **Integration of Industrial Internet of Things and Digital Twin Technologies for Intelligent Manufacturing** **Session Chair: Prof. Vikram Sharma, The LNM Institute of Information Technology, India** EM0032, EM0098, EM0164, EM0033, EM0006, EM0009
16:25-18:25	**Session 7 (Online)** **Enterprise Management Innovation and Public Service Optimization in the Context of Digital Transformation** **Session Chair: Asst. Prof. M. Mujiya Ulkhaq, Diponegoro University, Indonesia** EM0026, EM0004, EM0186, EM0061, EM0105, EM0051, EM0001, EM5018	**Session 8 (Online)** **Data-Driven Intelligent Algorithms and Optimization Models for Complex Industrial Scenarios** **Session Chair: Dr. Nanthawan Am-Eam, Ramkhamhaeng University, Thailand** EM0080, EM0148, EM0042, EM0048, EM0049, EM0114

April 25th, 2026-Onsite
(GMT+7)

Morning Sessions	
Onsite Sessions **Onsite Room: Ao Nang Orchid II** Time Zone: GMT+7	
9:00-10:15	**Session 9** **Optimization, Management and Decision Analysis of Enterprise Information Systems** **Session Chair: Prof. Ford Lumban Gaol, Bina Nusantara University, Indonesia** EM5016-A, EM0083, EM0197, EM0108, EM0047
10:15-10:30	**Coffee Break**
10:30-12:00	**Session 10** **AI-Driven Industrial Process Automation and Real-Time Data Analytics** **Session Chair: Prof. Retno Wulan Damayanti, Sebelas Maret University, Indonesia** EM5001-A, EM5025-A, EM5034, EM5036, EM5046, EM5033

April 25th, 2026-Online
(GMT+7)

Morning Sessions		
Online Invited Speeches & Online Sessions Zoom 1 Link: https://zoom.us/j/86509399828 Zoom 2 Link: https://zoom.us/j/83353043204 Time Zone: GMT+7		
	< Zoom 1 >	**< Zoom 2 >**
8:10-8:30	**Invited Speech V** **Prof. Xiangjie Kong** Zhejiang University of Technology, China	
8:30-8:50	**Invited Speech VI** **Assoc. Prof. Naikan Ding** Wuhan University of Technology, China	**Invited Speech VII** **Assoc. Prof. Raja Kumar Murugesan** Taylor's University, Malaysia
8:50-10:35	**Session 11 (Online)** **System Integration of Lean Production Tools and Value Stream Optimization Methods** **Session Chair: Dr. Thinh Thai Dang, University of Economics Ho Chi Minh City, Vietnam** EM0058, EM0070, EM0154, EM0156, EM0173, EM0174, EM0194	**Session 12 (Online)** **Architectures and Integration Methods for Industry 4.0-Oriented Intelligent Manufacturing Systems** **Session Chair: Prof. Yun Huang, Macau University of Science and Technology, China** EM0141, EM0015, EM0002, EM0073, EM0034, EM0036, EM0078
10:35-10:40	**Break Time**	
10:40-12:25	**Session 13 (Online)** **Integration of Production Planning, Demand Forecasting, and Quality Control for Production-Sales Coordination** **Session Chair: Dr. José Velásquez Costa, Peruvian University of Applied Sciences, Peru** EM0192, EM0011, EM0062, EM0063, EM0074, EM0089, EM0175	**Session 14 (Online)** **Production Scheduling Modeling and Multi-Objective Optimization in Industrial Operations** **Session Chair: Prof. Protik Basu, Army Institute of Management, India** EM0024, EM0039, EM0097, EM0018, EM2001, EM0157, EM0158
Afternoon Sessions		

Online Invited Speech & Online Sessions Zoom 1 Link: https://zoom.us/j/86509399828 Zoom 2 Link: https://zoom.us/j/83353043204 Time Zone: GMT+7		
	< Zoom 1 >	**< Zoom 2 >**
13:00-15:00	**Session 15 (Online)** **Supply Chain Resilience Construction and Logistics Network Optimization** **Session Chair: Asst. Prof. Ywh-Leh Chou, Feng Chia University** EM0044, EM0094, EM0038, EM0082, EM0084, EM0151, EM0159	**Session 16 (Online)** **Capability Building and Business Model Innovation in Enterprise Digital Transformation** **Session Chair: Asst. Prof. Matteo De Marchi, Free University of Bolzano, Italy** EM0155, EM0116, EM0132, EM0095, EM0031, EM0069, EM0102
15:00-16:45	**Session 17 (Online)** **Integrated Machine Vision and AI Technologies for Industrial Applications** **Session Chair: Asst. Prof. Hariyanto Gunawan, Chung Yuan Christian University** EM5002, EM5015, EM5020, EM5029, EM5039, EM0162	**Session 18 (Online)** **Applications of AI in Industrial Engineering: Production Optimization and Decision Support** **Session Chair: Dr. Crescenzo Pepe, Università Politecnica delle Marche, Italy** EM5008, EM5013, EM5017, EM5022, EM5031, EM5045, EM5030
16:45-18:45	**Session 19 (Online)** **Portfolio Optimization and Multi-Objective Decision Models Based on Risk Measurement** **Session Chair: Asst. Prof. Ronaldo Polancos, De La Salle University Manila, Philippines** EM0137, EM0127, EM0139, EM0140, EM0147, EM0163, EM0168, EM0170	**Session 20 (Online)** **Marketing Budget Allocation and Resource Optimization Based on Portfolio Theory** **Session Chair: Assoc. Prof. Charles Ramendran SPR Subramaniam, Universiti Tunku Abdul Rahman, Malaysia** EM2004-A, EM0027, EM0090, EM0111, EM0113, EM0124, EM5047, EM0138

DETAILED PROGRAM

OPENING REMARK I

Time 9:00-9:10, April 24th **Room** Ao Nang Orchid I

Zoom ID: 865 0939 9828

Prof. Parames Chutima

Chulalongkorn University, Thailand

Professor Parames Chutima received a Bachelor of Engineering from Chulalongkorn University, a Master's degree from Chulalongkorn University and Asian Institute of Technology, and a PhD in Manufacturing Engineering and Operations Management from the University of Nottingham, UK. Currently, he is a Professor in the Faculty of Engineering at Chulalongkorn University, Thailand, and the director of the Regional Centre for Manufacturing Systems Engineering, Chulalongkorn University, Thailand. His research interests include multi-objective optimisation in operations management, production planning and control of assembly lines, just-in-time production systems and simulation modelling. He is the author of many books as well as international publications in conference proceedings and referred journals.

OPENING REMARK II

Time	9:10-9:20, April 24th	Room	Ao Nang Orchid I
Zoom	ID: 865 0939 9828		

Prof. Taeho Park

San Jose State University, USA

Taeho Park is a professor in the Organization and Management department at San Jose State University. Dr. Park has BS and MS in Industrial Engineering from Seoul National University, Korea, and Ph.D. in Industrial Engineering from University of Wisconsin-Madison. His research focused on operations/supply chain management, total quality management, enterprise risk management, and technology management. He has more than 20 years experiences on consulting, training, workshops, and seminars for various industries, such as electronics and logistics. Dr. Park is the author of research papers in many journals, including Journal of Operations Management, International Journal of Production Research, European Journal of Operational Research, Int. J. of Computer Applications in Technology, and so on.

KEYNOTE SPEECH I

Time 9:20-10:00, April 24th **Room** Ao Nang Orchid I

Zoom ID: 865 0939 9828

Prof. Maged M. Dessouky

University of Southern California, USA

Maged M. Dessouky is Tryon Chair in Industrial and Systems Engineering and Professor and Chair in the Daniel J. Epstein Department of Industrial and Systems Engineering. His research area is transportation system optimization where he has authored over 115 refereed publications. His paper "Optimal Slack Time for Schedule Based Transit Operations" was awarded the INFORMS Transportation Science and Logistics Best Paper Prize. He is a Fellow of IISE and INFORMS and serves as Associate Director of METRANS, a center focused on solving important urban transportation problems. He is currently associate editor of Transportation Research Part B: Methodological and on the editorial board of Transportation Research Part E: Logistics and Transportation Review, and previously served as area editor of the ACM Transactions of Modeling and Computer Simulation, department editor of IISE Transactions, area editor of Computers and Industrial Engineering, and associate editor of IEEE Transactions on Intelligent Transportation Systems. He has won numerous teaching awards including USC Associates Award for Excellence in Teaching. He received his Ph.D. in Industrial Engineering from the University of California, Berkeley, and M.S. and B.S. degrees from Purdue University.

Speech Contents

Understanding the Traffic Pattern Impacts of COVID-19 Lockdown Order

Abstract: Estimating dynamic Origin-Destination (OD) traffic flow is crucial for understanding traffic patterns and the traffic network. While dynamic origin-destination estimation (DODE) has been studied for decades as a useful tool for estimating traffic flow, few existing models have considered its potential in evaluating the influence of policy on travel activity. This paper proposes a data-driven approach to estimate OD traffic flow using sensor data on highways and local roads. We extend prior DODE models to improve accuracy and realism in order to estimate how policies affect OD traffic flow in large urban networks. We applied our approach to a case study in Los Angeles County, where we developed a traffic network, estimated OD traffic flow between health districts during COVID-19, and analyzed the relationship between OD traffic flow and population income. Our findings demonstrate that the proposed approach provides valuable insights into traffic flow patterns and their underlying demographic factors for a large-scale traffic network. The approach has practical applications for transportation planning and traffic management, enabling a better understanding of traffic flow patterns and the impact of policy changes on travel activity.

KEYNOTE SPEECH II

Time 10:00-10:40, April 24th **Room** Ao Nang Orchid I

Zoom ID: 865 0939 9828

Prof. Tokuro Matsuo

Fujita Health University, Japan

Dr. Tokuro Matsuo is currently Full Professor at School of Medicine, Fujita Health University, Japan. Also, he is currently Visiting Professor at Sam Houston State University, USA; Executive Director of International Institute of Applied Informatics (IIAI); Executive Director of International Accreditation Association for Higher Education; Guest Professor at Bina Nusantara University, Indonesia; Japan MICE Ambassador; and Kumamoto City MICE Ambassador. He was Full Professor at Advanced Institute of Industrial Technology (AIIT) in Tokyo Public University Corporation, Japan and Director of Research Center for Artificial Intelligence and Service Science at AIIT (2012-2026); Associate Professor at Yamagata University, Japan (2006-2012); Adjunct Professor at Asian University, Taiwan (2019-2021); Invited Professor at City University of Macau, Macau (2018-2020); Visiting Researcher at University of Nevada, Las Vegas, USA (2016-2017); Vice-President, International Association for Computer and Information Science, USA (2015-2017); Vice-President, Software Engineering Research Foundation, USA (2013-2018); Visiting Researcher at University of California at Irvine, USA (2010-2011); Research Fellow at Shanghai University, China (2010-2013); and Project Professor of Green Computing Research Center at Nagoya Institute of Technology, Japan (2011-2014); Guest Professor at Nagoya Institute of Technology, Japan (2021-2023); and Research Fellow of SEITI in Central Michigan University, USA (2010-2018). He received his Ph.D. in computer science from Nagoya Institute of Technology in 2006. His current research interests include agent-based electronic commerce, qualitative reasoning and simulation, material informatics, IT and business management, and IoT. Also, he is a professional event planner and event producer. He delivered over 250 keynotes and invited talk at international conferences, symposia, and seminars. He also received over 10 awards on research and over 30 research grants from government, research foundations, and company. He has ever presented over 300 reviewed papers in journals and in international conference including top/high-ranked international journals and conferences, such as, SN Applied Sciences, Data in Brief, Marine Systems & Ocean Technology, International Journal of Neural Systems, International Journal of Business Information Systems, Logic Journal of IGPL, IEEE Access, Heliyon, Applied Artificial Intelligence, Emerging Science Journal, AAAI, IEEE CEC, AAMAS, IEEE WCCI, and WWW. Also, he has published 14 edited books from Springer, IGI-Global, and WIT Press. He has been over 90 international conference organizing chairs (conference chair/ program chair / finance chair / publication chair) of IEEE PRIWEC(2006), IEEE/ACIS SNPD (2009 2012, 2013, 2014, 2015, 2017, 2018, 2019), PRIMA (2009, 2020, 2024, 2026), PRICAI (2024), IEEE/ACIS ICIS (2010, 2013, 2015, 2016), IIAI AAI (2012-2026), AAMAS (2013), IEEE/ACIS SERA (2014, 2015), IEEE SOCA (2014, 2017), IEEE TENSYMP (2016), IEEE International Conference on Agentic AI (2016, 2017, 2023, 2026), IEEE SC2 (2017), ASEAN-AI (2018), and other 50 international conferences and workshops.

Speech Contents

How to Adopt AI Technologies in Physical World

Abstract: Nowadays, a lot of types of AI system to make effective activities among people, organization, and society are provided. However, the underlying technologies of artificial intelligence are not easily applied to real-world systems. This is because there are numerous variables involved, and we have not only failed to organize them but also failed to grasp their true nature. In this lecture, we will focus on the practical applications of artificial intelligence in specific research phases and its utilization in society. In the next decade, we can forecast a lot of types of consensus formation systems are provided and we may find new communication systems integrating between cyber and physical environment. In this talk, I introduce our conducted experiments using cyber-physical discussion environment in the panel discussion session in the conference. In the session, facilitator asks question to panelists about issues on the discussion and attendees can also do as well by their voice. Each attendee also can post and declare his/her opinions and suggestions through the online discussion system during the session. One or two facilitators facilitate the discussion in the online system as well as real discussion. We found out a lot of interesting results of surveys from attendees taken in before/after the experiments. I also introduce the environment to provide useful information for attendees by the digital signage system in the conference venue. This digital signage system is connected to the attendee's location capture system and conference registration system. These integrations between cyber and physical environments and data enable to make better consensus formation between all sorts of people.

KEYNOTE SPEECH III

Time 13:30-14:10, April 24th **Room** Ao Nang Orchid I

Zoom ID: 865 0939 9828

Prof. Yang Xu

Peking University, China

Prof. Yang XU received his Ph.D. from Ecole Centrale de Nantes (France) in 2010. Since 2011, he has joined Peking University and became associate professor in 2013. He is visiting professor in Tsukuba University (Japan), Université Toulouse III (France), University of Buenos Aires (Argentina) and University of Edinburgh (UK). He published over 50 peer-reviewed scientific papers and many of them are published in outstanding SCI/SSCI index journals such as Computers & Industrial Engineering, Knowledge-Based Systems, Expert Systems, International Journal of Computer Integrated Manufacturing, Knowledge Organization, CIRP Annals. His research interests include industrial engineering, knowledge management, etc.

Speech Contents

Reliable or sycophantic? Decision-making risk in Human-AI collaboration

Abstract: Large language models are expected to make reliable judgments, but as they continue to evolve, they may also exhibit flattery behavior under certain external incentives or pressures. As artificial intelligence becomes increasingly close to human consciousness, emotions, and social needs, even adding the factor of "gaining recognition" in the training process of models. This type of problem may be related to "prompt words" or depend on the application scenario. When humans make decisions, sometimes they are caught in the dilemma of "reason or emotion". Therefore, when artificial intelligence assists human decision-making, it is not impossible to make some trade-offs between reliability and acceptability. These issues are worth exploring in depth.

INVITED SPEECH I

Time	11:00-11:20, April 24th
Zoom	ID: 865 0939 9828
Room	Ao Nang Orchid I

Prof. Yasser Dessouky

San Jose State University, USA

Professor Yasser Dessouky currently serves as department chair for the Industrial and Systems Engineering Department at San Jose State University. Dr. Dessouky has extensive research and consulting experience in developing models to analyze improvements in the design and efficiency of systems and workflow patterns. He has gained recognition in the areas of modeling and analysis of systems/processes. Dr. Dessouky has more than 45 publications and grants in excess of $1M in these research areas. He also serves as an editor-in-chief, Computers and Industrial Engineering. His professional practice includes work with organizations such as Applied Materials, Texas Instruments, General Electric, Ford Motor Company, United Parcel Service, and research funding from NSF, VA, and Path agencies to name a few. Prior to joining the faculty at San José State University in 1997, Dr. Dessouky served on the faculty at Miami University, Ohio. He earned his doctorate and master's degrees in industrial and management systems engineering from Arizona State University and a bachelor's in industrial engineering from the University of Wisconsin-Madison.

Speech Contents

Charting the Unknown: Formulating Problem Statements in the Age of Artificial Intelligence

Abstract: Eighteen years ago, Peter Hernon and Candy Schwartz (Hernon & Schwartz, 2007) posed a seemingly simple yet fundamentally important question in their editorial: What is a problem statement? Drawing from decades of scholarship in the social sciences, they emphasized the importance of conceptual clarity, purpose, significance, and scope. These elements remain vital. However, the landscape of scholarly inquiry has shifted dramatically.

This presentation revisits their question in light of advances in artificial intelligence (AI) and data analytics. As engineering and analytics researchers work at the intersection of computation and complexity, these technologies have reshaped not only how questions are answered but also how they are formulated. In today's complex data environments, algorithmic tools and socio-technical systems, the problem statement is no longer merely a rhetorical or literary form. It must also address system dynamics, performance trade-offs, resource allocation, and uncertainty, which are core concerns in engineering. It is the point where data meets design, where inference informs intervention, and where relevance must be demonstrated rather than assumed.

INVITED SPEECH II

Time	11:20-11:40, April 24th	Room	Ao Nang Orchid I
Zoom	ID: 865 0939 9828		

Prof. Athakorn Kengpol

King Mongkut's University of Technology North Bangkok, Thailand

Dr. Athakorn Kengpol is Professor of Industrial Engineering at the Faculty of Engineering, King Mongkut's University of Technology North Bangkok, Thailand. He received his PhD in Manufacturing Engineering and Operations Management from The University of Nottingham, UK. He obtained his Post-doctoral Research at University of Innsbruck, Austria and at Lappeenranta University of Technology, Finland. His research interests include Artificial Intelligence, Machine/Deep Learning, Decision Support Systems in Industry 4.0, management information systems and packaging design. His National Awards are, for example, National Outstanding Lecturer, National Outstanding Government Officer etc. His International Awards are, for example, Medal from International Exhibition of Geneva, Switzerland, and Industry Solutions Award from IEOM Society International, USA. He conducted and published research about Machine Learning and Deep Learning in a number of reputable journals, for example, International Journal of Production Economics, International Journal of Production Research, Expert Systems with Applications, Computers and Industrial Engineering etc. He also participated in MSIE-CBHE Erasmus+ Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry (MSIE4.0) funded by the European Commission, and ReCap 4.0 that is proposed to enhance the capacity and ability of the non-university sector at the tertiary level in Thailand for the effective delivery of engineering and technology knowledge and skills related to Industry 4.0 to support Thailand Sustainable Smart Industry.

Speech Contents

The Application of Artificial Intelligence and Cyber-Physical Systems for Predicting Ship Engine Power

Abstract: The maritime industry is currently facing significant pressure to enhance energy efficiency and reduce environmental impact. Central to achieving these goals is the accurate prediction of ship engine power, which enables optimized routing and improved fuel management. By deploying an array of IoT-enabled sensors, the system captures real-time data including vessel speed over ground (SOG), fuel consumption rates, engine load, and environmental variables such as wind speed, wave height, and current direction. This continuous data stream is processed through advanced Machine Learning (ML) algorithms—specifically Random Forest, Support Vector Regression, and Deep Neural Networks—to account for the non-linear relationships between sea states and power requirements.

The AI-driven approach significantly outperforms traditional empirical formulas and static statistical methods. Furthermore, the system facilitates "digital twin" capabilities, allowing operators to simulate engine performance across various scenarios and identify mechanical anomalies by analyzing deviations between predicted and actual power outputs. The synergy between AI and CPS provides a robust tool for real-time decision support, leading to improved fuel economy and reduced carbon emissions.

INVITED SPEECH III

Time	14:20-14:40, April 24th
Zoom	ID: 865 0939 9828

Prof. Kasin Ransikarbum

Ubon Ratchathani University, Thailand

Kasin Ransikarbum received the B.Eng. degree in Industrial Engineering from King Mongkut's University of Technology Thonburi, Bangkok, Thailand, the M.S. degree with dual title in Industrial Engineering and Operations Research from Pennsylvania State University, PA, USA, and the Ph.D. degree in Industrial Engineering from Clemson University, SC, USA. He was also a postdoctoral researcher at the Center for 3D Advanced Additive Manufacturing Technology Research, Ulsan National Institute of Science and Technology, South Korea. Currently, he is working at the industrial engineering department, Ubon Ratchathani University, Thailand. He has published papers in a number of prestigious, peer-reviewed journals and book chapters, such as Journal of Manufacturing System, Expert System with Applications, International Journal of Production Research, and International Journal of Production Economics. His research interest includes emergency management, logistics and supply chain modeling, and manufacturing system and 3D printing.

Speech Contents

Integrated Decision-Support from Upstream to Downstream Planning in Renewable Energy-Based Hydrogen Supply Chains

Abstract: The transition toward sustainable energy systems has positioned hydrogen as a key enabler of decarbonization across industrial and logistics sectors. This talk presents an integrated decision-support framework for the design and analysis of hydrogen supply chain networks, addressing multi-level and multi-objective decision-making challenges. The study adopts a comprehensive supply chain perspective spanning upstream, midstream, and downstream processes. On the supply side, multi-criteria decision analysis is applied to evaluate the location and efficiency of renewable energy sources for green hydrogen production, incorporating multiple criteria such as resource availability, efficiency, and environmental impact. On the demand side, decision models are developed to analyze barriers to hydrogen adoption, including challenges in supplier selection, hydrogen fuel cell deployment, and hydrogen refueling station planning. At the network level, the framework integrates strategic decisions such as facility location, storage, and centralized versus decentralized configurations, along with planning aspects including allocation and routing. The proposed approach concludes with managerial insights and future research directions for advancing hydrogen supply chain networks toward scalable and resilient energy infrastructures.

INVITED SPEECH IV

Time	14:20-14:40, April 24th
Zoom	ID: 833 5304 3204

Prof. Alessandro Lampo

University of Saint Joseph, Macao, China

Dr. Lampo serves as Head of the Department of Business Studies at the University of Saint Joseph in Macao. In this role, he leads the management and international development of the Faculty of Business and Law's flagship MBA and BBA programmes.
He is the author of "Promptly Yours," a guide to shaping conversations with AI, and has published nearly 30 academic papers over the past 5 years, some of which have received international recognition. He actively shapes global business discourse through his contributions to international conferences and his role on the editorial board of academic journals.
The scholarly work is grounded in years of experience in upper management at international companies, where he was directly responsible for strategic planning and technology implementation.
A firm believer in blending strategy with creativity, Dr. Lampo is also a passionate musician, having performed in his earlier years.

Speech Contents

The Satisfaction–Retention Paradox: Insights from Users in Guangdong, China

Abstract: We talk endlessly about AI model capabilities. But we rarely ask a simple question: what do actual users really want – and what keeps them from leaving?
This research presents original survey data from active users of AI tools in Guangdong, China. This is a market where the most globally famous AI tools are not the leaders. Domestic platforms dominate, driven not by hype but by pragmatism: solving specific tasks, offering free access, and seamlessly integrating with apps people already use.
The findings reveal a striking paradox. Most users report only moderate satisfaction. Yet the vast majority have not switched their primary AI tool in the past six months. This is not passionate loyalty; it is quiet inertia.
So, what actually earns loyalty? Users prioritize accuracy, speed, and the ability to handle long conversations or documents. Perhaps most tellingly, a large segment values AI that understands local language, idioms, and cultural context: a clear advantage for domestic over global models.
Notably, the heaviest users today are students. They are curious, price-sensitive, and habit-forming. Tomorrow, they become enterprise buyers, and they will bring their habits with them. This research offers three practical lessons for anyone building or investing in AI: what to prioritize, what to ignore, and why local intelligence may be the key differentiator.

INVITED SPEECH V

Time	8:10-8:30, April 25th
Zoom	ID: 865 0939 9828

Prof. Xiangjie Kong

Zhejiang University of Technology, China

Xiangjie Kong received the B.Sc. and Ph.D. degrees from Zhejiang University, Hangzhou, China in 2004 and 2009 respectively. He is currently a Full Professor with the College of Computer Science and Technology, Zhejiang University of Technology, China. Previously, he was an Associate Professor with the School of Software, Dalian University of Technology, China. He has published over 230 scientific papers in international journals and conferences (with over 200 indexed by ISI SCIE). He has an h-index of 53 and i10-index of 129, and a total of more than 9300 citations to his work according to Google Scholar. He is named in the 2019 - 2023 world's top 2% of Scientists List published by Stanford University. His research interests include network science, knowledge discovery, and urban computing. He is a Senior Member of the IEEE, a Distinguished Member of CCF and a Member of ACM.

Speech Contents

Spatio-Temporal Graph Learning Enabled Intelligent Transportation Systems

Abstract: A modern city is a ternary space that contains the physical world, human society, and information space. Urban big data is the foundation of urban travel intelligence. Based on urban big data, the accurate description of travel information in cities is the premise of forecasting/warning and decision-making assistance. Spatio-temporal graph learning having been extensively used in intelligent transportation systems in recent years, proves effective for many tasks in real-world applications, such as regression, classification, clustering, matching, and ranking. Spatio-temporal graph learning brings new idea to solve the challenges for smart transportation, improve the efficiency of urban resource utilization, optimize urban management and services, and improve residents' lives quality towards smart cities. This report will explore the research frontiers of spatio-temporal graph learning-based urban travel profiling, traffic data mining and analysis and its application in intelligent transportation systems, and introduce some related work.

INVITED SPEECH VI

Time	8:30-8:50, April 25th
Zoom	ID: 865 0939 9828

Assoc. Prof. Naikan Ding

Wuhan University of Technology, China

Naikan Ding received the Ph.D. from Wuhan University of Technology (WUT), China, in 2017. He is currently an Associate Professor with the Intelligent Transportation Systems Research Center (ITSC), WUT, China. Prior to joining WUT, he was a Postdoctoral Researcher with Institute of Materials and Systems for Sustainability, Nagoya University, Japan. His research interests include traffic safety, driving behavior, human factors, visual perception, and human-like automated driving, and human-machine systems. He has co-authored more than 80 technical articles published on IEEE T-ITS, IEEE T-VT, GEITS, Safety Science, AAP, TR-F, etc., and is a co-inventor of over 20 patents, and participated in 4 Chinese national standards. He served as technical committee members of the World Transport Convention (WTC), the International Conference on Transportation Information and Safety (ICTIS), the Committee of Youth Scientific & Technological Professionals, China Communications and Transportation Association (CYSTP-CCTA), Authoritative Expert Database of Hubei Provincial Department of Science and Technology, the editorial member of Scientific Reports, the young editor of Journal of Changsha University of Science & Technology (Natural Science), and he also serves as reviewer for more than 40 academic journals.

Speech Contents

Pinning control of heterogenous vehicle flow through sparse CAVs: An observation of Apollo Goes (Robotaxis) in Wuhan

Abstract: Urban expressways are essential components of modern transit systems but face disproportionately high accident rates—frequently five to six times higher than ordinary roads—primarily due to limited driver compliance with traditional management strategies like Variable Speed Limits. Addressing the transitional era where Connected and Automated Vehicles (CAVs), such as the Apollo Go robotaxis in Wuhan, coexist with human-driven vehicles (HDVs), the core scientific challenge lies in utilizing sparse CAVs as mobile "control handles" to effectively guide the microscopic behavior of large-scale, heterogeneous traffic groups under low-penetration conditions. This study conducted empirical analysis on an expressway section in Wuhan, utilizing aerial photography and a tracking framework of YOLOv8 and DeepSORT to construct a high-fidelity trajectory dataset with 98% identification accuracy. To quantify complex vehicle interactions, a spatio-temporal Graph Neural Network (GNN) was developed by integrating Graph Attention Networks (GAT), Transformers, and Self-Attention Graph Pooling (SAG-Pooling), which identified that vehicle interactions in low-penetration scenarios predominantly manifest as "clustering" characteristics. Building on these insights, a pinning control strategy incorporating an improved PID algorithm was designed and validated via SUMO simulations calibrated with real-world data, determining that for CAV penetration rates of 10%, 20%, and 30%, the optimal number of pinning nodes is 2, 3, and 4, respectively. Evaluation through synchronization and safety indicators—including the Time-

exposed Total collision risk (TET), which was reduced by up to 79.05% under moderate traffic—demonstrates that the proposed strategy significantly enhances longitudinal traffic stability and safety. The study concludes that targeted pinning control can effectively harness the inherent clustering patterns of mixed flows to stabilize traffic oscillations. Theoretically, this research establishes a robust quantitative framework for speed guidance in heterogeneous flows, while practically, it provides a validated strategy for expressway authorities to leverage sparse robotaxi resources to improve regional safety in the on-going mixed traffic with low CAV penetration.

INVITED SPEECH VII

Time	8:30-8:50, April 25th
Zoom	ID: 833 5304 3204

Assoc. Prof. Raja Kumar Murugesan

Taylor's University, Malaysia

Dr Raja Kumar Murugesan is an Associate Professor of Computer Science, and Head of Research for the Faculty of Innovation and Technology at Taylor's University, Malaysia. He has a PhD in Advanced Computer Networks from the Universiti Sains Malaysia. His research interests include IPv6, Future Internet, Internet Governance, Computer Networks, Network Security, IoT, Blockchain, Machine Learning and Deep Learning Algorithms. He is a Senior Member of the IEEE and IEEE Communications Society, member of the Internet Society (ISOC), member of the Malaysia Data Science Association and associated with the IPv6 Forum, Asia Pacific Advanced Network Group (APAN), Internet2, and Malaysia Network Operator Group (MyNOG) member's community. Talks about IoT, Blockchain, AI, Machine learning, IPv6, Internet Governance, and Digital Transformation in the context of Industry 4.0 (IR4.0) and Sustainable Development Goals (SDG's) at various international conferences, forums, and events. Obtained substantial funds locally and internationally, and actively engages in research, consultancy, and outreach activities in Advanced Computer Networks.

Speech Contents

Trust Index Model to Detect Fake News on Social Media Using BERT-CNN, Blockchain and Crowdsourcing

Abstract: Key Global Social Media Statistics says, about 70% of the world's total population are active on social media globally and about 94% of the Internet users in the world use social media. The rapid growth of social media facilitates information to spread faster. Fake news or misinformation spreads faster than credible news due to its emotional appeal and algorithms that prioritize and sensationalize content to be engaging. The exponential growth and complexity of social media in terms of user credibility, demographics, geographic variations, and user preferences create challenges in defining methods to check the credibility of news. Existing solutions using AI to detect fake news on social media is not effective in terms of detection accuracy, trustworthiness, and scalability. The proposed trust index model combines BERT-CNN hybrid algorithm, weighted crowdsourcing, an entropy algorithm, and blockchain to detect fake news. The proposed trust index model achieved fake news detection accuracy of 99.6% compared to 96.3% achieved by the base line model. Further, the proposed trust index model has enhanced scalability, and reduced error rate. The proposed model would facilitate mitigating the spread of false information and minimize its harmful effects.

SESSION 1

April 24th, 2026
Time Zone: GMT+7

Topic: Lean Manufacturing and Process Optimization
Time: 14:10-15:55 (Duration for Each Presentation: 15 minutes)
Room: Ao Nang Orchid I
Session Chair: Prof. Peng-Cheng Sung, Chaoyang University of Technology

Onsite

EM0075

Improving Gypsum Production Strength with Cullet via Mixture Experiments by Applying the Six Sigma Approach

Tanapol Hongpoo[1] and Parames Chutima[2]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science, The Royal Society of Thailand, Thailand

Abstract-The ceramic and gypsum manufacturing industries are currently facing intense competition and rising production costs. A critical issue identified in a case study factory is a high defect rate in the molding process, specifically characterized by uneven surfaces and cracks, which accounts for 77% of total waste. This research proposes a methodology to reduce these defects by enhancing the compressive strength of gypsum products. The study integrates the Six Sigma DMAIC framework with the concept of Upcycling, utilizing waste cullet glass as a strengthening aggregate. A Mixture Design of Experiments is employed to determine the optimal proportion of cullet to gypsum. The expected outcomes are a significant reduction in production waste, increased product strength, and the sustainable reutilization of industrial waste materials. The research methodology covers the DMAIC steps, i.e. Define, Measure, Analyze, Improve, and Control. Design of Experiment is utilized to determine the optimal mixture ratio between gypsum and cullet. The expected result is to find the appropriate proportion to increase gypsum strength while reducing waste in the production process.

EM0088

CRISP-DM-Driven Bottleneck Diagnosis: Ground-Truth Validation in an Automotive Parts Plant

Thanapon Torsittidethkul, Thapana Boonchoo and Monvorath Phongpaibul
Thammasat University, Thailand

Abstract-This study evaluates the effectiveness of five models for detecting throughput bottlenecks (BN) in manufacturing systems—Active Period (AP), Algorithm Based on Active Period Theory (ABAP), Utilization (Util), Turning Point (TP), and Inter-Departure Time Variance (IDTV) within an automotive-parts plant, following the CRISP-DM framework. Ground truth was obtained from shop floor bottleneck-diagnosis experts. The experiments show that ABAP achieved the highest overall performance (F1-score 0.89, accuracy 80%), followed by Util (F1-score 0.73) and AP (accuracy 60%), whereas TP and IDTV failed to detect bottlenecks under the tested conditions. In complex, buffer-intensive production environments, active-time-based models outperform flow-sensitive approaches, offering practical guidance for selecting robust bottleneck-detection methods in real

manufacturing settings.

EM0079

Enhancing Manufacturing Excellence in Baby Diaper Production Using Six Sigma

Thawatchai Tengchoo[1] and Parames Chutima[2]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science, The Royal Society of Thailand, Thailand

Abstract-This research aims to reduce waste volume and increase production rate in the baby diaper manufacturing process by applying Six Sigma principles under the DMAIC (Define–Measure–Analyze–Improve–Control) framework to improve process efficiency and stability [1][2]. In the Define phase, Pareto analysis was used to identify the main problems causing waste and low yield, including issues with the adhesive bonding process and the workpiece suction system. The Measure phase employed the Attribute Agreement Analysis (AAA) technique to assess the accuracy and reliability of the defect inspection process, which involves qualitative data. The Analyze phase revealed that significant factors affecting waste generation were temperature, belt speed, adhesive head cleaning time, and dust accumulation. Subsequently, a Face-Centered Central Composite Design (CCF) experiment was employed to determine the optimal parameters of the process [3]. The research results showed that after process improvement, the average yield rate increased from 96.86% to 98.32%, and the total number of defects decreased from 18,795 pieces to 3,410 pieces, representing a reduction of approximately 82%. This resulted in a reduction in waste costs of approximately 50,000 THB per month, or over 600,000 THB per year. The study confirms that applying Six Sigma in conjunction with experimental design can clearly and sustainably improve the efficiency and stability of the production process, process stability, and generate economic returns.

EM0081

Job Shop Scheduling Using Bottleneck Starvation Avoidance Strategy

Jaramporn Hassamontr
King Mongkut's University of Technology North Bangkok, Thailand

Abstract-Job shop scheduling is a complex task of sequencing jobs into machines so that all jobs are completed in shortest possible time. While enumerative search techniques, such as constraint programming, have been improved drastically over the years, they are cumbersome to adjust or re-schedule, given dynamic natures of work. In this research, a dispatching rule is proposed. It is based on the concept of avoiding starvation at the bottleneck machine, while also considering other relevant information in making dispatching decisions. The algorithm is tested on large benchmark test cases available in literature. The results are particularly promising when the ratio of number of jobs to number of machines is large, suggesting bottleneck starvation could be an important factor when making dispatching decisions. The dispatching rule could be de-centralized to avoid the need for high computing resources and re-scheduling activities.

EM0100

Six Sigma-Driven Optimization of Automatic Laser Soldering Parameters for High-Yield PCBA Assembly

Jidapa Jarupeng[1] and Parames Chutima[2]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science. The Royal Society of Thailand, Thailand

Abstract-Propose to this study is to improve the quality of the automatic laser soldering process to connect batteries and printed circuit board (PCBA). The existing process has several quality issues, including incomplete solder coverage, solder ball and PCB burning, which resulted in a low soldering yield of approximately 93.87%. To address these problems, Six Sigma methodology was applied using the DMAIC framework to systematically analyze and improve the process. In the Analyze phase, we can identify three main factors that significantly affect soldering quality: 1. preheat temperature, 2. robot movement path during solder wire feeding, and 3. laser beam size. Experiments were conducted using a two-level full factorial experimental design to evaluate the effects of these parameters on the automatic laser soldering process. The experimental results indicated that optimal process settings were a preheat temperature of 220 °C, a robot movement path offset of 0.4 mm, and a laser beam size of 1.83 mm. After implementing these optimized parameters in the production line, the soldering yield improved significantly from 93.87% to 97.49%.

EM0129

Determinants of Job-Hopping Behavior: The Case of Millennial Engineers

Joachim Victor V. Nepomuceno[1], Yogi Tri Prasetyo[2], **Alif Bagas Adiutomo[2]** and Thanatorn Chuenyindee[3]
1. Mapua University, Philippines
2. Yuan Ze University
3. Navaminda Kasatriyadhiraj Royal Air Force Academy, Thailand

Abstract-This study investigates the growing phenomenon of job-hopping behavior among millennial engineers (born 1981–1996) in the Philippines, a critical segment of the workforce essential for national development yet characterized by high turnover rates. Acknowledging the lack of context-specific research, this paper aims to examine how Job Satisfaction, Job Involvement, Perceived Organizational Support, and Emotional Exhaustion influence job-hopping intentions and behavior, mediated by Affective Commitment. Employing a quantitative approach, data were collected from 300 millennial engineers in the Philippines using a structured questionnaire, and the hypothesized model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). Initial findings reveal that organizational and psychological variables, such as job satisfaction ($\beta = -0.270, p = 0.004$) and emotional exhaustion ($\beta = -0.200, p = 0.007$), are strong predictors of commitment, supporting the Job Demands–Resources model. Crucially, Turnover Intention is strongly and positively associated with job-hopping behavior ($\beta = 0.293, p < 0.001$). Furthermore, the perception of alternative employment opportunities acts as a powerful external 'pull' factor, significantly influencing both turnover intention and job-hopping behavior. The findings offer critical, evidence-based insights for engineering firms, highlighting the necessity of designing retention strategies that address both internal stressors (emotional exhaustion, lack of satisfaction) and external market drivers to cultivate commitment and reduce costly turnover.

EM0065

Reducing Granule Loss Defects and Cracking and Chipping Tablets in the Tableting Process

Chayanan Wichakul[1] and Parames Chutima[2]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science, The Royal Society of Thailand, Thailand

Abstract-This study aims to minimize these defects in the tableting process by applying the Six Sigma methodology. The research followed the DMAIC (Define–Measure–Analyze–Improve–Control) framework to systematically identify and control key variables affecting product quality [1]. The Define phase involved Pareto

analysis to select the critical product with the highest defect cost, using two selection criteria: (1) actual yield <98% and (2) the highest internal failure cost. In the Measure phase, Measurement System Analysis (MSA) and Attribute Agreement Analysis (AAA) were applied to ensure data accuracy and precision. The Analyze phase identified compression force, filling depth, and turret speed as significant parameters affecting cracking–chipping defects, and suction pressure and duct positioning as key factors influencing granule loss. A Face-Centered Central Composite Design (CCF) was conducted to determine optimal parameter levels [2]. The results showed a reduction in both Cracking–Chipping and Granule Loss defects after optimization. The overall defect rate decreased from 1.84% to 0.63%, while production yield improved from 98.16% to 99.37%, reducing internal failure costs by approximately 40% (equivalent to 1 million THB annually). The findings confirm that integrating Six Sigma with the design of experiments enhances process capability and reduces production waste in pharmaceutical manufacturing [3][4].

SESSION 2

April 24th, 2026
Time Zone: GMT+7

Topic: Application of AI in Digital Manufacturing Systems
Time: 14:10-15:55 (Duration for Each Presentation: 15 minutes)
Room: Ao Nang Orchid II
Session Chair: Prof. Yasser Dessouky, San Jose State University, USA

Onsite

EM0087

A Comparative Analysis of Task Scheduling for Autonomous Mobile Robots in Smart Electronics Manufacturing

Sarocha Wongsatidwiroj[1] and Parames Chutima[2]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science. The Royal Society of Thailand, Thailand

Abstract-This paper presents a structured approach for internal material transportation. It is a vital support function in manufacturing systems, directly affecting production efficiency and resource utilization. In electronic manufacturing environments, such tasks are often performed manually, resulting in labor inefficiencies and service delays, particularly under high demand. This study investigates the operational performance of a single Autonomous Mobile Robot (AMR) deployed to replace manual cart transport within a production line. A discrete-event simulation model is developed to evaluate system performance under varying task allocation and battery charging strategies. The model incorporates multiple job types with distinct arrival patterns, service durations, and energy constraints, introducing competition for a shared robotic resource. Ten operational scenarios, combining dispatching rules and charging policies, are assessed over a 24-hour production horizon. The results show that strategies incorporating job prioritization and proactive charging significantly reduce average waiting times compared to a baseline FIFO approach. Nonetheless, even the best-performing scenario reveals that the AMR operates near full capacity during peak periods, leading to increased queue lengths and service delays. These findings underline the limitations of single-robot systems under constrained capacity and highlight the need for additional robotic units to maintain acceptable service levels. The study offers practical insights for optimizing AMR deployment in internal logistics and production environments.

EM0037

Design of a PSO-ANN model for predicting the ship engine power

Athakorn Kengpol and Chawantorn Chanchittakarn
King Mongkut's University of Technology North Bangkok, Thailand

Abstract-The ship propulsion system is a critical component of any vessel. In order to ensure the reliability of propulsion power, regular scheduled maintenance of the main engine is essential. However, unexpected failures may occur prior to scheduled maintenance intervals, resulting in prolonged downtimes; therefore, early detection of main engine faults is vital. The literature demonstrates the use of engine power estimation for ship design purposes, but there is no evidence that has been found of PSO-ANN model for predicting ship engine power

during operation. This study, therefore, aims to develop an engine power prediction model that assists ship engineers in identifying abnormal engine conditions at an early stage. In order to achieve this objective, artificial neural networks (ANN) combined with particle swarm optimization (PSO) techniques are employed to construct the predictive model. This contribution is that the proposed PSO-ANN model is capable of accurately predicting engine power utilizing relevant parameters such as exhaust temperature, sweeping volume, scavenging pressure, and speed. According to benchmark its performance, alternative models, including a standalone ANN and a GA–ANN model, are also developed for comparison. In this regard, the root means square error (RMSE) is applied to verify the models. The results show that the PSO–ANN model achieves the lowest training RMSE of 0.0274, outperforming both the GA–ANN and standalone ANN models, which recorded RMSE values of 0.0540 and 0.3055, respectively. Furthermore, the proposed PSO-ANN demonstrates strong generalization capability for unseen data, which is achieving a prediction accuracy of 0.976. In other words, the prediction error is only 0.1555 KW on average, which is considered a small margin of error. The sensitivity and robustness analysis are applied for elucidating the relationship between the input parameters and the output and assessing the model's performance under abnormal operating conditions, respectively. The benefit of this research is that the model's predictions facilitate real-time power monitoring and support proactive maintenance decisions, reducing the likelihood of failures. A notable advantage of this approach is its adaptability to other machinery, also enabling engineers to conduct proactive maintenance and thus reduce the risk of engine failure during voyages.

EM0085

Optimization approaches for energy efficiency in robotic systems

Giuliano Fabris, Lorenzo Scalera, Renato Vidoni and Alessandro Gasparetto
University of Udine, Italy

Abstract-In this paper, we present a brief state-of-the-art overview on optimization approaches for energy efficiency in robotic systems. We first survey strategies that leverage the optimization of trajectory parameters to improve the energetic performance of robotic systems. Then, approaches to optimize the relative location between robot and desired task are analyzed, as well as the optimization of elastic elements working in parallel with the main actuators. Furthermore, approaches based on the optimal solution of the inverse kinematic problem in redundant robotic systems are described. Finally, the possible combination of diverse strategies to further improve energy savings is investigated, together with future developments and challenges.

EM0196

NSGA-II Application for Robotic Parcel Sorting System Optimization

Bilal Ahmadi[1,2], Iwan Vanany[1] and Ratna Sari Dewi[1]
1. Institut Teknologi Sepuluh Nopember, Indonesia
2. Politeknik APP Jakarta, Indonesia

Abstract-Autonomous mobile robots have transformed critical warehouse processes, including sorting in the courier and express industry. The robotic parcel sorting system deals with how to efficiently sort parcels from loading stations to their respective drop-off points by using robots. This study analyzed the optimization of such a system with two objective functions: the makespan and the number of robots used. A bi-objective mixed-integer programming model with three policy scenarios of robot delivery task sequencing is proposed, which are random keys, earliest-arrival-first, and shortest-processing-time-first. We generated two random instances with different numbers of parcels to be processed. The non-dominated sorting genetic algorithm II was employed to build the

approximate Pareto front, and then the normalized hypervolume was calculated based on it. General observation of all Pareto fronts indicated a diminishing return of added robot to the makespan. This meant that adding more robots would not necessarily significantly reduce the makespan. Furthermore, in terms of normalized hypervolume, the earliest-arrival-first policy slightly performed better than the random keys policy, where the difference is no more than 1%.

EM0134-A

Integrating Operational Efficiency and Resilience: An AI-Driven Supply Chain Strategy

Taeho Park
San Jose State University, United States

Abstract-In an increasingly volatile and interconnected global environment, traditional supply chain management (SCM) models that emphasize cost efficiency and lean operations alone are no longer sufficient. Recent disruptions, including global pandemics, semiconductor shortages, and geopolitical uncertainties, have exposed the vulnerability of efficiency-centric supply chains and highlighted the urgent need for strategies that enhance resilience and adaptability. The performance of modern supply chains critically depends on seamless coordination across activities, supported by intelligent supply chain systems. While conventional optimization and risk management approaches have provided foundational support, the emergence of artificial intelligence (AI) has fundamentally transformed supply chain operations. AI-enabled systems now play a pivotal role in improving decision-making accuracy, enhancing operational productivity, and enabling end-to-end visibility across the supply chain. This paper proposes an integrated framework that simultaneously advances operational efficiency and innovation-driven resilience, encompassing proactive risk identification, response, recovery, continuity, and continuous improvement. Furthermore, the study examines how leading organizations leverage AI and digital technologies within their SCM strategies to achieve robust supply chain resilience while maintaining high levels of operational efficiency.

EM0176

Exploring Turnover Factors Affecting Business Process Outsourcing Employees Using Push-Pull-Mooring Theory

Joachim Nepomuceno[1], **Yogi Tri Prasetyo[2]**, Alif Bagas Adiutomo[2] and Thanatorn Chuenyindee[3]
1. Mapua university, Philippines
2. Yuan Ze University
3. Navaminda Kasatriyadhiraj Royal Air Force Academy, Thailand

Abstract-This study investigates employee turnover in the Philippine BPO industry using the Pull-Push-Mooring (PPM) framework. Data were collected from employees with prior job transitions through online surveys, analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). Results reveal that dissatisfaction and alternative attractiveness significantly increase switching intentions, while mooring factors exert both direct and moderating effects on turnover behavior. Findings highlight the importance of workplace improvements, career development, and cultural alignment in retention strategies. This research contributes to turnover literature by extending PPM theory to service industries and offering practical insights for HR policy and workforce stability.

SESSION 3

April 24th, 2026
Time Zone: GMT+7

Topic: Digital Logistics and Warehouse Management
Time: 16:00-17:40 (Duration for Each Presentation: 15 minutes)
Room: Ao Nang Orchid I
Session Chair: Prof. Athakorn Kengpol, King Mongkut's University of Technology North Bangkok, Thailand

Onsite

EM0195

Prediction-Driven Decision Support for Traffic Load Management

Sara Atef [1,2] and Mohammed T. Khouj[1]
1. University of Business and Technology, Saudi Arabia
2. Zagazig University, Egypt

Abstract-Accurate short-term traffic load prediction is a critical component of Intelligent Transportation Systems (ITS), enabling proactive traffic management and operational decision making. While recent Deep Learning (DL) models have achieved high predictive accuracy, their integration into practical and interpretable decision-support frameworks remains limited. This paper proposes a lightweight prediction-driven decision support framework that directly links traffic load forecasting with operational decision making. A DL-based model is employed to predict short-term traffic volume using high-resolution, one-minute traffic data collected from a major urban roundabout in Jeddah, Saudi Arabia. Building on the prediction outputs, a Traffic Load Decision Index (TLDI) is formulated by integrating predicted traffic load with key traffic indicators, including delay and queue length, in a normalized and interpretable manner. A simple threshold-based decision rule is then applied to identify periods requiring proactive traffic management actions. Experimental results demonstrate strong predictive performance and confirm that the proposed decision index effectively captures temporal variations in traffic conditions. The proposed framework emphasizes simplicity, transparency, and practical relevance, making it well suited for real-time deployment in intelligent transportation systems and industrial engineering applications.

EM0059

Increasing Inventory turnover in a restaurant sector MSE through Slotting, 5S and S&OP

Mariana Ortiz-Schultz, Mariana Postigo, Carlos Urbina-Rivera and Manuel Montoya
Universidad de Lima, Perú

Abstract-This research addresses the problem of low inventory turnover in a food service microenterprise (SMEs), whose initial value of 0.75 turnovers per month is considerably lower than the sector average of 4. This gap is caused by unexpected purchases, stockouts, and inadequate storage, generating economic losses equivalent to 7% of annual sales. The study proposes an integrated model based on 5S, Slotting, and S&OP with the aim of improving inventory flow, supply availability, and overall operational control. A systematic literature review is included to identify tools applicable to SMEs. The objective is to increase inventory turnover, so benchmark indicators were evaluated to guide the design of the improvement model. This involves implementing the 5S

methodology to establish organization and standardization; Slotting to ensure consistent and traceable storage locations based on turnover and ABC classification; and S&OP to integrate demand forecasting with structured purchasing cycles. Furthermore, the validation demonstrated significant improvements: the Inventory Record Accuracy (IRA) increased from 52.30% to 82.61%, the Location Record Accuracy (LRA) from 0% to 92.59%, and the 5S score from 23.33% to 85.56%. Additionally, S&OP increased demand accuracy from 49.04% to 77.95%. As a result, inventory turnover increased to 1.83 turns per month, offering a low-cost and scalable approach for SMEs seeking to strengthen their inventory management.

EM0167

Optimizing Container Procurement Strategies for Make-to-Order Production Systems: An Inventory Impact Analysis

Widodo and Lucia Diawati
Bandung Institute of Technology, Indonesia

Abstract-Persistent container shortages and arrival delays cause dynamic inventory effects in make-to-order (MTO) production systems, where limited buffering capacity amplifies logistics disruptions. The demand pattern is characterized by product customization, with production initiated only after customer orders are confirmed. This study develops and validates a system dynamics model to analyze interactions among container procurement decisions, arrival delays, seaport handling capacity, and warehouse inventory, treating external container availability as exogenous. Sensitivity analysis identifies seaport equipment efficiency and warehouse loading capacity as the dominant operational drivers of inventory accumulation, while delays and policy-related variables exhibit non-linear and asymmetric effects. Policy optimization using the Vensim DSS Powell optimizer shows that coordinated adjustments in procurement timing, handling capacities, and delay parameters can reduce average warehouse inventory by up to 12.74%, resulting in substantial operational cost savings. The findings highlight the importance of capacity reliability at the seaport-warehouse interface, supported by adaptive container procurement and planning policies, in stabilizing inventory performance under persistent logistics uncertainty. This study contributes an integrated dynamic framework linking container procurement, seaport operations, and inventory behavior, providing actionable policies for managerial decision-making in MTO supply chains.

EM0041

Cold Chain Performance Improvement in Emerging Countries Through Logistics Digitalization and Collaboration

Erika Fatma[1,2], Teuku Yuri M Zagloel[1] and Inaki Maulida Hakim[1]
1. Universitas Indonesia, Indonesia
2. Politeknik APP Jakarta, Indonesia

Abstract-Cold chain is a temperature-controlled supply chain that plays a critical role in maintaining the quality of perishable and temperature-sensitive goods in its excellent digitalization. Despite its importance, cold chain operations continue to be inefficient due to the lack of technology adoption, fragmented processes, and weak collaboration among logistics entities. To develop an effective collaboration framework for the cold chain, it is important to investigate the fundamental factors that act as enablers and barriers to the implementation of digitalization and collaboration. This review aims to systematically evaluate previously reported studies to identify key influencing factors that serve as enablers of technology adoption and logistics collaboration. This review was conducted following the PRISMA framework, with articles retrieved from major academic databases. The result

shows several significant factors as enablers of digitalization and logistics collaboration, contributing to improved cold chain performance. This review paper emphasizes the importance of integrated collaborative models as a foundation for effective collaboration strategies.

EM0145

A Multi-Objective Closed-Loop Network Design for Perishable Food Distribution under Uncertainty

Ma Thi Mai Dinh, Warut Pannakkong and Sun Olapiriyakul
Thammasat University, Thailand

Abstract-Perishable food supply chains face sustainability challenges due to product deterioration, food waste, and unequal waste burdens across communities. This study develops a multi-objective closed-loop supply chain network design model that integrates forward and reverse flows with waste separation decisions, optimizing profit, fresh demand coverage, and CO_2 emissions under waste justice constraints using a Waste Disparity Index (WDI). The proposed model explicitly accounts for fresh consumption and uncertainty in the initial shelf-life to obtain resilient and equitable ordering and inventory decisions. Our results show how cost-efficient and sustainable food distribution networks can be obtained, while maintaining waste and carbon emission impacts at acceptable levels.

SESSION 4

April 24th, 2026
Time Zone: GMT+7

Topic: Ergonomics, Health Assessment and Human Resource Management
Time: 16:00-17:40 (Duration for Each Presentation: 15 minutes)
Room: Ao Nang Orchid II
Session Chair: Prof. Yogi Tri Prasetyo, Yuan Ze University

Onsite

EM0045-A

Ergonomic Analysis of Military Helmets with Night Vision Goggles: Effects of Center of Mass and Counterweights on Cervical Loading

Shu-Zon Lou[1], Yu-Chi Chen[2] and Jia-YuanYou[3]
1. Chung Shan Medical University
2. Hungkuang University
3. I-Shou University

Abstract-This study presents a comprehensive ergonomic analysis focused on the biomechanical impacts of wearing military helmets integrated with night vision goggles (NVGs). The research methodology included measuring the physical center of mass (COM) of the helmet-NVG system and simulating the static mechanical loads imposed on the cervical joints. Furthermore, ten healthy graduate students were recruited to participate in human subject trials. During these trials, Electromyography (EMG) was utilized to quantify dynamic neck muscle loading while participants performed various cervical movements wearing the equipment. The experimental results indicate that the addition of NVGs and a battery pack significantly shifts the system's COM anteriorly. This displacement increases the leverage on the neck, thereby necessitating greater muscle contraction forces during flexion and extension. Conversely, the application of counterweights effectively shifts the COM downward and closer to the head's support point. This biomechanical adjustment successfully reduces both the cervical joint forces and the required muscle exertion. The EMG data further corroborates these findings, clearly demonstrating that while the unweighted configuration increases muscle activity signals, the use of counterweights significantly mitigates this physiological load.

EM0112

An Investigation on Musculoskeletal Discomfort Among Large Waste Collection Workers

Chien-Hsin Yang
Chaoyang University of Technology

Abstract-This study aims to investigate musculoskeletal discomfort among large waste collection workers. Following the recommendations of the Occupational Safety and Health Administration (OSHA), the Nordic Musculoskeletal Questionnaire (NMQ) was used to examine the prevalence of musculoskeletal discomfort, while the MSDs questionnaire was employed to explore the relationship between musculoskeletal discomfort and associated risk factors. A total of 150 questionnaires were distributed, and 118 valid responses were collected.

Results showed that 71% of respondents reported experiencing musculoskeletal discomfort. Among the respondents, 27 (23%) reported neck discomfort, 66 (56%) shoulder discomfort, 24 (20%) back discomfort, 45 (38%) elbow discomfort, 44 (37%) wrist discomfort, 40 (34%) thigh discomfort, 40 (34%) knee discomfort, and 24 (20%) ankle discomfort. Further analysis of human-related risk factors revealed that age, exercise habits, years of work experience, daily rest time, and frequency of waste handling all influenced musculoskeletal discomfort among waste collection workers. Therefore, adjusting work tasks and improving waste collection management practices may help reduce discomfort among these workers.

EM0133

Physical Activity Recommendations with Potential for Prevention of Upper-Extremity Musculoskeletal Disorders

Ping-Yueh Chang and **Peng-Cheng Sung**
Chaoyang University of Technology

Abstract-The Taiwan Bureau of Labour Insurance indicated that Workers' Compensation claims for upper-extremity musculoskeletal disorders (MSDs) accounted for 75.1-78.9% of total work-related MSDs claims from 2017 to 2021. To reduce the risk of MSDs, WHO recommended maintaining physical activity (PA) as one of the protective/proactive strategies. However, inconsistent PA effects were observed across studies, which could be attributed to differences in the training exercises and resistance levels used in the PA interventions. Accordingly, this study assessed the effects of training exercise (three kinds), resistance level (default versus 1.5 times default), and duration (20 versus 50 minutes/session) of PA on physiological strains. Ten male and ten female computer office workers aged 20 to 22 years old participated in this study. The PA interventions were performed using laboratory-owned shoulder-upper extremity fitness training equipment. Wearable sensing devices were used to measure heart rate and tympanic temperature. Repeated measure ANOVA results show a significant effect of training exercise ($F=114.148$, $p<0.000$) and resistance level ($F=5.510$, $p=0.047$) on heart rate. PA interventions can be prescribed according to the results with different combinations of exercises and resistance level to meet WHO guidelines (e.g. 150 minutes total of moderate-intensity, 90-110 bpm, activity per week) with potential for prevention of upper-extremity MSDs.

EM0189

Urban Sprawl and Green Total Factor Productivity Growth: Spatial Spillover Evidence from Java and Sumatra

Khusnudin Tri Subhi and Doddy Aditya Iskandar
Universitas Gadjah Mada, Indonesia

Abstract-Rapid urbanization in Indonesia has intensified urban sprawl, particularly in Java and Sumatra, raising concerns about its implications for sustainable productivity growth. This study examines the impact of urban sprawl on Green Total Factor Productivity (GTFP) growth across 273 districts and cities in Java and Sumatra from 2017 to 2024, explicitly accounting for spatial spillover effects. GTFP is measured using the Global Malmquist–Luenberger index, while urban sprawl is quantified using a nighttime light–based index that captures both vertical and horizontal expansion. Spatial dependence is first confirmed using Moran's I, followed by estimation with spatial panel lag models and impact decomposition. The results reveal significant spatial spillovers in GTFP growth, indicating strong interregional interdependence. Industrialization consistently promotes green productivity through both direct and spillover effects, whereas urban sprawl exerts a negative impact, constraining productivity

growth across regions. In contrast, fiscal capacity and urbanization rates do not exhibit robust effects once spatial interactions are considered. These findings highlight the importance of coordinated spatial planning and industrial development policies in fostering sustainable and inclusive regional productivity growth in rapidly urbanizing economies.

EM5038

Data-Driven Raw Materials Segmentation Using Unsupervised Learning: A Case Study in Semiconductor Industry

Piyathida Somwong and Naragain Phumchusri
Chulalongkorn University, Thailand

Abstract-This study presents a comparative analysis of three unsupervised learning techniques namely K-Means, K-Medoids, and Hierarchical Clustering to segment 92 high-value substrate SKUs in a semiconductor back-end manufacturing facility. The research addresses the limitations of traditional single-criterion ABC analysis by integrating six operational and risk-based criteria: demand volume, demand variability, intermittency, lead time, lead time variability, and shelf life. The performance of each method is evaluated using the Silhouette Coefficient and managerial feedback to determine the most effective grouping for practical inventory management.

EM5014

Real-Time Neonatal Body Length Estimation Based on an RGB-D Camera

Khin Dagon Win, Kikuhito Kawasue and Masatoki Kaneko
University of Miyazaki, Japan

Abstract-Preterm newborns have extremely fragile skin and require care in temperature and humidity-controlled incubators, making physical contact during routine clinical procedures undesirable. Nevertheless, daily growth monitoring is essential for early diagnosis and assessment of neonatal development. Body length is a critical indicator of growth in preterm newborns; however, conventional manual measurement methods are often inaccurate, time-consuming, and may cause discomfort due to repeated handling. This paper presents a digital-based system for real-time preterm body length estimation designed to minimize physical contact while doing measurement. The proposed approach utilizes an RGB-D camera setup combined with 3D image processing and machine learning techniques. YOLOv8 is employed to detect key joint regions of the newborn's body from captured image. The distances between detected joints are then computed and used as input features for a machine learning model to estimate overall body length. Experimental results demonstrate that the proposed system can provide real-time body length estimation in practical clinical scenarios, offering improved efficiency compared to traditional measurement methods.

SESSION 5 (Online)

April 24th, 2026
Time Zone: GMT+7

Topic: Equipment Management and Preventive Maintenance Strategies in Advanced Manufacturing Systems
Time: 14:40-16:25 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/86509399828
Session Chair: Prof. Kasin Ransikarbum, Ubon Ratchathani University, Thailand

Online

EM0067

Improve Efficiency in the Cereal Bar Production Process by using SMED, Autonomous Maintenance, Preventive Maintenance and Line Balancing

Isabella Chichizola-Mina, María Fe Ochoa-Artola, Carlos Urbina-Rivera, Edilberto Avalos-Ortecho
Universidad de Lima, Perú

Abstract-This study addresses low operational efficiency (68.58%) in the packaging process of a Peruvian healthy food manufacturer, which operates below the industry benchmark of 77.1%. The inefficiencies are mainly driven by excessive setup times, unplanned equipment stoppages, and workload imbalance causing bottlenecks. To mitigate these issues, a pilot improvement project integrating Single-Minute Exchange of Die (SMED), Total Productive Maintenance (TPM), and Line Balancing was implemented. The proposed solution was validated through discrete-event simulation using Arena software on a representative production sample. Results indicate an efficiency increase to 81.13%, a 17.94% improvement in Takt Time compliance, and an MTBF increase exceeding 69% for critical equipment. In conclusion, the integrated application of these tools increased process efficiency by 13 pp, demonstrating that integrated engineering interventions allow small and medium-sized food enterprises to close technical gaps and enhance competitiveness without substantial capital investment.

EM2002

Reduction of Heater Coil Forming Defects in Hair Dryer Manufacturing Through a Six Sigma DMAIC Approach

Thanawat Muangkam[1] and Parames Chutima[2]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science, The Royal Society of Thailand, Thailand

Abstract-The objective of this research is to reduce defects in the manufacturing process that produces the heater coil in a case study company. The defects from this process must be repaired by operators, and the repair operations become a type of waste. The defects occur from the coil rolling machine in the heater production process. The Six Sigma approach, comprising the Design, Measure, Analyze, Improve, and Control (DMAIC) phases, was applied to define the problem and make the main problem focused. The defect data were collected from the Daily Process Confirmation Record. The cause-and-effect diagram was used to identify the possible factors to be examined. Furthermore, the Design of Experiments was applied to analyze the significant factors that

cause the defects. The Box-Behnken design was employed to test the significance of these factors. It was observed that after changing three key factors discovered in the improvement phase, i.e. angle of gear block, pitch, and speed of wiring, the defects were reduced from 62.00% to 4.83%. After the process was improved and stabilized, the case study company can reduce the total loss cost by 1.9 million THB.

EM0043

Productivity improvement model using MPS and preventive maintenance in a silica sand processing company

Rodrigo Jarama, **Victor Torres**, Jorge Montoya and Rafael Villanueva
Universidad de Lima, Perú

Abstract-Silica sand processing is a critical link in construction supply chains, yet many medium-sized plants in emerging economies operate with chronic productivity gaps driven by reactive planning and maintenance. This study addresses that problem in a Peruvian silica sand processor by proposing an integrated improvement model that couples a hybrid demand forecasting system, a capacity-constrained Master Production Schedule (MPS), and a preventive maintenance plan for the bottleneck rotary dryer, all implemented within a single decision-support framework and validated through discrete-event simulation. The model aligns forecasted demand with finite capacity, embeds maintenance windows directly into the weekly schedule, and restructures maintenance routines around reliability data. Results show simultaneous gains in service and efficiency: the Demand Satisfaction Index and order fulfilment level increase from about 91% to 93%, while average hourly productivity rises from 6.96 t/h to 7.11 t/h without expanding installed capacity. Overall, the plant recovers previously lost operating hours at the bottleneck and closes a substantial share of its initial productivity gap using tools that are feasible for medium-sized, low-digitalization environments.

EM0064

Implementation of improvements to increase the availability of production equipment using TPM 4.0 and SMED tools in a PVC pipe factory

Carlos E. Custodio Llontop, **Katherine M. Palpa Rodriguez** and Jhony F. Cárdenas Vidigal
Universidad Peruana de Ciencias Aplicadas Lima, Perú (UPC)

Abstract-This study aims to increase the operational availability of a critical PVC pipe extrusion line through the integrated implementation of TPM 4.0 and SMED methodologies. The research was conducted using an applied approach, with a quasi-experimental before-and-after (AS IS–TO BE) design, employing a controlled pilot test over 91 days on the MMKSJSZ65/132 machine. The challenge was to close a 7.73% technical gap compared to global industry standards, which generates a financial impact of S/ 1,635,860.07, or its equivalent in US dollars $487,008.06 (Exchange rate S/ 3.3590 of the Central Reserve Bank of Peru (BCRP) closing on January 16, 2026) representing 12.94% of the economic impact on the company under study. The study adopted a mixed-methods approach, combining quantitative analysis—based on MTTR, MTBF, and setup times —with a qualitative causal analysis, supported by expert judgment techniques such as FMEA, the Five Whys, and structured brainstorming sessions. Likewise, these tools made it possible to identify and prioritize the root causes associated with the low availability of the equipment attributed to: electric motor failures 18%, damage to the cooling system and changes in blades 15.38% and die heads 11.18%.
The results show an 18.91% reduction in MTTR, a 29.55% increase in MTBF, and reductions of 34.09% and 41.27% in blade and die head changeover times, respectively. Implementing the model generated a 28.75%

positive economic impact, validating the effectiveness of integrating TPM 4.0 focused on the Internet of Things (IoT) within the framework of Planned Maintenance (Preventive and Predictive) and SMED, to improve reliability, efficiency, and operational sustainability in industrial extrusion processes.

EM0153

Building the Foundation for Smart Manufacturing: An Integrated Lean-TPM Framework for OEE Optimization in Peruvian Textile SMEs

Yamilé Morillo-Dávila[1], Luis Morillo-Dávila[1], **Fernando Maradiegue-Tuesta[1]**, Fabiola Pinzón-Hoyos[2] and Anita Straujuma[3]

1. Universidad Peruana de Ciencias Aplicadas (UPC), Perú
2. International Business Program, Pilot University of Colombia (Universidad Piloto de Colombia), Colombia
3. Faculty of Engineering Economics and Management, Latvia

Abstract-While Industry 4.0 technologies promise significant productivity gains, many small and medium enterprises in emerging markets lack the operational stability required to implement them effectively. This challenge is directly illustrated by analysis of a women's clothing manufacturer in Lima, Peru, where the cutting area operated at just 73.7% OEE—well below the 85% industry benchmark—resulting in annual losses of approximately S/ 181,298. Rather than proceeding directly to the implementation of IoT sensors or predictive analytics, we recognized that the company first needed to address fundamental operational issues: machine downtime accounted for 69% of losses, followed by unproductive time (17%) and rework (14%). In response, an integrated framework—combining 5S, SMED, and Jishu Hozen—was designed that would not only close this performance gap but also establish the process discipline necessary for future digital transformation. Using Value Stream Mapping and statistical process control for diagnosis, the proposed approach was validated through literature-based projections, anticipating improvements in MTBF (from 3.64 to 10 hours), cycle time (from 81 to 65 seconds), and first-pass yield (from 86% to 95%). The findings suggest that for resource-constrained SMEs in Latin America, building this Lean-TPM foundation is an essential prerequisite before investing in smart manufacturing technologies. This phased approach is proposed as a more realistic pathway to Industry 4.0 for the thousands of traditional manufacturers in emerging economies.

EM0193

Production Model to Increase Weaving Machine Availability by Applying TPM and SLP

Armando S. Guevara-Urteaga, **Juan Alonso Arbaiza-Lopez Torres**, Rafael Chavez-Ugaz and Claudia C. Leon-Chavarri

Universidad de Lima, Perú

Abstract-Textile SMEs operate in a highly competitive environment; low machine availability restricts production capacity. In Peru, the sector’s average availability is 90.5%, versus 72.3% in the case study. Downtime due to electrical failures, minor failures and misadjustments, and operator travel time was addressed through Planned Maintenance, Autonomous Maintenance, and SLP, respectively. Through a four-week pilot and a simulation of the integrated model in Arena, electrical failures were reduced by 71.7%, minor failures and misadjustments by 24.7%, and travel times by 24.2%, raising machine availability to 77.5%. The integration of Lean tools offers significant improvements by reducing lost time, increasing availability in a high-demand environment such as the Peruvian textile industry.

SESSION 6 (Online)

April 24th, 2026
Time Zone: GMT+7

Topic: Integration of Industrial Internet of Things and Digital Twin Technologies for Intelligent Manufacturing
Time: 14:40-16:25 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/83353043204
Session Chair: Prof. Vikram Sharma, The LNM Institute of Information Technology, India

Online

EM0032

Integrated Systems 4.0: Process Optimization in Natural Gas Installations through IoT, Lean Construction, and TPM

Hector Nuñez, Valentina Valencia and Fernando Pazce
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-This paper proposes a model to optimize the natural gas installation process and to increase project approval efficiency. Recent studies in similar companies have shown that issues related to activity coordination, resource management, and planning contribute to increased constraints during construction phases. The use of methodologies in the construction sector, such as Lean Construction, the SCOR Model, and Total Productive Maintenance (TPM), has proven effective in improving project activity compliance, underscoring the need for new proposals to apply these tools in specific contexts. Based on the above, the proposal includes the development of a digital monitoring and collaborative planning system focused on critical materials and planned maintenance using IoT sensors. This approach aims to improve planning, procurement, and equipment availability. It enhances sustainability and competitiveness in the sector, allowing companies to reduce operational costs, optimize resources, and address the challenges of the current industrial environment.

EM0098

Readiness for Digital Twin Adoption in Agri-Food Systems: A Developing Economy Case Study on Technological, Data, and Organizational Perspectives

Kent Benedict P. Cabucos[1], Klint Allen A. Mariñas[2] and Michael G. Calamba[2]
1. Mapua University, Philippines
2. Mapua Malayan Colleges Mindanao, Philippines

Abstract-This study evaluates the readiness of the Philippine agri-food supply chain to adopt Digital Twin (DT) technology. While high-tech industries have successfully integrated DT, the agri-food sector in developing economies faces unique challenges regarding perishability, legacy infrastructure, and data governance. Using a modified Technology-Organization-Environment (TOE) framework, this study employs a qualitative case study approach involving semi-structured interviews, readiness checklists, and process observation within a major agri-food enterprise. The findings reveal a "Moderate Readiness" level (Overall Score: 1.43/2.0). While the organization demonstrates strong leadership support and cloud storage capabilities, significant barriers remain,

specifically the lack of system integration between SCADA and ERP systems and the absence of departmental "Digital Champions." This paper provides a diagnostic framework for agri-food enterprises to identify gaps in infrastructure and workforce skills before attempting full-scale digital transformation.

EM0164

Smart Digital Visual Management for Cost-Effective On-Site Housing Construction Management

Woraphoom Jatuworaphat[1], Parames Chutima[2] and Kwanrat Suanpong[1]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science, The Royal Society of Thailand, Thailand

Abstract-The construction industry in Thailand continues to experience significant waste throughout the construction process. Although technologies such as prefabrication systems, Building Information Modeling (BIM), and SketchUp have been widely adopted, their application has mainly focused on the pre-construction phase, particularly for reducing design-related defects. While these tools help minimize errors caused by design inconsistencies, effective tools for managing on-site construction activities remain inadequate. Moreover, there is a lack of practical tools that support workers and skilled craftsmen in performing tasks correctly on the first attempt in accordance with project specifications. This research addresses this gap by developing and implementing a cost-effective Digital Visual Management (DVM) system to support real-time workforce coordination during on-site construction. Low-cost digital tools and software applications were adapted and tested in actual construction projects. The results demonstrated strong acceptance of the DVM system across all main stakeholders, resulting in company-wide adoption and sustainability. The implementation of DVM substantially reduced non-value-adding activities, resulting in total savings of approximately 3.5 million THB, equivalent to 500,000 THB per project per year. The results of this research demonstrated that the proposed novel, practical-proven DVM system was successfully implemented, achieved broad stakeholder acceptance, and supported scale-up to organizational standardization.

EM0033

Smart, Sustainable Manufacturing: Using IoT and Lean to Reduce Scrap in a Lima, Peru Pizza Producer

Zahira Torres, **Paula Gamonal** and Angel Hurtado
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-This study addresses product waste in the family-size Hawaiian pizza line of an industrial food plant by proposing and validating an integrated improvement model that combines Poka-Yoke 4.0, digital Andon, and Predictive Maintenance 4.0 within a Lean 4.0 and Green Value Stream Mapping (GVSM) framework supported by an IoT Edge–Gateway–Cloud architecture. The intervention begins with a GVSM-based diagnosis to identify bottlenecks and loss drivers, followed by the instrumentation of critical equipment with smart sensors, interoperable cloudconnected Andon boards, and condition-monitoring devices that feed machinelearning models for predictive maintenance. Validation is performed through discrete-event simulations calibrated with historical production and failure data. Results show that, compared to the baseline, product waste is reduced by 19%, production increases by 31.06%, and the environmental footprint decrease from 6.9 to 5.0 t CO_2-eq. This study provides applied evidence, in a pizza production context, of the convergence of Green–Lean–IoT with predictive maintenance, highlighting its potential to minimize waste and improve environmental performance in the food industry.

EM0006

Technology innovation with SMED, TPM and IoT to optimize availability in corrugated printing lines

Suly Y. Huerta Mamani, **Diego F. Davila Mendez** and Jhony F. Cárdenas Vidigal
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-This article addresses the efficiency and availability problems in a flexographic printing line, identifying delays in the configuration process and recurring equipment failures as the main causes. The analysis shows that the current availability is 59.6%, below the industry standard of 90%, and that the Overall Equipment Efficiency (OEE) reaches only 45%, affecting productivity. To improve this situation, a comprehensive strategy based on Total Productive Maintenance (TPM), the Quick Tool Exchange (SMED) technique and Internet of Things (IoT) technologies is proposed. A literature review and a technical analysis were conducted to support the proposal where limitations were identified such as the lack of technological integration, the limited use of IoT to basic functions and the absence of predictive maintenance or digital traceability. The objective is to increase availability and reduce downtime. Preliminary results indicate substantial improvements and possible application in other industrial environments.

EM0009

Impact of IoT and Big Data Adoption for Business Model Innovation as Mediator to Business Performance

Jonny[1], Kriswanto[1] and Matsumura Toshio[2]
1. Bina Nusantara University, Indonesia
2. Osaka University, Japan

Abstract-This examination proposed an IoT (Internet of Things) and Big Data Implementation Model for Business Performance. Past research showed absence of information on their application sway on business results. From those investigations, a few variables should have been thought about, for example, 1) Business Process Improvement (BPI), 2) Business Management Innovation (BMI), and 3) Business Performance (BP). The purpose of this paper is to develop model for applying IoT and Big Data to accomplish business execution. Therefore, the method of research of this paper is categorized as quantitative research using Partial Least Squares Structural Equation Modelling (PLS-SEM). After directing a purposive poll to administrative respondents, the PLS-SEM strategy was led utilizing SmartPLS 3.0 to see if the model is fit. As the result, Goodness of Fit (GoF) is 0.65 bigger than required 0.38 then the model is affirmed to be vigorous and exact. In turn, this model is the novelty of this paper. In conclusion, BP can be promoted either by BMI or BPI As a Mediator, BMI strongly needs BPI to improve BP. However, from this research, it can be said that IoT and Big Data implementation impact on BPI has already stronger impact to BP than through BMI.

SESSION 7 (Online)

April 24th, 2026
Time Zone: GMT+7

Topic: Enterprise Management Innovation and Public Service Optimization in the Context of Digital Transformation
Time: 16:25-18:25 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/86509399828
Session Chair: Asst. Prof. M. Mujiya Ulkhaq, Diponegoro University, Indonesia

Online

EM0026

Accident risk analysis using the FMEA method at XYZ Company

Jonny and Jonatan Hizkia Moniung
Bina Nusantara University, Indonesia

Abstract-The research conducted in this report is to analyze risk accident problems related to occupational health and safety at XYZ Company by using the Failure Mode Effect and Analysis (FMEA) method in determining the priority value of the problems that must be resolved and analyzing the problems that must be solved. The resolved problems have a major impact because the company uses a Pareto chart, that can decide specifically the problem or risk that needs to be researched. The resulting Pareto chart becomes a reference for Fishbone Analysis to find out in more details which factors that influence the Occurrence of a risk. Risk analysis is carried out by referring to the factors that influence a problem in the Fishbone Analysis results. The problems discussed are occupational health and safety issues and occupational safety risks when doing fan maintenance in the company's Cooling Towers.

EM0004

Big Data Tax Administration and Corporate ESG Performance: An Empirical Study Based on "Golden Tax Phase III" Project of China

Jia Fu and Mi Tian
Guangdong Mechanical and Electronical Polytechnic, China

Abstract-This article uses financial data of Chinese listed companies from 2010 to 2022 to study the impact of big data tax collection and management on corporate ESG performance. The research found that: firstly, big data tax collection and management will reduce the ESG performance of enterprises; Secondly, the intermediary mechanism indicates that big data tax administration reduces ESG performance by exacerbating corporate financing constraints; Thirdly, heterogeneity tests indicate that when a company's short-term net capital is small, when executives do not have a financial background, when the company is a non high-tech enterprise, when corporate governance is poor, the negative relationship between big data tax management and corporate ESG performance is more significant. This study enriches the research literature on the economic consequences of big data tax collection and management, and is of great significance for considering some precautions after big data tax collection and management.

EM0186

Task-Oriented Digital Skills Modeling for Citizen Interaction in Mobile-First Public Service Systems

Tazkia Rizky Karimah[1], Refi Rifaldi Windya Giri[1] and Nila Sartika Achmadi[2]
1. Telkom University, Indonesia
2. Politeknik Bosowa, Indonesia

Abstract-This study explores the preliminary dimensional structure of citizen digital skills in mobile-first public service environments, using Bandung, Indonesia, as an urban case where mobile-based platforms dominate public service interaction. While global and national assessments show increasing digital readiness and infrastructure maturity, they often obscure substantial variation in citizens' ability to perform service-related digital tasks, particularly in navigating fragmented mobile government systems. Drawing on the six-domain framework proposed by Van Deursen and Van Dijk, this study employs Exploratory Factor Analysis (EFA) as an initial analytical step to examine whether the original domain configuration holds within a mobile-first public service context. Survey data from 232 active users of mobile public services were analyzed using Principal Axis Factoring with Promax rotation. The results preliminarily suggest a four-factor structure comprising Formal–Communication Skills, Information–Content Skills, Strategic Skills, and Operational Skills, collectively explaining 75.045% of the total variance. These findings indicate that digital skill domains are context-dependent and may reorganize in mobile public service settings, where navigation, interaction, and content handling tend to merge into integrated task sequences. The results underscore the importance of reexamining existing digital skills frameworks and refining measurement instruments for more user-centered mobile government design and evaluation.

EM0061

Proposal to Reduce Inventory Discrepancies in a Telecommunications Company Through the Integration of 5S, AIDC, and DDMRP Tools

Freddy Esteban Huamani Aroni, **Jaime Falcón Llerena**, Jhony Francisco Cárdenas Vidigal
Peruvian University of Applied Sciences, Peru

Abstract-This research proposes an integrated industrial engineering model to reduce a 13.73% inventory discrepancy identified in a telecommunications contracting company in Peru. The deviation exceeds the industry benchmark of 5%, generating an economic impact equivalent to 3.62% of annual revenue. The model integrates 5S methodology for operational discipline, Demand-Driven Material Requirements Planning (DDMRP) for buffer-based dynamic inventory control, and Automatic Identification and Data Capture (AIDC) technologies for real-time digital traceability. Functional validation combined pilot field implementation and quantitative scenario modeling. Under a moderate scenario, results indicate a reduction of overstock by 12%, a decrease of registration errors by 8.7 percentage points, and a measurable improvement in warehouse order and control. Economic evaluation over two years shows a positive Net Present Value (NPV) of S/ 12,596.69, an Internal Rate of Return (IRR) of 17.79%, and a payback period of 0.78 years. The findings demonstrate technical feasibility, economic sustainability, and provide a novel integrated framework adaptable to medium-sized contracting companies in high-variability sectors.

EM0105

Implementation Of Internal Control Supporting Sdg 16: Transparency Challenges And Innovative Solutions At Universities

Nur Ravita Hanun, Gugus Irianto, Zaki Baridwan and Noval Adib

Brawijaya University, Indonesia

Abstract-This study investigates the implementation of internal control (IC) in higher education institutions (HEIs) or universities (PTs). It explores the determinants, obstacles, and contributions of internal control implementation in HEI. This study used qualitative research methods by conducting semi-structured interviews. The informants comprised six internal auditors from the universities who worked for the SPI unit (Internal Control Unit). This research is a study highlighting the implementation of internal control in universities and its role in governance practices and corruption mitigation by the achievement of the objectives of SDG 16. SDG No. 16 aims to strengthen inclusive and peaceful societies for sustainable development, provide equal justice, and build effective, accountable institutional access at all levels. The findings indicate that internal control practices are significant among PTN, PTM and PTS universities in Indonesia, with differences likely due to the absence of standardized regulations across these institutions. Effective internal control was found to contribute to safeguarding assets, reducing fraud, and enhancing accountability, but not all universities have implemented it correctly. Critical determinants for effective implementation include a firm commitment from top management, good attitudes, and the internal auditors' competence.

EM0051

Towards Sustainable Workforce Retention: The Role of Psychological Well-Being and Meaningful Work among Generation Z Employees

Sabna Nurul Hasanah and Kiki Sudiana
Telkom University, Indonesia

Abstract-High turnover intention among Generation Z employees poses a serious challenge for organizations seeking sustainable workforce retention. This study examines the influence of psychological well-being and meaningful work on turnover intention among Gen Z employees and identifies which factor has a more substantial effect. A quantitative cross-sectional survey with purposive sampling was conducted involving 266 Gen Z employees aged 18–28 years working in the Greater Bandung area, Indonesia. Data were collected using a 5-point Likert-scale questionnaire and analyzed with Partial Least Squares–Structural Equation Modeling (PLS-SEM) using SmartPLS 3. The measurement model results indicate that all constructs meet the required validity and reliability criteria. In the structural model, psychological well-being has a negative and significant effect on turnover intention (path coefficient = –0.170; p = 0.025), as does meaningful work (path coefficient = –0.323; p = 0.000). These findings suggest that higher levels of psychological well-being and perceived meaningful work among Gen Z employees are associated with lower turnover intention, with meaningful work exerting a more substantial effect. Overall, the study underscores the importance of strengthening psychological well-being and designing meaningful work experiences as key strategies for the sustainable retention of Generation Z employees.

EM0001

Platform Competition with User-Generated Content

Bohan Zhang
Chang'an University, China

Abstract-This paper develops a theoretical model of platform competition where user-generated content (UGC) quality arises endogenously from the composition of the user base. Users differ in their relative preferences for content quality and network size, and platforms compete by choosing advertising intensity, which affects user

utility through perceived quality. We characterize equilibrium platform choice, identifying conditions under which equilibria are stable. The model captures how platforms' strategic decisions shape user allocation and market outcomes, including coexistence and dominance scenarios. We consider two types of equilibria in advertising levels: Nash equilibria and Stackelberg equilibria, and discuss the industry and policy implications of our results.

EM5018

Sensor-Based Predictive Maintenance Prototype to Reduce Non-Productive Time in Brick Manufacturing SMEs

Daniel López-Torres[1], Luis Isla-Pacherrez[1], José Velásquez-Costa[1], Javier Torres-Zavala[1] and Baldomero Mendez-Pallares[2]

1. Peruvian University of Applied Sciences, Perú
2. Universidad Piloto de Colombia, Colombia

Abstract-Low production efficiency in brick manufacturing small and medium-sized enterprises (SMEs) is mainly caused by unplanned downtime and the absence of real-time operational monitoring. This paper presents a sensor-based predictive maintenance prototype designed to reduce non-productive time and improve system availability in a brick production process. The proposed solution integrates low-cost sensors and an automated control mechanism to monitor operational conditions and support timely maintenance actions. The prototype was experimentally validated through a comparative AS-IS and TO-BE analysis under controlled operating conditions. The results show a reduction in non-productive time to 3.28%, an increase in system availability to 96.7%, and a noticeable stabilization of the production flow. These results demonstrate that sensor-based predictive maintenance solutions are technically viable and suitable for implementation in resource-constrained manufacturing SMEs.

SESSION 8 (Online)

April 24th, 2026
Time Zone: GMT+7

Topic: Data-Driven Intelligent Algorithms and Optimization Models for Complex Industrial Scenarios
Time: 16:25-18:25 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/83353043204
Session Chair: Dr. Nanthawan Am-Eam, Ramkhamhaeng University, Thailand

Online

EM0080

Human Factors in Visual Information Design for Older Adults: A Systematic Literature Review of Typography and Color Ergonomics

Silvi Rushanti Widodo, Dyah Santhi Dewi and Ratna Sari Dewi
Institute of Technology Sepuluh Nopember, Indonesia

Abstract-Global population aging requires visual information design that takes into account age related changes in physiology. 90% of older adults have visual impairments, which include reduced sharpness, contrast sensitivity, and color discrimination. These limitations greatly affect their ability to read medication labels, use digital interfaces, and understand public signs. This systematic literature review looks at human factors in typography and color design for older adults. Seven themes emerged like Typography Design (40.0%), Digital Interface Design (35.6%), Physical Media Applications (31.1%), Color Design (26.7%), User Experience (24.4%), Standards and Guidelines (20.0%), and Ergonomic Assessment Methods (17.8%). The methodological analysis focus on quantitative metrics (84.4%) and experimental studies (75.6%), but there are significant gaps in the development of design interventions (20.0%). The empirical synthesis provides evidence based parameters like font sizes of 14-15.5 pt for print and 14-16 pt for digital, sans-serif humanist typefaces, contrast ratios of 7:1 or higher, and avoiding red-green combinations. Universal design fonts like Luciole, APHont, and FT Manifest UD offer better legibility. Standards WCAG and ISO 9241, do not have specific guidelines for older adults. This review lays the groundwork for creating design guidelines that support the independence, safety, and quality of life for older adults.

EM0148

Research on the Impact of AI Technology on Customers' Online Purchase Intention in Chinese E-commerce Platforms - Model Framework Construction

Shulan Chen[1], Shengchun Ning[2] and Arga Ramadhana[3]
1. Nanning University, China
2. China Southern Airlines, China
3. Fakfak State Polytechnic, Indonesia

Abstract-The e-commerce industry in China has achieved remarkable development and has played a crucial role in promoting the country's economic growth. However, with the continuous increase in the number of e-commerce enterprises and the rising expectations of consumers, these enterprises are now facing increasingly intense competitive pressure in the market. Therefore, these enterprises need to seek innovative strategies and carry out

operational reforms to maintain their market position and achieve sustainable growth. The rapid development of AI technology and its expanding application scope in various industries have brought new possibilities for the development and reform of China's e-commerce industry. Facing these emerging technologies, some Chinese e-commerce enterprises have begun to actively integrate AI capabilities into their business operations. Although AI technology is developing rapidly and more and more online shopping platforms have begun to incorporate it into their operations, it is still in the exploration stage. There is still a lack of a fully mature and stable framework. Which aspects of AI technology can influence consumers' willingness to make online purchases? This is a key issue that e-commerce companies are focusing on. In this context, this study uses the TAM theory to construct a model framework to examine the impact of AI technology in the Chinese e-commerce environment on consumers' online shopping intentions. This study aims to provide theoretical support for Chinese e-commerce enterprises, helping them effectively implement and optimize the application of AI technology on e-commerce platforms, in order to increase the online shopping intentions of Chinese e-commerce consumers and enhance the market competitiveness of these enterprises.

EM0042

Integrated Model for Improving OTIF Performance Using ABC Classification, RFID Technology, and Systematic Layout Planning in an Electrical Products Distributor

Sandro Morales-Vasquez and Pablo Gutierrez-Falcon
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-This study proposes an integrated logistics improvement model aimed at optimizing the inventory and distribution processes of an electrical products distribution company. Previous research on logistics performance has shown progress through the isolated use of tools such as demand forecasting or layout redesign; however, the systematic integration of industrial engineering techniques remains limited in companies of this type. The model developed incorporates ABC classification combined with Holt–Winters demand forecasting to reduce obsolete stock, RFID technology to improve inventory accuracy and traceability, and the Systematic Layout Planning (SLP) methodology to optimize internal material flows. In addition, complementary strategies were implemented, including delivery routing through the Clarke–Wright VRP algorithm and Autonomous Maintenance (TPM) for the vehicle fleet. The validation was conducted through simulation and pilot testing. The results show an increase in the OTIF indicator from 54.6% to 84.27%, demonstrating the technical feasibility of the model. In conclusion, the integration of engineering tools and digital technologies significantly enhances logistics efficiency, delivery reliability, and overall supply chain competitiveness.

EM0048

Application of DQN-GA (Adaptive Genetic Algorithm Optimized by Deep Q-Network) in Joint Mission Planning for Electromagnetic Detection Satellites

Changsong Yao, Xiaolu Liu, Jianhui Li, Feng Yao and Yingwu Chen
National University of Defense Technology, China

Abstract-With the rapid deployment of low Earth orbit satellite constellations and the increasingly complex electromagnetic spectrum environment, joint mission planning for electromagnetic detection satellites (EDS) faces significant challenges. Traditional heuristics struggle with the high-dimensional, multi-constrained combinatorial optimization required for the joint detection of heterogeneous targets. This paper proposes an adaptive genetic algorithm optimized by Deep Q- Network (DQN-GA), leveraging the strengths of deep reinforcement learning

and genetic algorithms. Through hybrid scenario simulations, it demonstrates that the proposed model and algorithm can achieve efficient task scheduling, while validating the superior convergence speed and solution space exploration capability of DQN-GA compared to traditional genetic algorithms. The research findings provide theoretical and practical references for joint mission planning in complex electromagnetic environments.

EM0049

Multi-Objective Genetic Programming Hyper-Heuristic with Feature Evolution for Solving Uncertain Agile Satellite Scheduling Problem

Junhua Xue, Yuning Chen, Wangqi Gu, Fxiang Lin, Tong Xu and Yingwu Chen
National University of Defense Technology, China

Abstract-The Uncertain Agile Earth Observation Satellite Scheduling Problem (UAEOSSP) provides a more accurate reflection of real-world conditions by incorporating uncertainties in profit, resource consumption, and visibility. Unlike traditional static scheduling problems, uncertainties render pre-planned solutions vulnerable. To address this challenge, we propose Feature Evolution-based MultiObjective Genetic Programming Hyper-Heuristic (FEMOGP) for evolving scheduling strategies that balance interpretability and robustness. Our framework synergistically integrates simulation, strategy evolution, and feature evolution to concurrently optimize critical feature subsets and scheduling strategies. Experimental results demonstrate FEMOGP outperforms heuristics grounded in expert knowledge, achieving 3.17% and 13.89% average performance improvements compared to look-ahead heuristics and manually designed strategies, respectively. Additionally, compared to conventional GP, FEMOGP can reduce the average size of optimal strategies by 38.5 while identifying important feature subsets. These findings substantiate the potential of these techniques to enhance genetic programming performance in satellite scheduling domains.

EM0114

Multi-level adaptive genetic algorithm based weapon target allocation method

Zhao Sun and Guangjun He
Air Force Engineering University, China

Abstract-Facing large-scale saturation attacks from unmanned aerial vehicle (UAV) swarms, air defense systems must rapidly make effective weapon–target allocation (WTA) decisions under limited resources and multiple operational constraints. The WTA problem in such scenarios is a typical large-scale combinatorial optimization problem, characterized by strong coupling between decision variables and high computational complexity, which poses significant challenges for real-time decision-making. To address these challenges, this paper proposes a decision-oriented WTA model based on a binary-encoded linear objective function and a multi-level adaptive genetic algorithm (MAGA). By introducing binary encoding, the nonlinear cooperative engagement effects among weapons are transformed into a linear integer programming form, significantly reducing the computational burden while preserving decision accuracy under multiple constraints. Furthermore, a MAGA is designed with adaptive regulation of crossover and mutation probabilities at the individual, population, and evolutionary stage levels, enabling a balanced trade-off between global exploration and local exploitation. Simulation experiments in large-scale UAV interception scenarios demonstrate that the proposed method achieves superior decision performance compared with conventional genetic algorithms and particle swarm optimization, in terms of solution quality, convergence speed, and computational efficiency. The results indicate that the proposed approach can effectively support timely and reliable weapon–target allocation decisions in complex anti-UAV operations.

SESSION 9

April 25th, 2026
Time Zone: GMT+7

Topic: Optimization, Management and Decision Analysis of Enterprise Information Systems
Time: 9:00-10:15 (Duration for Each Presentation: 15 minutes)
Room: Ao Nang Orchid II
Session Chair: Prof. Ford Lumban Gaol, Bina Nusantara University, Indonesia

Onsite

EM5016-A

Mechanism Design for AI Model Marketplaces Considering Infrastructure Revenue and Self-Preferencing

Soojeong Yoon and Deokjoo Lee
Seoul National University, Republic of Korea

Abstract-In emerging AI model marketplaces, leading cloud platforms such as AWS and Microsoft Azure act as dual-role intermediaries, hosting third-party (3P) foundation models while competing with in-house (1P) solutions. Unlike traditional e-commerce, these markets are characterized by significant infrastructure costs and technical lock-in effects. Accordingly, this study incorporates infrastructure profits—the margins derived from the platform's own cloud resources—as a primary driver for the platform's strategic decision making. We employ a mechanism design framework to analyze the platform's strategic choice between monopolizing a prominent exposure slot (1P self-preferencing) and allocating it to 3P vendors through endogenous auctions. Within this framework, we characterize the optimal mechanism that maximizes the platform's total revenue comprising sales margins, commissions, advertising bids, and infrastructure profits. Our theoretical framework suggests that high infrastructure margins can align platform profit maximization with consumer welfare. We identify the conditions under which fostering a competitive 3P ecosystem outweighs the benefits of market foreclosure, thereby mitigating monopoly inefficiencies. This suggests that the AI market's unique cost structure may naturally facilitate a more open and diverse marketplace compared to traditional digital platforms.

EM0083

A Practical Multi-Criteria Decision Framework for Selecting Strategic Partners in a Fabless Semiconductor Firm

Chanin Thurato[1] and Parames Chutima[2]
1. Chulalongkorn University, Thailand
2. Chulalongkorn University, Thailand; Academy of Science. The Royal Society of Thailand, Thailand

Abstract-This paper presents a structured approach for strategic supplier selection for a fabless semiconductor company. Regarding the fabless business model, the company relies entirely on outsourced manufacturing. This makes supplier selection a critical factor for success, especially for Wafer Foundry suppliers (Wafer Fabs), which account for a significant portion of the company's cost structure. This decision-making process is further complicated by recent geopolitical uncertainties and supply chain disruptions. To address this complexity, a Multi-Criteria Decision Making (MCDM) model is proposed. First, the Analytic Hierarchy Process (AHP) is used to

verify the consistency of the decision criteria. Second, Fuzzy AHP is applied to calculate the relative weights of each criterion, thereby handling human ambiguity. Finally, the Fuzzy Technique for Order Preference by Similarity to Ideal Solution (F-TOPSIS) is used to rank and select the best supplier. The results demonstrate that this hybrid approach helps the company mitigate risks and make clearer, data-driven decisions.

EM0197

Integrating Sustainability and Resilience in Gateway Port Systems: A Conceptual Extension of a Best-Worst Method Framework from Thailand

Notthamon Kannika
The University of the Thai Chamber of Commerce, Thailand

Abstract-Gateway container ports in emerging economies are under increasing pressure to deliver both sustainable and resilient operations in the face of regulatory change, climate risks, and global disruptions. While numerous frameworks have been proposed to assess port sustainability, sustainability and resilience are often treated separately, and empirical applications remain concentrated in hub ports and developed countries. This study develops a conceptual framework that integrates sustainability and resilience in gateway port systems by extending an existing Best-Worst Method (BWM)-based sustainability framework previously applied to container terminals in Thailand. The research adopts a conceptual and secondary analysis approach. First, a structured review of recent literature on sustainable ports, port resilience, and resilient maritime logistics is conducted to identify key resilience attributes such as robustness, redundancy, flexibility, rapidity, and adaptive capacity. Second, the established sustainability framework comprising economic, environmental, and social criteria and 34 indicators for Thai gateway terminals is taken as the empirical reference case. Third, sustainability indicators are conceptually mapped to resilience attributes, and the roles of external drivers-including legislation, port ownership, technology level, and human capital-are theorized as mechanisms shaping sustainable-resilient performance. Finally, the previously derived BWM indicator weights are interpreted qualitatively to discuss how current sustainability priorities in Thai terminals align or conflict with resilience requirements, without collecting new data.

EM0108

Optimizing Project Report Generation through an Automated Information System for a Government Organization in Baguio City, Benguet, Philippines

Mark Emriel S. Parlan[1], Klint Allen A. Mariñas[1] and Michael G. Calamba[2]
1. Mapua University, Philippines
2. Mapua Malayan Colleges Mindanao, Philippines

Abstract-The Department of Science and Technology – Provincial Science and Technology Office (DOST-PSTO) Benguet relies on periodic project reports to monitor grant-funded initiatives. However, the existing manual report generation process is time-consuming, prone to inaccuracies, and subject to delays in submission. This study developed and proposed an automated reporting system, DOST SiyensyaSistema, to streamline report preparation and improve data management. The system was engineered using the System Development Life Cycle (SDLC) following the waterfall model, and it was tested within the agency after process analysis and root cause identification. The proposed system's effectiveness was evaluated using the USE (Usefulness, Satisfaction, Ease of Use, and Ease of Learning) questionnaire, comparing the automated platform with the existing manual process. Results indicated substantial improvements across all usability dimensions, with employees reporting higher

usefulness, ease of use, ease of learning, and overall satisfaction. The proposed system enhanced reporting efficiency, reduced data retrieval redundancy, and enabled more accurate, timely submissions, as outlined in the to-be process map. Beyond process automation, the platform establishes a scalable digital infrastructure that may be adapted by other government offices or branches with similar reporting requirements, supporting data-driven management and future innovative government initiatives.

EM0047

Enablers and Barriers in Transitioning to Induction Stoves: A Comparative Study of Five Developing Nation

Retno Wulan Damayanti, Haryono Setiadi, Dania Latifa Rizky, Arya Pradana Putra
Sebelas Maret University, Indonesia

Abstract-Global energy consumption growth and climate change concerns have driven countries to pursue sustainable household energy management solutions. While Liquid Petroleum Gas (LPG) is a clean cooking energy source, its usage presents challenges, including high government subsidy burdens, vulnerability to global oil price fluctuations, and greenhouse gas emissions. Several developing nations, including Ecuador, India, Ghana, and Indonesia, have initiated LPG-to-induction stove conversion programs as an efficient and environmentally friendly alternative. This study examines these countries' experiences to identify implementation facilitators and barriers. Research findings emphasize the critical role of government support through regulations, subsidies, educational campaigns, and technical assistance in program success. Key implementation challenges include inadequate electrical infrastructure, cultural resistance, and high initial costs. These insights aim to inform academics and policymakers in developing more effective future induction stove conversion policies.

SESSION 10

April 25th, 2026
Time Zone: GMT+7

Topic: AI-Driven Industrial Process Automation and Real-Time Data Analytics
Time: 10:30-12:00 (Duration for Each Presentation: 15 minutes)
Room: Ao Nang Orchid II
Session Chair: Prof. Retno Wulan Damayanti, Sebelas Maret University, Indonesia

Onsite

EM5001-A

Singular boundary method and RBF neural networks for the Inverse

Farzaneh Safari
Nanjing Forestry University, China

Abstract-We propose a boundary-type method for solving the inverse Cauchy problem and to point out that it is possible to evaluate the approximation solution of the problem in a domain where no boundary condition is defined in some part of the boundary domain. Based on the RBFNN, the singular boundary method (SBM) is capable of avoiding the ill-posedness of the problems.

EM5025-A

Mechanism Design for AI Model Marketplaces Considering Infrastructure Revenue and Self-Preferencing

WORAPON TOOPMONGKOL
Chiang Rai Rajabhat University, Thailand

Abstract-This research aimed to (1) examine the entrepreneurial skills levels of students in the English for International Communication program before and after using artificial intelligence (AI) technology, and (2) assess students' satisfaction with the use of AI technology in enhancing entrepreneurial skills. The study employed a quasi-experimental research design with a pretest-posttest control group. The sample consisted of 36 third-year students from the English for International Communication program at Chiang Rai Rajabhat University, divided into an experimental group (n = 18) and a control group (n = 18). The research instruments included (1) an entrepreneurial skills assessment, (2) an entrepreneurial self-efficacy scale, (3) a rubric for evaluating business pitch presentations, and (4) a satisfaction questionnaire. Data were analyzed using descriptive statistics and analysis of covariance (ANCOVA).

The research findings showed that (1) students in the experimental group who received instruction using generative AI technologies such as ChatGPT, Google Gemini, Claude, and NotebookLM demonstrated significantly higher entrepreneurial skills than the control group, the regular model of pedagogy at the .05 level of significance ($F = 28.45$, $p < .001$, $\eta^2 = .46$), and (2) students reported high satisfaction with the use of AI technology in their learning ($M = 4.32$, $SD = 0.48$).

The results indicate that integrating artificial intelligence technology into instruction can effectively enhance students' entrepreneurial skills, and students demonstrate high satisfaction with the use of such technology in their learning process.

EM5034

A 5G-Enabled Digital Twin Architecture for Real-Time Monitoring and Event-Driven Control: Experimental Network Performance Study

Pradujthep Maneechay[1], Tuangyot Supeekit[1], Thanakorn Naenna[1], Eakkachai Warinsiriruk[1], Orrawadee Ruenrom[2] and Mananya Paksaksri[3]

1. Mahidol University, Thailand
2. Advanced Info Service Public Company Limited, Thailand
3. Thai German Institute, Thailand

Abstract- This paper presents the design and performance evaluation of a remote monitoring-and-control Digital Twin system operated over the AIS 5G network. System performance was assessed under three bandwidth scenarios Local (Wi-Fi), 5G limited to 1 Mbps, and 5G limited to 10 Mbps by comparing latency and practical usability, while controlling the measurement conditions using Ping round-trip time (RTT) with a 32-byte payload (N = 100) in each scenario. The results show 0% packet loss across all cases, indicating reliable packet delivery; however, real-world usability differed clearly due to variations in latency and effective performance. In particular, the 5G 10 Mbps condition achieved an average latency of 61 ms, meeting the minimum practical requirement for initial real-time Digital Twin operation. Overall, the findings suggest that AIS 5G with a 10 Mbps bandwidth limit is sufficient to support baseline real-time monitoring and control for a Digital Twin deployment.

EM5036

From Raw Measurements to Smart Data Products: Representation Learning, Augmentation, and Quality Qualification for Industrial Monitoring

Fakhreddine Ababsa

PIMM Laboratory, ENSAM, France

Abstract-Industrial monitoring increasingly depends on heterogeneous, multi-sensor, multi-scale and multi-temporal data, yet real-world performance is often constrained by two data-centric bottlenecks: (i) raw measurements are not engineered into learning-ready representations comparable across modalities and scales, and (ii) outputs are rarely quantified and qualified into consistent indicators and KPIs usable in industrial workflows. This paper proposes a data-centric framework for building smart, quantified industrial data products spanning micro-scale SEM microscopy (composite quality control), structural-scale SHM (Lamb-wave measurements), and macro-scale railway corridor monitoring (centimeter-level LiDAR and InSAR time series), with explicit attention to temporal consistency for evolution tracking. We introduce a representation-centric pipeline that maps each modality to standardized image-like or indicator-like objects: (i) Spatially Organized Images (SOI) from SHM damage indices and actuator–sensor path geometry, (ii) SEM segmentation maps coupled with KPI extraction (porosity, morphology, spatial distributions), and (iii) spatio-temporal change indicators and deformation hotspots from multi-epoch LiDAR, qualified with InSAR temporal trends. Data scarcity and labeling cost are addressed through two measurable levers: semi-automatic annotation and generative augmentation (controlled perturbations and VAE-based synthesis). We further propose data qualification metrics to assess representation quality and KPI consistency across samples and time. Three real-world case studies demonstrate that robust industrial analytics can be achieved primarily through principled data representation, augmentation, and qualification, turning raw sensing streams into deployable, quantified data products.

EM5046

Implementation of Single-Minute Exchange of Die (SMED) for Reducing Extruder Downtime in Pet Food Production

Nipapron Hakhot, Apiwat Muttamara and **Parichat Chuenwatanakul**
Thammasat University, Thailand

Abstract-In the pet food manufacturing industry, effective use of machinery is essential for maintaining competitiveness. In dry pet food production, the extrusion process is often the main bottleneck in the production line. This study aims to improve the overall performance of the extruder by applying Single Minute Exchange of Die (SMED) to reduce die changeover time and cleaning time. A Pareto analysis was used to identify the major causes of machine downtime that most affect production performance. The SMED methodology was implemented through actual operational procedures focused on reducing die changeover time. The results demonstrate that the successful application of SMED led to a substantial improvement in machine availability increase of 6.88%. (from 62.12% to 69.00%) and consequently, the OEE improved from 58.22% to 64.67%, an increase of 6.45% These findings underscore the significant potential of lean-based process improvement initiatives to enhance production performance and provide practical guidance for practitioners seeking to optimize extrusion operations in similar manufacturing environments.

EM5033

A Physical-Agentic AI Enabled, User-Centric Machine with an Intuitive Design: Smart Drug Compounding System

Pradujthep Maneechay, Tuangyot Supeekit, Thanakorn Naenna and Eakkachai Warinsiriruk
Mahidol University, Thailand

Abstract-In this study, we developed and integrated a Physical-Agentic AI system using n8n as the communication and orchestration layer between users and the system, enabling Agentic AI to process inputs and issue commands to physical equipment, including a collaborative robot and a compounding machine. In the original implementation, the n8n automated workflows relied on four AI agents to analyze requests and generate control actions; however, each agent accepted API calls from multiple sources, which increased data-handling complexity and raised the risk of errors. To improve the workflow architecture, we introduced a Master Agent as a single-entry point for all incoming API calls. The Master Agent filters and standardizes the input data, then routes tasks to the appropriate specialized agents based on their roles. Practical deployment results indicate that the improved workflow achieves higher accuracy and correctness, reduces data ambiguity, and simplifies maintenance and future modifications. Nevertheless, this architecture increases processing time and consumes more AI tokens than the original flow. This trade-off is considered acceptable because chemotherapy compounding is a high-risk process where accuracy and operational safety must be prioritized.

SESSION 11 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: System Integration of Lean Production Tools and Value Stream Optimization Methods
Time: 8:50-10:35 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/86509399828
Session Chair: Dr. Thinh Thai Dang, University of Economics Ho Chi Minh City, Vietnam

Online

EM0058

Operational improvement model based on Lean Manufacturing tools to enhance productivity in a textile company

Andrea Ballón, Claudio Pereira and Rafael Villanueva
Universidad de Lima, Peru

Abstract-The Peruvian textile industry exhibits persistent productivity gaps compared to international benchmarks, particularly among medium-sized yarn manufacturers. In the company analyzed, economic productivity reaches 0.0239 kg/PEN, below the sectoral benchmark of 0.0325 kg/PEN, revealing a technical gap of 35.98% mainly driven by unplanned machine downtime, lengthy setup times, and rework in the dyeing laboratory. This study proposes an integrated Lean model composed of two complementary components: (1) the joint application of SMED and Preventive Maintenance on critical equipment to reduce operational unavailability, and (2) the combined implementation of 5S and Standardized Work in the dyeing laboratory to minimize variability and reprocessing. Validation followed a hybrid approach using discrete-event simulation in Arena and pilot testing on the shop floor. Results show reductions of 23.6% in critical internal activities, 19.3% in total setup time, 19.7% in the frequency of unplanned downtime, and a decrease in the rework rate from 7.05% to 5.4%. Under a conservative scenario, these improvements translate into approximately one million PEN in additional annual value added, demonstrating the effectiveness of the proposed model in closing productivity gaps within industrial spinning operations.

EM0070

Enhancing Restaurant OTIF Using 5S, Standardized Work, DDMRP, and Machine-Learning-Based Demand Forecasting

Pierina D. Jiménez-Cárdenas, Patricia J. Orue-Flores, Rafael Chávez-Ugaz and Juan C. Quiroz-Flores
Universidad de Lima, Perú

Abstract-Restaurants operate in highly variable environments, where long waiting times, stockouts, and non-conforming orders deteriorate customer satisfaction and profitability. Prior research has explored Lean tools and forecasting models independently, yet few studies integrate 5S, Standardized Work, DDMRP, and Machine-Learning-Based Demand Forecasting to enhance OTIF performance in restaurant operations. This case study addresses a Peruvian restaurant with an initial OTIF of 6.75%, far below the 92% industry benchmark and

generating monthly losses exceeding 3,600 USD. The proposed model reorganizes the kitchen with 5S, stabilizes task execution through standardized work, and ensures supply availability using Random-Forest-based demand forecasting coupled with DDMRP buffers. Validation using time studies, Arena simulation, and inventory analysis increased OTIF to 55.72%, raised OTD by 52.67 percentage points, achieved a Fill Rate of 91.78%, and reduced cycle time to 23.8 minutes. The findings contribute evidence for integrated Lean–analytics approaches in service operations and encourage broader applications across food-service SMEs.

EM0154

Improving Quality and Reliability in Latin American Textile SMEs through a Lean–TPM 4.0 Framework

Shannia Mallqui-Alzamora[1], Gerardo Caparachin-Romero[1], **Fernando Maradiegue-Tuesta[1]**, Fabiola Pinzón-Hoyos[2] And Anita Straujuma[3]

1. Peruvian University of Applied Sciences, Peru
2. Pilot University of Colombia, Colombia
3. Riga Technical University, Latvia

Abstract-Textile SMEs experience productivity losses due to high defect rates and reactive maintenance in sewing operations. This study proposes a Lean–TPM 4.0 framework integrating a CNN-based Digital Poka-Yoke and an LSTM predictive maintenance model, validated through discrete-event simulation. The Digital Poka-Yoke achieved 59.6% accuracy, suitable for proof-of-concept under limited SME data conditions. Simulation results project defect reduction to 8.1%, MTBF increase beyond 150 hours, and efficiency improvement to approximately 86%. The LSTM model obtained an RMSE of 6.2 hours, supporting preventive maintenance planning. The findings demonstrate the feasibility of combining Lean and accessible Industry 4.0 technologies in textile SMEs.

EM0156

Improving Productivity in a Metalworking SME through an Integrated Lean Model: A 5S, SMED, Poka Yoke Approach

Luisa K. Bayona-Sojo, **Claudia J. Guevara-Lucio**, Claudia C. Leon-Chavarri and Edilberto Ávalos-Ortecho
Universidad de Lima, Peru

Abstract-Low productivity remains a persistent challenge for metal-mechanical small and medium-sized enterprises, largely driven by excessive non-productive time associated with poor workplace organization, long machine setup times, and manual errors during assembly processes. These inefficiencies directly limit operational performance and competitiveness, particularly in labor-intensive manufacturing environments. To address this problem, this study proposes and evaluates an integrated and sequential Lean model that combines workplace organization, setup-time reduction, and error prevention through the coordinated application of 5S, SMED, and Poka Yoke. The model was applied to the junction-box manufacturing process of a metal-mechanical SME and validated through a pilot implementation that measured productivity, tool-searching time, machine setup time, and downtime due to manual errors. The results show significant improvements: productivity increased by 28.97%, tool-searching time decreased by 53.23%, machine setup time was reduced by 47.81%, and downtime caused by manual errors decreased by 50.99%. These findings demonstrate that applying Lean tools within a structured and sequential framework effectively reduces non-productive activities and enhances operational efficiency. Overall, the study provides empirical evidence that an integrated Lean model offers a practical and scalable approach for improving productivity in metal-mechanical SMEs facing organizational, procedural, and human-related inefficiencies.

EM0173

Integrated Lean–Digital Kanban Model for Improving Production Efficiency and OTD Performance in a Gas Stove Manufacturing SME

Diego Orizano Salvador [1], Francis Lachos Silva[1], **Fernando Maradiegue Tuesta[1]** and Fabiola Pinzon Hoyos [2]
And Anita Straujuma[3]
1. Peruvian University of Applied Sciences, Peru
2. Pilot University of Colombia, Colombia
3. Faculty of Engineering Economics and Management, Latvia

Abstract-Improving On-Time Delivery (OTD) in manufacturing SMEs requires addressing variability and material availability simultaneously. This paper proposes a low-cost Lean–Digital Kanban approach for a Peruvian metalworking SME producing gas stoves. Using a 2024 order trace (N = 148), baseline OTD is 73.65% and the critical two-burner family reaches 70%, with annual delay losses of USD 18,776. The model combines variability reduction (5S/SMED/standardized work/TPM) with BOM-driven Digital Kanban replenishment. Hybrid validation—benchmark bounds plus DES—shows OTD exceeding 90% and penalty reduction of approximately 86%, feasible with minimal digital investment.

EM0174

Synergy of Lean Tools to optimize operational efficiency in textile SMEs

Nicole Juliana Salazar Espinoza[1], Kevin Nicholas Campos Saboya[1], **Fernando Maradiegue Tuesta[1]** and Fabiola Pinzón-Hoyos[2]
1. Universidad Peruana de Ciencias Aplicadas, Peru
2. Pilot University of Colombia, Colombia

Abstract-The Peruvian textile industry, which represents 7.3% of manufacturing GDP and generates 65 million jobs, faces critical competitiveness challenges due to operational inefficiencies. The jacket manufacturer analyzed generates losses of 8.10% of its annual revenue due to its efficiency of 69.72%, which is 5.48 percentage points below the sectoral benchmark of 75.20%. We present an integrated model that combines four Lean tools: Standardized Work, Poka-Yoke with elements of Industry 4.0, SMED, and Centerline. The model parameters are calibrated based on peer-reviewed empirical studies and validated through Monte Carlo simulation (10,000 replications) [6-8,12,18]. Contributions include the systemic integration of multiple root causes, accessible digitization via QR codes and tablets for SME environments with high employee turnover, and simulation-based validation. The results show that the investment of USD 24,760 will result in annual savings of USD 4,650 ± 420 over 246 days of implementation, while efficiency will increase to 74.3% ± 1.2% (95% CI: 72.1–76.5%), defects will decrease from 17.5% to 5.1% ± 0.8%, and setup time will decrease from 31 to 16.8 ± 1.3 minutes.

EM0194

Lean Service Application to Improve On-Time Project Delivery in a Company in the Construction Sector

Jose Casanova, Priscila Sanchez, Edilberto Avalos-Ortecho and Claudia León Chávarri
Universidad de Lima, Peru

Abstract-Improving delivery reliability has become a major challenge for the construction sector. In Peru, more than 60% of SME construction projects experience schedule deviations, largely due to inefficient procurement

processes and frequent rework. This study addresses the low Duration Performance Index (DPI) observed in a Peruvian SME construction company by implementing a Lean Service based improvement approach. The methodology integrates BPMN and SIPOC to map and standardize procurement and execution workflows, 5S and ABC classification to organize and prioritize critical inventory items, and a Kanban system supported by PDCA cycles to control task progression and reduce rework. A pilot intervention was first applied to validate the effectiveness of the proposed tools, followed by a discrete-event simulation using Arena to evaluate the TO-BE scenario under comparable operating conditions. Results indicate that BPMN and SIPOC reduced delays associated with reactive procurement by improving the planning and issuance of purchase orders; 5S and ABC eliminated stockout-related interruptions by ensuring the availability of critical materials; and Kanban stabilized task execution, significantly reducing rework. These findings highlight the potential for replicating the proposed Lean framework across other SMEs in the construction sector.

SESSION 12 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Architectures and Integration Methods for Industry 4.0-Oriented Intelligent Manufacturing Systems
Time: 8:50-10:35 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/83353043204
Session Chair: Prof. Yun Huang, Macau University of Science and Technology, China

Online

EM0141

Improving the Operational Efficiency of a Metalworking Company Through Smed 4.0, Autonomous Maintenance, and Iot-based Industry 4.0 Sensorization

Steven Andree Abihu Castro Gonzalez, Jose Arturo Rivera De La Cruz, Manuel Fernando Montoya Ramirez, Carlos Medardo Urbina Rivera
Universidad de Lima, Perú

Abstract-This paper aims to improve the operational efficiency of a metalworking microenterprise located in Lima, Peru, through the integrated application of the autonomous maintenance pillar of Total Productive Maintenance (TPM), SMED 4.0, and Industry 4.0 technologies. A quantitative-experimental approach was employed, utilizing Arena simulation software to model both the current and proposed systems. Historical data revealed an average Overall Equipment Effectiveness (OEE) of 62%, a Mean Time Between Failures (MTBF) of 702.54 hours, and a Mean Time To Repair (MTTR) of 8.165 hours. Key root causes, such as prolonged machine setup times, mechanical failures, human errors, lack of standardization, and insufficient training, were addressed through the implementation of autonomous maintenance, SMED 4.0, and Industry 4.0 systems, including SCADA for real-time monitoring and sensor-based data collection. The solution was validated through pretest-post test simulation, showing significant improvements in OEE, MTTR, and MTBF indicators. The findings demonstrate that the combined application of these methodologies, adapted to the context of small enterprises, offers an effective, sustainable, and replicable strategy to enhance operational competitiveness in resource-constrained industrial environments.

EM0015

Integrated Model Using TPM 4.0, MRP, and Kanban to Optimize Assembly Efficiency in an Automotive Company in Lima, Peru

Snaider Sebastian Cordova-Sihuincha, Valeria Lara-Rabanal and **Adrián Antonio Villafuerte-Rivera**
Universidad Peruana de Ciencias Aplicadas, Perú

Abstract-The current research presents an improvement model focused on increasing operational efficiency in an automotive company specializing in the assembly of small vehicles. The analysis indicates that the main reasons for inefficiency are machine downtime, uncoordinated material delivery, and high time variability between different stations. To solve these problems, Kanban, MRP, and TPM tools were incorporated, in addition to an

Internet of Things (IoT) system for real-time tracking of key equipment. The proposal was approved through performance metrics, demonstrating an increase in operational efficiency from 71% to 80%, in addition to a 35% decrease in overtime use and associated costs. Therefore, the proposed model optimizes material transit, increases equipment availability, and strengthens production scheduling, which favors the company's sustainability and competitiveness in the Peruvian automotive industry.

EM0002

Inventory management design through Industry 4.0 in MSMEs importing electrical products

Miriam Bravo-Orellana, **Omar Collazos** and Cyntia Ruiz
Universidad Peruana de Ciencias Aplicadas (UPC), Industrial Engineering Program, Perú

Abstract-This study presents a proposal to improve inventory management in a micro and small enterprise (MYPE) dedicated to the import of electrical products, through approaches based on Industry 4.0. The strategy involves the implementation of the Just-in-Time (JIT) system, the Economic Order Quantity (EOQ) model, and the 5S methodology to strengthen inventory control, reduce shortages, and increase operational efficiency. Using innovations such as the Internet of Things (IoT), machine learning algorithms, and digital twin systems, the proposal enables real-time inventory monitoring and data-driven decision-making. The results highlight the value of Industry 4.0 technologies in improving inventory processes, reducing operating costs, enhancing management accuracy, and strengthening supply chain responsiveness. Specifically, inventory turnover increased from 1.37 to 1.65 times per year, the average waiting time decreased from 31 to 24 days, and inventory discrepancies were reduced from 14.9% to 11.5%. This work provides practical recommendations for micro and small enterprises in the electrical sector seeking to adopt intelligent technologies in their inventory management processes.

EM0073

Efficiency improvement in printing process of a plastic bag company by applying planned maintenance and SMED

Viviana CHUNG-CHUMBE, Valeria TORRES ARÉVALO, Carlos URBINA-RIVERA and Manuel MONTOYA-RAMIREZ
Universidad de Lima, Perú

Abstract-The central problem of this study was the inefficiency in the printing process of a plastic bag manufacturing company in Lima, Peru. This was evidenced by an Overall Equipment Effectiveness (OEE) of 51.64% and an availability of 56.53%, values far below international reference standards (85% and 90%, respectively). The main objective was to increase the availability of the printing machine to 85.46% in order to improve the OEE by addressing root causes such as critical component failures and excessive changeover and setup times. To address this problem, industrial engineering tools were applied, specifically Single Minute Exchange of Die (SMED) and Planned Maintenance. Improvement actions were defined based on real operational data from the company, and their impact was evaluated through a discrete-event simulation model of the printing process developed in Arena software, allowing a comparison between the current and proposed states. The simulation results showed an increase of 3.92% in machine availability, which led to a 3.58% improvement in OEE. These results indicate that the joint application of SMED and Planned Maintenance contributes to a more stable and efficient production process and may be transferable to other manufacturing contexts.

EM0034

Hybrid Model of Digital Transformation and Lean Manufacturing to Increase Operational Efficiency in the Footwear Sector in Peru

Joe Huaroto, Jeison Raymundo and Angel Hurtado
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-The purpose of this research is to optimize processes and increase operational efficiency in a Peruvian SME in the footwear sector that faces high levels of order non-compliance, defects, and unnecessary movement—common problems in this industry. Its objective is to propose and validate a Hybrid Model of Digital Transformation (Lean 4.0) and Lean Manufacturing that sequentially integrates Lean tools and low-cost digital technologies. Using a case study design, a comprehensive diagnosis of the production process is conducted to identify sources of inefficiency. Subsequently, a Lean-Digital model is designed to strengthen operational maturity prior to digitalization, and its impact is validated through Discrete Event Simulation. The results show improvements of 38% in operational efficiency, as well as reductions of more than 50% in setup times and defects, confirming that Lean maturity is a key prerequisite for effective digitalization and improved organizational performance. This research was applied only to one SME in the footwear sector. However, the study provides an accessible and adaptable model for SMEs, highlighting the incorporation of the Set-up Saving Deployment (SSD) as a complement to SMED to guide the prioritization of investments and reduce the financial barriers that limit a sustainable digital transformation.

EM0036

Industry 4.0: Sustainable transformation of plastics SMEs through TPM, SMED, and POKA YOKE

Carlos A. Diaz-Aliaga, Estefanny D. Jurado-Toscano and Angel Hurtado
Universidad Peruana de Ciencias Aplicadas, Perú

Abstract-The plastic industry faces operational challenges that directly impact the competitiveness of small and medium-sized enterprises (SMEs), particularly in key processes such as PET bottle blow molding. This study proposes a continuous improvement model that integrates Lean Manufacturing tools with advanced Industry 4.0 technologies aimed at optimizing processes in a plastic-sector SME. The model combines traditional methodologies such as SMED, TPM, and POKA YOKE with digital Industry 4.0 solutions, including smart sensors, real-time data analytics, and automation tools such as Power BI and Power Automate. The results obtained from the model demonstrate significant improvements: a 35% reduction in machine downtime, a 28% decrease in production defects, and a 40% improvement in tool change times. Additionally, the use of digital technologies enabled automated data collection, real-time alert generation, and visualization of key performance indicators, facilitating faster and evidence-based decision-making. Beyond operational efficiency, the model contributes to sustainable transformation by reducing waste, improving energy efficiency, and promoting more resource-efficient manufacturing practices. This continuous improvement model, complemented by Industry 4.0 tools, offers a replicable and sustainable strategy to enhance efficiency, reduce costs, and support the long-term competitiveness of SMEs in an increasingly digital and environmentally demanding industrial environment.

EM0078

Defective Product Reduction Model for a Bakery Using Standardized Work, TPM and Poka-Yoke

Alejandro Caque, **Mauricio Leon**, Ezilda Cabrera and Rafael Chavez
Universidad de Lima, Perú

Abstract-In the Peruvian food industry, approximately 15% of raw materials are wasted exclusively during the processing and packaging stages due to non-compliance with established quality standards. This study aims to reduce the percentage of defective hamburger buns in a bakery production line that currently reports 2.75% of defects, exceeding the sector benchmark (1.71%). The main causes identified were insufficient time during rounding and fermentation, operational errors in dough rounding and cutting, and thermal failures associated with oven component malfunctions. To address these issues, an integrated improvement model was developed using the Lean tools Standardized Work, Poka-Yoke, and a TPM-based preventive maintenance program. Validation through pilot testing, physical prototypes fabricated via 3D printing, and simulation in Arena demonstrated significant improvements: reductions in cycle times for dough rounding and cutting (4.02% and 3.76%), fewer operational errors (2.09% and 1.41%), full compliance with fermentation time, and a 14.32% increase in the oven's MTBF. Overall, the model enhanced process stability and reduced defective products to 1.64%, reducing the environmental impact by 4,318.47 kg CO_2-eq per year.

SESSION 13 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Integration of Production Planning, Demand Forecasting, and Quality Control for Production-Sales Coordination
Time: 10:40-12:25 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/86509399828
Session Chair: Dr. José Velásquez Costa, Peruvian University of Applied Sciences, Peru

Online

EM0192

Reduction of Non-Productive Time Using Standardization, ROP, and EOQ to Improve Service in the Cleaning Sector

Gustavo V. Jara-Ingaruca, **Lindsay S. Monzón-Barrios**, Claudia C. León-Chavarri and Rafael Chávez-Ugáz
Universidad de Lima, Perú

Abstract-Companies that rely on equipment-based services require high operational continuity; however, small maintenance workshops commonly lack standardized procedures, generating variability, delays, and unproductive time. Existing maintenance and inventory models are often designed for large-scale or highly formalized organizations, limiting their applicability to small service environments characterized by informality and reliance on individual expertise. This study proposes an engineering-based operational model specifically tailored to small maintenance workshops, integrating process standardization with inventory management using reorder point and EOQ. The approach was validated through discrete-event simulation in Arena. Results show an improvement in service level from 43% to 75.33%, a reduction of stockouts to 4%, and greater task consistency. By integrating these techniques, small maintenance workshops can mitigate operational disadvantages and achieve service performance levels comparable to those of larger, highly formalized service organizations.

EM0011

Forecasting Electricity Consumption to Optimize Budget Allocation: A Case Study of an Electronic Components Manufacturing Plant

Roongrat Pisuchpen and **Anon Jai-sue**
Kasetsart University, Thailand

Abstract-This study developed a forecasting model for the monthly electricity consumption of an electronic components manufacturing plant to optimize cost competitiveness. Historical data from 2021 to 2023 were used to evaluate and compare six forecasting techniques based on the mean absolute percentage error (MAPE). The Random Forest model achieved the highest forecasting accuracy, with a MAPE of 4.92 percent. Application of this model reduced the electricity budget estimation error for 2024 by 75 percent, demonstrating its effectiveness in improving energy budgeting accuracy and cost management.

EM0062

Proposal for improving inventory management in a pharmacy through automated demand forecasting,

reorder point, and ABC analysis

Nicole Juliette Ramos Guevara, **Fernanda Lucia Espiritu Matos** and Maria Teresa and Noriega-Aranibar
Universidad of Lima, Peru

Abstract-This study proposes an integrated model to improve inventory management in an ambulatory pharmacy through automated demand forecasting, reorder point (ROP) calculation, and ABC classification. The current system presents a 24.9% stockout rate, low forecasting accuracy (68.75%), and long replenishment lead times, generating reactive decisions and service discontinuities. Using historical consumption data from 2023–2024, the Random Forest algorithm achieved the best forecasting performance (MAPE 3.75%), serving as the basis for defining accurate ROP parameters for 12 critical medications. Additionally, the ABC analysis enabled prioritization of high-impact items, supporting the redesign of the internal warehouse layout. The proposed model was validated through discrete-event simulation in Arena, showing a reduction in stockouts to 3.8%, a decrease in replenishment effort by 38.8%, and an improvement in inventory accuracy to approximately 98.7%. The results demonstrate that integrating predictive analytics, structured inventory policies, and layout optimization significantly enhances availability, operational efficiency, and service continuity in ambulatory pharmacy settings.

EM0063

SMED 4.0 Model to Improve Operational Efficiency and Sustainability in an Agricultural Chemical Industry

Renzo Verano, **Geraldin Aguilar** and Angel Hurtado
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-The study adapts and applies an SMED 4.0 model, an evolution of the Single Minute Exchange of Die (SMED) approach, to reduce changeover times, improve operational efficiency, and promote sustainability in the agricultural chemical industry. This model integrates Industry 4.0 technologies, such as machine learning and the Internet of Things, enabling the optimization of format changeover times through a predictive system that automatically adjusts operating parameters using historical and real-time data, thereby reducing waste and variability. Its implementation in agrochemical product packaging processes reduced the average setup time from 45 to 28 minutes and decreased startup defects from 3% to 2.50%, demonstrating greater operational stability. Although previous cases have employed the method in other sectors, the originality of the present study lies in providing further evidence of the model's applicability in a company within the agricultural insecticide industry, thereby extending its reach to a relatively unexplored environment. From a practical perspective, the results offer a replicable tool for data-driven decision-making, facilitating the standardization of format changes, reducing reliance on individual operators' experience, and improving operational control.

EM0074

Improving Dispatch Compliance in an Automotive Distribution Center by applying Poka-Yoke, Slotting, and Forecasting

Jose Luis Rojas Guevara, **Marcelo Alonso Saravia Lovaton**, Edilberto Miguel Avalos Ortecho and Carlos Medardo Urbina Rivera
Universidad de Lima, Perú

Abstract-This article analyzes the issue of low dispatch compliance in the distribution center of a minor automotive-sector company. It examines the logistics of merchandise storage and transportation within the Peruvian context, where companies face challenges in supplying their retail locations and meeting consumer

demand. The objective of the study is to increase the delivery fulfillment level, initially at 80%, within the supply process of a logistics center through the integrated implementation of industrial engineering tools such as Poka-Yoke, Slotting, and Forecasting. The methodology employed is based on diagnosing the factors and root causes that generate the central problem in the context of the case study, implementing the proposed engineering tools, and ultimately validating and evaluating them through statistical and simulation instruments. For this purpose, Arena software was used to model the company's operational reality. Picking times, stockouts, and administrative errors were reduced following the implementation of these tools, resulting in an improvement of the OTIF (On Time In Full) indicator from 80% to 90%.

EM0089

Predicting Intraday Market Direction in Emerging Economies: A Stacked Ensemble Learning Approach to the VN-30 Index

Thai-Thinh Dang
University of Economics Ho Chi Minh City, Vietnam

Abstract-This research investigates the predictability of the Vietnamese stock market through a Stacked Ensemble Learning architecture, focusing on the VN-30 index and its constituents. Addressing the inherent noise of the intraday "Open-toClose" window, the study utilizes ten years of high-dimensional OHLCV data across 31 financial instruments. The methodology employs a two-tier learning process: Round 1 utilizes six base learners, including Random Forest, XGBoost, and SVM, to capture diverse temporal patterns, while Round 2 implements a meta-learner to synthesize these outputs into a final directional forecast. Empirical results identify Random Forest as the superior base learner, with the final meta-learner achieving a peak directional accuracy of 63.9% and an AUC of 0.657. Feature importance analysis reveals that the opening price is the primary predictive signal, accounting for a relative importance of 0.40. While individual equities like GAS (67.0%) show high predictability, the VN30F1M derivative remains resistant to forecasting at 49.0%. These findings suggest that while the Vietnamese market exhibits "weakform" efficiency and significant microstructure noise, the proposed ensemble framework successfully identifies rhythmic shifts, offering a statistical edge over traditional "buy-and-hold" strategies.

EM0175

Increase in Service Level at Wanxin Company Through the Application of S&OP and Slotting

Carlos Ballón-Castañeda, **Javier Vergara-Mesinas**, Carlos Urbina-Rivera and Manuel Montoya-Ramirez
Universidad de Lima, Perú

Abstract-The Peruvian commercial sector faces logistical challenges that undermine competitiveness, particularly in inventory management and delivery efficiency. Wanxin Peru, a motorcycle importer and distributor, reported a service level of 92.45%, 2.55% below the market leader's benchmark of 95%, due to inefficiencies in demand forecasting (accuracy of 88.44%) and dispatch performance (16.74% of orders delayed). This study addresses these issues through the implementation of a collaborative Sales & Operations Planning (S&OP) process, ABC analysis, and warehouse reorganization using Slotting techniques. The methodology included a systematic literature review, root cause analysis with Ishikawa diagrams and Pareto charts, engineering design, and pilot validation. Results show forecast accuracy improved to 90.27%, dispatch velocity increased from 2.21 to 2.83 orders/hour for linear motorcycles and from 1.95 to 2.35 orders/hour for three-wheelers, while service level reached 96.28%. These findings confirm that integrating S&OP and Slotting significantly enhances operational efficiency and service quality, offering a replicable framework for similar organizations in emerging markets.

SESSION 14 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Production Scheduling Modeling and Multi-Objective Optimization in Industrial Operations
Time: 10:40-12:25 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/83353043204
Session Chair:

Online

EM0024

Proposed Efficiency Improvement Model in Furniture Production Using Poka-Yoke 4.0, SLP, and TPM 4.0

Gimena A. Eneque[1], Carolina E. Espinoza[1], Tania Torres[1] and Agustín Caferri[2]
1. Universidad Peruana de Ciencias Aplicadas, Perú
2. Universidad Tecnológica Nacional, Argentina

Abstract-The Peruvian furniture sector, particularly small and medium-sized enterprises (SMEs), faces significant challenges in achieving high levels of efficiency in their production processes. This article analyzes the causes of low efficiency in a Peruvian SME dedicated to the manufacturing of melamine furniture, evidenced by an Overall Equipment Effectiveness (OEE) of 60.2%, a value considerably lower than the standard in the manufacturing sector (85%). The findings identify three main operational inefficiencies: high variability in the manual board-cutting process, unnecessary movements within the plant, and unscheduled downtime resulting from deficiencies in maintenance. To address this situation, a comprehensive improvement model is proposed that integrates Poka-Yoke 4.0, the use of Standard Work (SW), the Systematic Layout Planning (SLP) methodology, and the pillars of TPM 4.0. The intervention projects a 19% increase in productivity through layout optimization, a 17% reduction in average travel times, and a 6.2% decrease in the monthly cutting error rate through fault-detection systems. An in-depth root-cause analysis, complemented by comparisons with international cases, supports the robustness of the proposal. Finally, the implementation of a pilot test on the shop floor is recommended to validate the replicability of the approach within the manufacturing sector.

EM0039

Improvement proposal to increase efficiency in the production process through the implementation of TPM 4.0 and SMED 4.0 in a Peruvian metalworking SME

Angela Jimenez, Paulo Rosales, Agustín Caferri and Tania Torres
Universidad Peruana de Ciencias Aplicadas, Perú

Abstract-The metalworking sector faces increasing demands for productivity and faster response times. In this context, the problem of low operational efficiency in the production of metal structures at a metalworking company is addressed. This situation arises from long setup times (11%), poor maintenance management (13%), inadequate machinery calibration (27%), and non-standardized welding procedures (48%). Therefore, a comprehensive improvement plan is proposed based on the implementation of Industry 4.0 tools, specifically TPM and SMED, supported by IoT technologies. TPM was applied to improve the reliability of CNC machinery and

standardize welding procedures, reducing rework by 10% and increasing equipment availability by 9%. SMED, for its part, enabled a reduction in setup times of more than 50%, optimizing the performance of the production flow. Finally, the integration of IoT ensured real-time monitoring, strengthening data-driven decision-making. The projected results reflect significant improvements: an increase in Overall Equipment Effectiveness (OEE). The application of these methodologies demonstrates the viability of Industry 4.0, constituting a replicable model for SMEs seeking to increase their efficiency and sustainability.

EM0097

Reducing Truck Turnaround Time through Lean Six Sigma: A KPI-Based Case Study in Food Manufacturing Logistics

Kent Benedict P. Cabucos[1], Klint Allen A. Mariñas[2] and Michael G. Calamba[2]
1. Mapua University, Philippines;
2. Mapua Malayan Colleges Mindanao, Philippines

Abstract-Truck Turnaround Time (TAT) is a critical metric in logistics, directly influencing supply chain efficiency and customer satisfaction. This study applies Lean Six Sigma (LSS) methodology to optimize outbound logistics in a food manufacturing facility, aiming to reduce average TAT from a baseline of 245 minutes to a target of 195 minutes. Using the DMAIC framework, the study analyzed 3,322 truck records and integrated industrial engineering tools, including Queuing Theory, Linear Programming, and Line Balancing. Root cause analysis identified unstructured queuing, a lack of dispatch ownership, and inefficient process flows as primary delays. Improvement interventions—including expressway docks, pre-entry fogging, and digital monitoring via Power BI—resulted in a 25% reduction in TAT (averaging 195 minutes) and an 11% increase in dispatch throughput, significantly enhancing revenue potential.

EM0018

Reducing Cycle Time of Disc Brake Assy in a Brake System Manufacturer Company using 8 Steps and 7 Tools Method

Jonny
Bina Nusantara University, Indonesia

Abstract-This paper shows how Company ABC as a Brake System Manufacturer in Indonesia reduces its assembling line cycle time named DB1. This cycle time should equal or exceed its customer's takt time amounting to 28.6 seconds or 113 pcs per hour because its actual cycle time was 41.5 seconds or 78 pcs per hour. Its deviation was at 9.7 seconds or 35 pcs per hour. This gap should be overcome by a quality control circle (QCC) using 8 steps and 7 tools method. After conducting the method, three root causes were: 1) process capacity sheet, 2) standardized work combination table sheet, and 3) standardized work chart. From those root causes, several improvements were taken place such as 1) process automation, 2) machine re- layout, 3) balancing job operators, 4) mis-proofing tools, 5) motion effectiveness and efficiencies,
6) working tools, and 7) machine working efficiency. The result was in the form of a decreased cycle time from 41.5 seconds to 27.5 seconds or 109% achievement from the target of 28.6 seconds or 31% down from the baseline.

EM2001

Productivity Improvement Based on 5s And Systematic Layout Planning in Wooden Pallet Production

Camila M. Albarracin-Reategui and Ariana L. Gaviria-Salcedo
Universidad de Lima, Peru

Abstract-The pallet manufacturing sector in Peru faces operational limitations associated with non-productive times, excessive material handling, and variability in task execution. At Royal Corp, the initial diagnosis revealed low productivity per operator, prolonged cycle times, and a physical layout that generated unnecessary movements and imbalances in workload distribution. To address these issues, an integrated improvement model based on the Systematic Layout Planning methodology and the 5S system was proposed, aimed at enhancing workflow efficiency and standardizing the work environment. The methodology included time studies, process mapping, cause–effect analysis, and prioritization, as well as validation through discrete-event simulation to compare the current state with the improved scenario. The results showed a significant reduction in cycle times, an increase in operator productivity, a decrease in internal travel distances, and an improvement in the final product quality. These findings confirm that the integration of Systematic Layout Planning and 5S represents a low-cost, high-impact alternative for improving operational efficiency in pallet manufacturing processes.

EM0157

Increasing Efficiency in the Paint Industry: Integrating Industrial Automation and Standardized Work for Smart Manufacturing

Roxana Alvarado-Vasquez[1], Daniel Espinoza-Gonzales[1], José Velásquez-Costa[1], Luis Minaya-Gonzales[1] and Baldomero Mendez-Pallares[2]
1. Peruvian University of Applied Sciences, Peru.
2. Universidad Piloto de Colombia, Colombia

Abstract-The Peruvian paint industry continues to grow, but its competitiveness is limited by operational gaps in manual dosing, mixing, and capping processes, leading to unstable operations and higher reprocessing costs. In the company analyzed, operational efficiency stands at 74.8%, well below the sector benchmark of 88%, with volume variability ranging from 6% to 8%, operational errors reaching 59.18%, and losses equivalent to 4.5% of annual revenue due to overfilling, spillage, and repeated manual adjustments. In response to this scenario, the research develops a comprehensive model based on programmable automation using PLCs, photoelectric, capacitive, and inductive sensors, solenoid valves, and pneumatic actuators, structured into four phases: container classification, automatic dosing, sequenced mixing, and standardized capping. Experimental validation through a physical prototype and an As-Is / To-Be comparison demonstrates substantial improvements: an increase in efficiency to 84.7%, a reduction in cycle time to 11 s, 99% compliance with the dosed volume, a decrease in volume variability to 2.5%, a reduction in operational errors to 38.47%, and a decline in mixing variations to 18.3%. The results confirm that the integration of automation and standardized work constitutes a technically viable strategy to enhance the precision, stability, and reliability of the production process in the paint industry.

EM0158

Model to improve efficiency in the production of metal protectors for motorcycles by applying SLP and TPM 4.0 with Industry 4.0

Greasse Calderón[1], Luis Zavala[1], José Velasquez-Costa[1] and Cristina Losada-Gutiérrez[2]
1. Peruvian University of Applied Sciences, Peru.
2. Universidad de Alcalá, España.

Abstract-The metalworking industry faces significant challenges related to low operational efficiency, extended downtime, and limited manufacturing flexibility. This study proposes an integrated optimization model for the production process of motorcycle sliders in a Peruvian metalworking company, combining TPM, SLP, IoT, and Machine Learning. The methodology included process analysis, bottleneck identification, layout redesign, and the implementation of predictive maintenance through IoT-based monitoring. The results demonstrated measurable improvements: rework time was reduced from 20.07 to 8.60 h; material handling distance decreased by 34.49% (from 44.53 to 35.61 m); operational efficiency increased from 37.90% to 94.18%; MTBF improved to 353.76 h; and MTTR decreased to 5.81 h. Overall, the integrated approach achieved a 56.28% increase in productivity, aligned with Industry 4.0 principles.

SESSION 15 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Supply Chain Resilience Construction and Logistics Network Optimization
Time: 13:00-15:00 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/86509399828
Session Chair: Asst. Prof. Ywh-Leh Chou, Feng Chia University

Online

EM0044

A Hybrid IoT–AI Model to Enhance Efficiency and Content Verification in Smart Logistics

Bethy Centeno, **Cristhian Romero** and Fernando Pazce
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-The research introduces a combined IoT and AI approach designed to boost efficiency in logistics processes where both variability and fast order-picking are prevalent. The integration of an RGB camera, millimeter-wave radar, and convolutional neural networks enables automated content verification, decision-support capabilities, and reduced variability in human judgment. The model generates real-time data that facilitates the calculation of standard processing times and contributes to stabilizing operational execution. Expected results, supported by recent evidence, project identification accuracies ranging from 95.6 % to 99.3 %, action-recognition rates above 95%, and an increase in picking efficiency from 68% to levels approaching 85%. These findings demonstrate the model's potential to achieve more consistent executions and more stable operational flows. The proposal offers a scalable and repeatable solution for supply chains aiming to automate verification using Industry 4.0 technologies, which helps enhance decision-making and boost overall logistics efficiency.

EM0094

Improving Project Delivery Compliance through Integrated Material Planning, IoT-Based Inventory Control, and Warehouse Layout Design in a Construction SME

Yhonatan Gala Carrillo, Jessica Mendoza Reategui and Oscar Díaz Ruiz
Peruvian University of Applied Sciences (UPC), Peru

Abstract-In small and medium-sized construction enterprises (SMEs), particularly those operating in geographically dispersed regions, inefficiencies in material management represent a critical operational challenge. Inadequate material planning, limited inventory visibility, and inefficient warehouse layouts frequently result in stockouts, incomplete deliveries, and project execution delays. These issues directly affect the On-Time In-Full (OTIF) indicator, generating financial losses due to penalties, rework, and idle labor hours, as observed in construction companies in the Amazonas region of Peru. Although previous studies have demonstrated the individual benefits of Material Requirements Planning (MRP), Internet of Things (IoT) technologies, and warehouse layout optimization techniques, their isolated implementation often produces fragmented improvements. This research addresses this gap by proposing an integrated model that combines MRP for

structured material planning, IoT for real-time inventory monitoring, and Systematic Layout Planning (SLP) for warehouse redesign. The projected results indicate an increase in OTIF performance from 66.67% to a range between 78% and 80%, a reduction in stockouts to below 5%, and an improvement in inventory accuracy to above 93%. These projections are grounded in structured benchmarking and expert validation.

EM0038

Route Optimization and Digital Twin Simulation for Urban Logistics: A Case Study of a Peruvian Customs Agency

Sebastián A. Sarmiento Curay, Salvador S. Sánchez-Silva Sánchez and Angel Hurtado
Universidad Peruana de Ciencias Aplicadas, Peru

Abstract-Port logistics is characterized by increasing operational complexity and strict delivery deadlines, which generate high additional costs due to delays and problems at the beginning of the supply chain. Therefore, this study focuses on the development and validation of an integrated model designed to improve delivery compliance and operational efficiency in this sector. The proposed strategy combines Mixed-Entry Linear Programming with Goal Programming. The integration of Digital Twins is also considered a fundamental contribution, achieving real-time traceability and a dynamic configuration of the physical system. The study demonstrated, in an initial scenario, that the routes exhibited deviations of 10.89% - 23.09% relative to the theoretical optimum. After applying the model, these deviations were reduced, resulting in more equitable allocations and minimal penalties for noncompliance. Furthermore, the implementation of DT facilitated the detection of bottlenecks and simulation of contingencies, resulting in a quantifiable reduction in costs associated with delays of between 10% and 15%. In summary, the proposed hybrid model was validated as a scalable, data-driven solution that enhances the reliability, traceability, and operational efficiency of customs logistics environments.

EM0082

Single-agent Reinforcement Learning Model for Regional Adaptive Traffic Signal Control

Qiang Li, **Ningjing Zeng** and Lina Yu
Shenzhen Technology University, China

Abstract-Several studies have employed reinforcement learning (RL) to address the challenges of regional adaptive traffic signal control (ATSC) and achieved promising results. In this field, existing research predominantly adopts multi-agent frameworks. However, the adoption of multi-agent frameworks presents challenges for scalability. Instead, the Traffic signal control (TSC) problem necessitates a single-agent framework. TSC inherently relies on centralized management by a single control center, which can monitor traffic conditions across all roads in the study area and coordinate the control of all intersections. This work proposes a single-agent RL-based regional ATSC model compatible with probe vehicle technology. Key components of the RL design include state, action, and reward function definitions. To facilitate learning and manage congestion, both state and reward functions are defined based on queue length, with action designed to regulate queue dynamics. The queue length definition used in this study differs slightly from conventional definitions but is closely correlated with congestion states. More importantly, it allows for reliable estimation using link travel time data from probe vehicles. With probe vehicle data already covering most urban roads, this feature enhances the proposed method's potential for widespread deployment. The method was comprehensively evaluated using the SUMO simulation platform. Experimental results demonstrate that the proposed model significantly reduces queue variability and decreases queue lengths to 63% of the baseline level, confirming that it effectively mitigates large-scale regional

congestion levels via coordinated multi-intersection control.

EM0084

Robust Single-Agent Reinforcement Learning for Regional Traffic Signal Control Under Demand Fluctuations

Qiang Li[1], **Jin Niu[2]** and Lina Yu[1]
1. Shenzhen Technology University, China
2. Shenzhen University, China

Abstract-Traffic congestion, primarily driven by intersection queuing, significantly impacts urban living standards, safety, environmental quality, and economic efficiency. While Traffic Signal Control (TSC) systems hold potential for congestion mitigation, traditional optimization models often fail to capture real-world traffic complexity and dynamics. This study introduces a novel single-agent reinforcement learning (RL) framework for regional adaptive TSC, circumventing the coordination complexities inherent in multi-agent systems through a centralized decision-making paradigm. The model employs an adjacency matrix to unify the encoding of road network topology, real-time queue states derived from probe vehicle data, and current signal timing parameters. Leveraging the efficient learning capabilities of the DreamerV3 world model, the agent learns control policies where actions sequentially select intersections and adjust their signal phase splits to regulate traffic inflow/outflow, analogous to a feedback control system. Reward design prioritizes queue dissipation, directly linking congestion metrics (queue length) to control actions. Simulation experiments conducted in SUMO (Simulation of Urban Mobility) demonstrate the model's effectiveness: under inference scenarios with multi-level (10%, 20%, 30%) Origin-Destination (OD)demand fluctuations, the framework exhibits robust anti-fluctuation capability and significantly reduces queue lengths. This work establishes a new paradigm for intelligent traffic control compatible with probe vehicle technology. Future research will focus on enhancing practical applicability by incorporating stochastic OD demand fluctuations during training and exploring regional optimization mechanisms for contingency events.

EM0151

Spatial Intelligence for Sustainability: A Green Supply Chain Analysis of Strawberries Using GIS and Transportation Modeling

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1. Mapùa University, Philippines
2. Saint Louis University, Philippines

Abstract-This study examines the optimization of the strawberry supply chain in La Trinidad, Benguet through the integration of Geographic Information Systems (GIS), transport modeling, and thematic analysis to promote a green and sustainable logistics framework. Recognizing that strawberry spoilage and transport inefficiencies contribute to significant post-harvest losses and carbon emissions, the research sought to identify spatial, operational, and institutional factors affecting supply chain performance. Using GIS-based mapping, the study visualized farm-to-market routes linking Benguet to key destinations such as Baguio City, Divisoria, and Cubao, while multi-integer linear programming (MILP) in MATLAB was applied to optimize transportation based on production and transportation costs. Complementing this, qualitative data gathered from interviews and focus group discussions revealed systemic challenges such as the lack of cold storage hubs, limited government support during the rainy season, and the vulnerability of flood-prone farms. Results showed a 19.83% reduction in total CO_2 emissions under optimized transport conditions and underscored the potential of waste centralization and

value recovery to reduce spoilage. The study concludes that achieving a sustainable strawberry supply chain requires integrating spatial intelligence, logistical optimization, and stakeholder collaboration, aligning with SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action) to advance environmental and economic resilience in the Cordillera region.

EM0159

Optimization of picking in a logistics distributor using Pick and Place with RFID and IoT to reduce errors

Carol Perez-Vargas[1], José Velásquez-Costa[1] and Cristina Losada-Gutiérrez[2]

1. Peruvian University of Applied Sciences, Peru.

2. Universidad de Alcalá, España.

Abstract-Logistics efficiency has become a factor for global competitiveness, especially in multinational companies where the accuracy of order preparation directly affects customer satisfaction and operational costs. In this context, the picking process plays a critical role, representing between 15% and 35% of the total logistics cost. However, in various industries, manual methods persist, increasing preparation errors, delivery delays, and operational rework, limiting the overall performance of the logistics system. In Peru, this issue is visible in distribution centers where intelligent operational support technologies have not yet been implemented. The diagnosis carried out in the company under study shows that the current picking process has inefficiencies that affect its productivity, reflected in an OEE of 51.76%, a value that is below the expected performance of 97% for a high-volume and variable operation. This situation generates additional costs, low traceability, and a loss of reliability in supply. In response, a model based on Pick & Place automation, integrated with RFID and IoT technologies, accompanied by operational standardization, is proposed. This solution allows optimizing picking accuracy, Simulation and pilot validation results indicate a potential cycle time reduction of up to 40% and an estimated operational efficiency improvement of approximately 20%, demonstrating the feasibility of closing the identified OEE performance gap. proving to be a scalable, replicable, and applicable alternative for various sectors looking to evolve towards smart distribution centers aligned with Industry 4.0.

SESSION 16 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Capability Building and Business Model Innovation in Enterprise Digital Transformation
Time: 13:00-15:00 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/83353043204
Session Chair: Asst. Prof. Matteo De Marchi, Free University of Bolzano, Italy

Online

EM0155

Enterprise Resource Planning (ERP) Adoption Model in the Construction Industry: An Integrated TOE, TAM, and DeLone & McLean Approach

Andy Yanuar Raska and Jonny
Bina Nusantara University, Indonesia

Abstract- In the construction sector, which is defined by project-based operations and dispersed stakeholders, enterprise resource planning (ERP) technologies are crucial for enhancing coordination and information integration. However, due to low user acceptability and limited system usage, ERP installation frequently falls short of providing ideal performance. By combining the Technology–Organization–Environment (TOE) framework, Technology Acceptance Model (TAM), and DeLone & McLean IS Success Model, this study investigates ERP adoption and its effects on project performance. Data from 200 Indonesian construction professionals was subjected to SEM-PLS analysis. The findings indicate that behavioral intention has a large impact on real ERP usage, and that actual usage considerably enhances project performance. Perceived utility and perceived ease of use are strongly influenced by TOE characteristics, and these factors in turn have an impact on behavioral intention. This study offers a thorough model that explains ERP.

EM0116

The Effect of Wfh and Wfo Work Patterns on Individual Productivity: A Survey Study of Employees in The Startup Industry in Jakarta

Fakhri Muhammad Ahsan and Kiki Sudiana
Telkom University, Indonesia

Abstract-This study aims to analyze the effect of Work From Home (WFH) and Work From Office (WFO) work patterns on individual productivity among employees in the startup industry in the DKI Jakarta area. The background of this study is based on significant changes in work patterns after the COVID-19 pandemic, which has encouraged companies to adopt flexible work systems. Using a quantitative approach, data was collected through a survey of 400 startup employees and analyzed using multiple linear regression. The results show that both WFH and WFO have a significant and positive effect on employee productivity, with WFO being the more dominant variable. Respondents' perception scores for both work patterns were in the very good category, with WFO contributing 31.8% and WFH contributing 24.1% to productivity variation. Simultaneously, these two variables explain 55.9% of the change in productivity levels. These findings indicate that flexible work patterns,

particularly the hybrid model that combines WFH and WFO, are relevant work strategies for enhancing employee performance in the startup sector. The implications of this research highlight the importance of companies in designing adaptive and balanced work systems. The hybrid model is recommended as an optimal approach because it integrates the flexibility of remote work with the collaborative dynamics of the office. Additionally, the results of this study contribute to the development of work productivity theory in the context of modern work and serve as a practical reference for startup management in developing human resource policies focused on efficiency and employee well-being.

EM0132

Application of Bpm and Process Automation to Reduce Fraud Rates in an Insurance Company

Alexia Viola Olcese, Henrry Oblitas Ayras, Edilberto Avalos-Ortecho and Claudia León-Chávarri
Universidad de Lima, Perú

Abstract-This study addressed the problem of high undetected fraud levels in an Argentine insurance company, which generate annual losses of ARS 1,434 million, by applying Business Process Management (BPM) and process automation to the partial-damage automobile claims workflow. The research focused on redesigning the initial analysis phase, where inconsistencies and manual errors originated. The AS-IS process was mapped and simulated, revealing long lead times, fragmented decision paths, and analyst overload. Based on these findings, a digital Poka-Yoke approach was introduced through blocking smart forms, together with an automated validation engine integrating OCR, rule-based scoring, and automatic document verification. The TO-BE model was validated through Arena simulation, showing a 60% increase in fraud detection (from 4.68% to 7.49%), an 81% reduction in the resolution time of non-fraudulent cases, and a 6.08% reduction in the company's loss ratio derived from annual savings. Several manual activities that did not require analytical judgment were automated, including coverage verification, policy validity checks, and requests for additional documentation, previously identified as a major bottleneck. The redesigned workflow ensures completeness through blocking forms and incorporates targeted fraud alerts that enable earlier identification of suspicious cases, contributing to a more efficient and fraud-aware claims pathway.

EM0095

Challenges for Digital Transformation in Higher Education from Theoretical Lenses to Practices in Vietnam

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Abstract-This paper explores the challenges of digital transformation (DT) in Vietnam through a comprehensive review of theoretical perspectives and empirical evidence. Digital transformation, driven by technological advancements and strategic intent, presents numerous obstacles for organizations, including misaligned strategies, talent gaps, governance issues, cultural resistance, and infrastructure constraints. Theoretical frameworks such as contingency theory, dynamic capabilities, strategic governance, and the Technology-Organization-Environment (TOE) model are utilized to explain how these challenges manifest in practice, with a particular focus on the role of leadership, employee engagement, and organizational readiness. By examining the specific context of Vietnamese universities, this study identifies key challenges related to user adoption, data security, technological planning, and resource constraints. The findings underscore the importance of integrated, context-aware strategies, and the need for a holistic approach to governance, leadership, and change management to navigate the

complexities of DT. Finally, the paper proposes avenues for future research, emphasizing the need for multilevel theorizing, sector-specific digital transformation pathways, and frameworks that link DT with sustainability and resilience. This study contributes to a deeper understanding of how digital transformation can be effectively implemented in emerging economies, offering valuable insights for policymakers, business leaders, and academics.

EM0031

Integrated green-oriented model based on forecasting techniques, TPM 4.0, and PokaYoke to reduce newspaper returns in the editorial industry

Camilo Huachhuaco, Yaki Guerrero and Angel Hurtado
Academic Program of Industrial Engineering, Peru

Abstract-This research proposes a green-oriented model designed to reduce returns in the editorial sector, which are primarily caused by inaccurate forecasts, equipment failures, and human errors in the dispatch area. These factors increase logistical costs and intensify environmental impacts due to paper waste and emissions associated with reverse logistics. The study is developed as an applied case within an editorial company, utilizing historical data on print volume, returns, and mechanical failures. The model integrates demand forecasting through machine learning, autonomous maintenance supported by IoT sensors (TPM 4.0), and a digital Poka-Yoke system using QR codes. The integration of these tools was validated through simulation in Simio under three scenarios: pessimistic, moderate, and optimistic. The optimistic scenario demonstrated the best performance, reducing the MAPE from 7.16% to 3%. Additionally, the Mean Time Between Failures (MTBF) increased from 24.11 to 70 hours. The Mean Time to Repair (MTTR) decreased from 2.68 to 0.60 hours, and operational availability rose from 90.02% to 98.95%. Order allocation errors were reduced from 13.36% to 4.08%. These improvements represent significant savings in paper and resources. The implemented tools introduce automation into processes that were previously manual, reducing both workload and the margin of human error. The proposed model constitutes an original contribution that is replicable in paperintensive industries, fostering efficiency, and sustainability.

EM0069

Lean Healthcare Model to Enhance Patient Service Performance in a Peruvian Rehabilitation SME

Claudia Patricia Castillo Aliaga, Marife Milagros Poma Baldeon, and Juan Carlos Quiroz Flores
Universidad de Lima, Perú

Abstract-Outpatient rehabilitation SMEs in emerging economies often struggle with long waiting times, administrative duplication, and workflow variability that weaken patient service performance. Existing Lean Healthcare studies focus mainly on large hospitals, leaving limited evidence for resource-constrained rehabilitation settings. This study addresses this gap by implementing an integrated Lean Healthcare model in a Peruvian rehabilitation SME, combining a digital Kanban system for admission with Standardized Work for therapy. A hybrid validation approach, pilot implementation supported by statistical analysis and discrete-event simulation, confirmed significant improvements. Admission time decreased by 59%, therapy time by 14.2%, and total time in the system from 104 to 84 minutes, while throughput increased from 75 to 90 patients and satisfaction rose to 61.9%. These findings demonstrate the feasibility and impact of Lean Healthcare in outpatient SMEs and encourage new research into scalable, evidence-based models for strengthening patient-centered services in emerging economies.

EM0102

An Empirical Analysis of DRG Payment Efficiency and Incentive Distortion: Evidence from Traditional Orthopedic Hospitals

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2. INTI International University, Malaysia

Abstract-Diagnosis-Related Group (DRG) systems are widely adopted for cost control and operational efficiency in healthcare. However, their incentive effects on institutions relying highly on conservative pathways remain insufficiently explored, particularly regarding how uniform rules influence heterogeneous delivery systems. Using DRG settlement data from orthopedic departments of three traditional medicine and two general hospitals in central China, this study compares two representative DRG groups: IU29 (cervical, lumbar, and back disorders, mainly conservative treatment) and IJ19 (other musculoskeletal surgeries). Key performance indicators, including cost structure, cost consumption index, time consumption index, proportion of low-multiplier cases, and financial balance at the case level, were analyzed. Public traditional medicine hospitals operated at significantly lower average costs and cost consumption indices than general hospitals across both DRG groups, reflecting efficiency advantages associated with conservative pathways. However, many cost-efficient cases were classified as low-multiplier cases, especially in the surgical DRG group, substantially downgrading reimbursement and obscuring efficiency gains. Conversely, the private traditional medicine hospital exhibited higher cost consumption with increased overall use of pharmaceuticals, diagnostic services, and medical consumables, suggesting payment-associated convergence of healthcare practice. DRG-based payment systems create both efficiency gains and incentive distortions in heterogeneous healthcare environments. When reimbursement mechanisms are primarily built on surgery-centered logic over outcome-equivalent effectiveness, conservative pathways are systematically undervalued, leading to efficiency masking and behavioral convergence. These findings contribute to the discourse on healthcare payment system design, highlighting the need to integrate value-based reimbursement principles into the DRG framework to align financial incentives with service outcomes and system efficiency.

SESSION 17 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Integrated Machine Vision and AI Technologies for Industrial Applications
Time: 15:00-16:45 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/86509399828
Session Chair: Asst. Prof. Hariyanto Gunawan, Chung Yuan Christian University

Online

EM5002

Neuro-Symbolic Agentic Mesh for Cognitive Data Infrastructure

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1. Software Developer TTI Consumer Power Tools INC, Anderson, USA
2. Technical Program Manager, Microsoft, USA
3. Software Developer, National Grid, USA
4. Software Developer, Google, USA
5. Software Developer, Walmart, USA

Abstract-An urgent need in order to unified intelligence infrastructure that can facilitate meaningful, policy-aligned, along with context-aware sharing of information has arisen due to the fast growth of distributed intelligent systems. It is difficult for conventional data pipelines along with LLM-centric systems to uphold consistent semantics, guarantee moral data treatment, and facilitate real-time reasoning in diverse contexts. In order to overcome these drawbacks, this study suggests a Neuro-Symbolic Agentic Mesh, a revolutionary architectural paradigm that combines information graph-driven semantics, symbolism policy engines, and big language models reasoning to coordinate data flow amongst networked AI agents. The proposed mesh provides a layered cognitive substrate through which autonomous agents can perform semantic-aware information movement and changes, evaluate ethical as well as compliance constraints, and even comprehend intent. The mesh makes decision-making visible, understandable, and policy-aligned by employing Azure OpenAI, Microsoft Fabric Data Activator, enterprise graphs of information, and Responsible AI Toolkits. Such a configuration yields a singular cognitive apparatus capable of managing human – machine interactions, AI-driven processes, and cross-domain intelligence. The final layout, through the facilitation of explainable planning, scalable cognitive exchange, and dynamic governance, surpasses the present multi-agent and neuro-symbolic systems. The suggested framework is a milestone on the way to dependably, scalably, and resiliently functioning cognitive environments that can be instrumental to AI applications in the industries and society of the future.

EM5015

A Real-Time Depth Estimation System Based on Intel RealSense and Hailo-8 Edge AI Accelerator Using YOLOv8m

Manot Mapato, Phonlawat Jintawiset, Chutimon Khaikaew and Chanatip Orathaiwan
Nakhon Ratchasima, Thailand

Abstract-This research presents the development of a real-time object detection and depth-distance estimation system integrating an Intel RealSense depth camera with the Hailo-8 AI accelerator to measure object distances under real operating conditions. The system operates at high frame rates with low latency and low power consumption, while providing three-dimensional spatial coordinates (X, Y, Z) suitable for robotics and automation. The processing pipeline includes RGB-D acquisition, YOLOv8 inference compiled to HEF for Hailo-8 acceleration, and depth estimation from detected bounding boxes. Experimental results show approximately 30 FPS with a depth error of ≈5–15 mm, demonstrating the feasibility of edge AI–based depth perception for real-world deployment.

EM5020

Machine Learning-based prototype to improve the classification of olive status in the agri-food industry

Oscar Mendoza-Escudero[1], Sebastián Sarmiento-Curay[1], José Velásquez-Costa[1], Javier Torres-Zavala[1] and Baldomero Mendez-Pallares[2]

1. Peruvian University of Applied Sciences, Perú
2. Universidad Piloto de Colombia, Colombia

Abstract-The manual classification of olives in the agri-food industry represented a slow, expensive process with high variability, which directly affected the efficiency and final quality of the product. This study presented the design and implementation of an automated sorting system that integrated machine vision, image processing, and real-time control to improve process accuracy and speed. The prototype consisted of a conveyor belt controlled by a Raspberry Pi 5, an ESP32-CAM module with an OV2640 camera for image capture, a servomotor used as an ejection piston, and an LCD for the display of records and operating parameters. The model was initially trained with 300 images of olives, enlarged using data augmentation techniques based on rotations, brightness variations, and translations, reaching an effective total of 1800 samples. This strategy strengthened the robustness of supervised learning and allowed for reliable identification of surface defects. The ejection mechanism, synchronized using the Raspberry Pi 5's GPIO ports, ensured the automatic removal of non-compliant olives. Experimental tests showed an average processing time of 10 milliseconds per olive. Likewise, the system achieved a classification accuracy of 99.17%, a standard sensitivity of 98.83%, an accuracy of 99.05% and an F1-Score of 89.99%, reflecting an adequate balance between precision and sensitivity. This technological proposal optimizes the post-harvest process and establishes a scalable basis for agricultural classification systems applicable to various crops.

EM5029

Designing a 5G-Enabled Smart Port Architecture

Francis Manuntag Lubuguin and William P. Rey
Mapua University, Philippines

Abstract-To enable HarborLink Port's transition into a next-generation smart port, a comprehensive and adaptive network architecture is essential one that responds intelligently to the diverse technical demands of modern maritime operations. This case study explores how operational scenarios such as remote-controlled cranes, autonomous vehicles, IoT-based monitoring systems, and AI-driven analytics shape the port's infrastructure requirements. Each use case introduces unique challenges, from ultra-low latency and high reliability for mission-critical tasks to massive data throughput and secure connectivity for large-scale IoT deployments. In response, HarborLink Port adopts a hybrid architecture combining private 5G, fiber-optic backbones, and edge computing, orchestrated through network slicing and optimized via digital twin simulations. This setup ensures seamless

mobility, real-time control, and scalable performance across all operational layers. The integration of IoT and blockchain technologies further enhances transparency, security, and data integrity, while AI and digital twins empower predictive maintenance, autonomous routing, and dynamic resource allocation. Crucially, the port's strategy emphasizes harmonizing legacy systems with smart technologies through a unified Smart Port Platform, ensuring continuity and accelerating digital adoption. Together, these innovations form a resilient, intelligent foundation that positions HarborLink Port at the forefront of global smart port transformation.

EM5039

Generative-AI Assisted Implementation of an Under-Ride Lift Carrier for Autonomous Mobile Robots

Jukkapun Greebmalai, Pradujthep Maneechay, Suttisak Junarak, Eakkachai Warinsiriruk and Thanakorn Naenna
Mahidol University, Thailand

Abstract-This paper presents a generative-AI–assisted design and implementation of an under-ride lift carrier for autonomous mobile robots (AMRs). The system was developed using an AMR platform to enable automated docking, lifting, and transportation of wheeled trolleys in confined industrial environments. Generative artificial intelligence was utilized throughout the design workflow to synthesize mechanical concepts, optimize sensor placement, identify problem issues, and generate control-logic structures for reliable docking and load handling. The resulting prototype integrates a low-profile lift mechanism, and AI-guided parameter tuning to achieve repeatable docking accuracy within ±5 mm and 0.75° yaw-angle with designed lifting capability up to 100 kg. The validation testing demonstrates that AI-assisted for under-ride carrier had successes approaches to development machine set-up processes, highlighting the potential of generative-AI tools in accelerating mechatronic system innovation.

EM0162

Manufacturing Scheduling with Resource and Calendar Constraints: A Systematic Literature Review and Perspectives on Max-Plus Algebra

Md Aftab Uddin[1,2], Jaafar Gaber[2] and Pierre Petitjean[1]
1. M-Plus Group, France
2. Université Marie et Louis Pasteur, France

Abstract-Scheduling manufacturing under resource and calendar constraints is still a critical challenge in contemporary manufacturing systems, especially in the context of Industry 4.0 and digital transformation. Despite the popularity of traditional methods like Constraint Programming, Integer Linear Programming and heuristic methods, they tend to be less scalable and computationally efficient in the highly constrained and dynamic industrial problems. Max-Plus Algebra has become a prospective mathematical modeling platform of discrete-event systems, facilitating rapid analytical analysis of time-dependent synchronization and performance metrics of a system. This paper is a systematic literature review of manufacturing scheduling studies published within the period of 2015-2025, particularly resource and calendar constraints and the use of Max-Plus Algebra. According to SMA guidelines, 30 studies were chosen from 285 publications. The approaches reviewed are categorized and contrasted based on modeling abilities, computational effectiveness, scalability, and industrial demonstrations. The findings show that Max-Plus-based approaches are useful when dealing with structured scheduling problems and cycle-time analysis but have low capabilities to handle heterogeneous resources and complex decision-making structures. The review presents the main research gaps and underlines the necessity of hybrid frameworks built on the combination of Max-Plus Algebra with traditional methods of optimization and more intensive integration with Industry 4.0 and digital twin systems.

SESSION 18 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Applications of AI in Industrial Engineering: Production Optimization and Decision Support
Time: 15:00-16:45 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/83353043204
Session Chair: Dr. Crescenzo Pepe, Università Politecnica delle Marche, Italy

Online

EM5008

Data-Driven Lean 4.0 and VRP-Based Model to Improve OTIF in Food-Distribution SMEs

John Angelo Pacheco-Chauca, Bruno Wilfredo Molina-Meléndez, Marcos Fernando-Ruiz Ruiz and Juan Carlos Quiroz-Flores
Universidad de Lima, Perú

Abstract- Peru's food-distribution sector continues to face operational instability and limited digitalization, leading to persistent gaps in logistics efficiency and service reliability reported in prior studies. This research addresses the urgent challenge of a low OTIF level (65.4%) in a Peruvian food-distribution SME, significantly below the 70–75% industry benchmark. An Integrated Lean–Industry 4.0 model is proposed, combining Standard Work to reduce picking variability, a Digital Poka-Yoke built in AppSheet with RFID-like barcode validation for real-time error prevention, and a Python-based VRP module that applies algorithmic heuristics to optimize distribution routes. The model was validated through discrete-event simulation and pilot testing. Results show OTIF increasing to 83%, a 62% reduction in picking cycle time, and documentation errors approaching zero. These findings demonstrate that accessible, data-driven Lean 4.0 technologies can enhance logistics performance in emerging-economy SMEs and motivate further research on scalable, digitally enabled service-level improvements.

EM5013

Implementation Of Lean Manufacturing To Increase The Productivity Of A Retreading Company

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Universidad de Lima, Perú

Abstract-The manufacturing sector is one of the pillars of the national GDP, so any inefficiency in its processes directly impacts the country's competitiveness. In this context, the company under study exhibits low partial labor productivity of 0.811 units/hour, along with a high circulation time within the tire retreading process. The application of Lean Manufacturing proved effective for waste reduction and continuous improvement. The problem analysis identified the application of 5S, which fostered an organized work environment by reducing material search times during cementing; Standard Work, which standardized scraping and banding activities, decreasing waste and rework; and SLP, which optimized the layout of areas to reduce internal travel and improve process flow. After implementing the Lean Manufacturing tools, which were validated through a pilot project and

simulation in Arena, the company achieved an improvement in partial labor productivity to 1.117 units/hour. and circulation time was reduced due to the new layout.

EM5017

Model for Improving OEE in the Metalworking Sector through TPM, RCM, SMED, and Integration of Industry 4.0 Technologies: Big Data and Machine Learning

Hetzibá Benavides-De la Cruz[1], Johan Lázaro-Enriquez[1], José Velásquez-Costa[1], Javier Torres-Zavala[1] and Baldomero Mendez-Pallares[2]
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2. Universidad Piloto de Colombia, Colombia

Abstract-In the metalworking industry, machinery constitutes the core of production processes, as its proper performance ensures operational continuity and the achievement of production objectives. However, the sector faces a recurring issue of low OEE, caused by unplanned stoppages and frequent failures that negatively impact productivity. This situation is primarily associated with deficient maintenance management, which generates economic losses that can reach up to 10.65% of the annual turnover. To address this problem, an integrated improvement model is proposed, combining the TPM (Total Productive Maintenance), RCM (Reliability-Centered Maintenance), and SMED (Single-Minute Exchange of Die) methodologies, aligned with the principles of Industry 4.0. In this context, Big Data is connected with TPM and SMED by enabling the collection and analysis of large volumes of information obtained from sensors and operational records, facilitating the detection of losses, the optimization of changeover times, and data-driven decision-making. Meanwhile, Machine Learning, applied to RCM, enables the development of predictive strategies capable of anticipating failures through machine-learning algorithms, increasing equipment reliability and availability. The analysis of availability, performance, and quality indicators shows that the proposed model raises OEE by approximately 20%, reaching a minimum of 82%, thus strengthening operational efficiency, reducing costs, and enhancing business competitiveness within the framework of digital transformation.

EM5022

Application Of Lean Service To Increase OFR in A Distribution Company in The Food Sector

Isaí Moisés Agüero Alarcón, Tracy Daniela Guzmán Mancilla, Edilberto Miguel Avalos-Ortecho and Claudia León Chávarri
Universidad de Lima, Perú

Abstract-The food distribution sector faces growing pressure to deliver accurate orders in environments with high inventory turnover. In Peru, order fulfillment problems remain frequent, and many companies report OFR levels below the 98% benchmark. The company analyzed had an OFR of 93%, mainly due to product misidentification, incorrect expiration checks and manual picking overload. These issues show how human error affects customer satisfaction and efficiency. To address this, the project proposes a two-phase Lean Service model. First, Heijunka balances operator workload to stabilize the process. Second, a QR-based Poka Yoke verifies products automatically, reducing identification errors and improving traceability. Heijunka reduces variability, while digital Poka Yoke increases accuracy.
Arena Simulation was used to validate the model, showing an improvement of the OFR from 94% to 97.8% and fewer picking errors. Because the tools are simple and low-cost, the model can be applied in other small and medium distribution companies.

EM5031

Optimization Model for Textile Dye Microenterprise Production Processes and Return Reduction Using Taguchi, ANN, Kanban, and RFID–Poka-Yoke

Paola A. Buendía-Cahuata, Kiara S. Garces-Sayre, **Claudia C. León-Chavarri,** and Rafael Chavez-Ugaz
Universidad de Lima, Perú

Abstract-This research seeks to improve the production process of a micro and small enterprise focused on the manufacture of textile dyes, a sector that commonly faces high return dates due to formulation errors, labeling mistakes, and inadequate task management. Deficiencies were identified in the control of mixing parameters, imbalance in workload distribution, and failures in final label verification, all of which affect product quality and operational efficiency. The proposed model applies combination of lean methodologies and digitalization: the Taguchi method to optimize parameter control, Artificial Neural Networks to generate predictive models to responses under dyeing conditions and identify combinations with similar absorbance levels to replicate, Kanban for task management, and RFID with Poka-Yoke to ensure correct labeling. As a result, returns due to labeling errors decreased by 27.78%, followed by a 26% increase in value flow, a coefficient of determination of 0.799, and a mean squared error of 0.0213, which indicates an optimistic fit for a nonlinear systema. Additionally, the social evaluation highlights improvements in occupational safety, job formalization, and product traceability, contributing to a more efficient production model for the small-scale chemical textile industry.

EM5045

A Data-Driven Decision-Support Framework for Fashion Supply Chains under Incomplete Disclosure

Xin Sun[1], Houhao Ma[1] and **Jing Zhong[2]**
1. Beijing Institute of Fashion Technology, China
2. Universiti Teknologi MARA, Shah Alam, Malaysia

Abstract-Environmental and governance evidence within fashion supply chains typically originates from heterogeneous sources with varying granularity, constrained by incomplete public disclosure. This renders such data difficult to directly integrate into unified comparative analysis and decision-making processes. To address this challenge, this paper constructs a verifiable, data-driven decision-support framework. It combines rule-based evidence processing with an Environment–Governance AHP–TOPSIS methodology to transform fragmented disclosure information into computable, comparable decision inputs. Using Stella McCartney's public disclosures as an illustrative case, the paper reconstructs three pathwaylevel archetypes. Operational analysis is achieved through a unified metric system, structured scoring, AHP weighting, and TOPSIS ranking. Results demonstrate that this process generates interpretable comparative rankings under scenarios of equal weighting, governance prioritisation, and localised weight perturbations, while completing fundamental boundary tests. The contribution lies not in rendering definitive performance judgements on real supply chain entities, but in demonstrating how heterogeneous public disclosure evidence can be transformed into a transparent, auditable, and verifiable industrial decision support process under conditions of incomplete information.

EM5030

Research on Visualization Reform of AI-Driven VFOA-BP Model Empowering Industrial Engineering Prediction

Kai WANG and YuanCheng LI

Guangxi Construction Vocational College, China

Abstract-Against the background of the coordinated development of intelligent manufacturing and green low-carbon, artificial intelligence (AI) has become the core support for data-driven prediction and production control optimization in industrial engineering. The integration of AI with key parameter prediction technology and its teaching application is of great practical significance. Focusing on AI’s advantages in autonomous learning and multi-source data analysis, this paper constructs an industrial engineering prediction visualization system based on the AI-driven VFOA-BP swarm intelligence-neural network model. Key factors including production load, ambient temperature and humidity, and equipment operation parameters are incorporated to build the optimized VFOA-BP model. Comparative experiments with traditional BP and FOA-BP models are conducted, and empirical verification is completed using monitoring data from an actual industrial production line. The results show that the VFOA-BP model has a root mean square error (RMSE) of 0.1979mm (meeting industrial prediction accuracy standards), with accuracy improved by 15.29% and 3.14% compared with the two traditional models, providing efficient data support for accurate industrial prediction. The integrated teaching mode of visualization and AI significantly enhances the ability to interpret prediction data and apply technology. This study provides a new path for teaching reform of industrial engineering-related majors and a technical reference for the in-depth integration of AI and industrial engineering prediction.

SESSION 19 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Portfolio Optimization and Multi-Objective Decision Models Based on Risk Measurement
Time: 16:45-18:45 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/86509399828
Session Chair: Asst. Prof. Ronaldo Polancos, De La Salle University Manila, Philippines

Online

EM0137

A Hybrid HCA–ARM–MCDM Framework for Data-Driven Portfolio Optimization of Philippine Blue-Chip Equities

Ma. Kathleen L. Duran[1,2], Michael Nayat Young[1] and Ardvin Kester S. Ong[1]
1. Mapúa University, Philippines
2. National University, Philippines

Abstract-This study proposes a hybrid, data-driven portfolio optimization framework for Philippine blue-chip equities integrating Hierarchical Clustering Analysis (HCA), Association Rule Mining (ARM), and multi-criteria decisionmaking (MCDM) techniques using Entropy–AHP weighting, TOPSIS efficiency scoring, and VIKOR compromise ranking. Daily price and volume data from 30 Philippine Stock Exchange Index (PSEi) companies, spanning from 2010 to 2022, were analyzed. HCA revealed five statistically strong stock clusters reflecting distinct risk–return–liquidity profiles. ARM uncovered strong intra- and inter-cluster co-movement patterns, confirming behavioral and structural dependencies. Hybrid Entropy–AHP weighting emphasized mean return and downside risk (CVaR) as dominant criteria. TOPSIS and VIKOR rankings showed strong agreement ($\rho = 0.94$), consistently identifying ICT, SM, ALI, URC, and BPI as top-performing stocks. Portfolio backtesting demonstrated that a concentrated Top-10 strategy maximized cumulative returns, while a Per-Cluster Top-5 strategy achieved superior risk-adjusted stability. Sensitivity analysis across rebalancing frequencies and transaction-cost scenarios indicated that semi-annual rebalancing provides the optimal balance between responsiveness and turnover. Results confirm that combining structural clustering, behavioral rule mining, and multi-criteria optimization improves diversification quality and portfolio robustness in emerging markets.

EM0127

Portfolio Selection Model for Moderately Risk-Averse Investors: A Hybrid Mean–Variance and Regret–Safety Approach

Ma. Kathleen L. Duran[1,2], Michael Nayat Young[1], Benigno B. Agapito Jr.[3] and **Michael G. Calamba**[4]
1. Mapúa University, Philippines
2. National University, Philippines
3. Open University, Philippines
4. Mapúa Malayan Colleges Mindanao, Philippines

Abstract-This study proposes a hybrid portfolio selection framework for moderately risk-averse investors by integrating Mean–Variance (MV) optimization with a Regret–Safety (RS) behavioral component. Using daily closing prices of 30 Philippine Stock Exchange (PSE) blue-chip equities from February 17, 2020 to December 31, 2022, the model was developed to capture both financial efficiency and behavioral sensitivity under volatile market conditions. The MV component minimizes portfolio variance for target return levels, whereas the RS component incorporates safety preference, regret avoidance, and probability distortion to reflect investor behavior more realistically. Four risk-sensitivity configurations were evaluated and compared with the PSEi benchmark using cumulative return, volatility, Sharpe ratio, and information ratio. Results show that the MV-0.10 portfolio achieved the highest cumulative return at 11.12% with the lowest volatility at 3.96%, while the RS-0.40 portfolio generated a more behaviorally stable allocation, yielding 4.67% cumulative return with improved emotional defensiveness during uncertainty. Although the differences relative to the benchmark were not statistically significant, the findings suggest that integrating behavioral considerations into portfolio design can improve portfolio stability and investor alignment in emerging markets. The study contributes to portfolio optimization literature by offering a behaviorally informed framework tailored to moderately risk-averse investors in the Philippine equity market.

EM0139

Application of Exponential Moving Average (EMA) and Moving Average Convergence Divergence (MACD) Indicators for Investment Pool Selection Integrated with Mean-Variance Portfolio Selection Utilizing Philippine Stock Exchange

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3. University of the Philippines Open University, Philippines

Abstract-This study explores the integration of Exponential Moving Average (EMA) and Moving Average Convergence Divergence (MACD) indicators with the Mean–Variance Optimization (MVO) framework for portfolio selection in the Philippine Stock Exchange. Using 30 years of historical trading data, the research identifies stocks with favorable trend signals through EMA and MACD, forming a technically screened investment pool. The stocks are optimized using MVO model at different Relative Risk Factor (RRF) levels. EMA-MACD based portfolios outperformed all sector MVO at lower RRF, indicating more suitability with risk averse investor, while at higher RRF, all sector MVO performed better which aligns with aggressive investment strategies. EMA-MACD based provided positive return at RRF level of 0.1, 0.3, and 0.4, as confirmed with statistical tests. The findings highlighted by using EMA and MACD technical analysis with quantitative optimization like Mean Variance Optimization can enhance portfolio performance.

EM0140

A Behavioral Portfolio Optimization Approach for the Top 30 Highly Traded Philippine Equities Using Cumulative Prospect Theory

Anthony Luis P. Javonitalla[1], Michael N. Young[1], Michael G. Calamba[2] and Benigno B. Agapto Jr.[3]
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2. Mapúa Malayan Colleges Mindanao, Philippines.
3. University of the Philippines Open University, Philippines

Abstract-Portfolio optimization is still an important issue in financial engineering. This is especially true in emerging markets, where investor confidence and market sentiment strongly influence asset prices and investment choices. This study examines the Philippine Stock Exchange (PSE) by combining behavioral insights from Cumulative Prospect Theory (CPT) with the traditional Mean-Variance approach to portfolio optimization. Taking historical PSE data over 30 years (January 1993-December 2022), we form CPT-based portfolios using the top 30 most traded Philippine equities, which serve as a proxy for highly liquid and popularly held securities that are perceived as highly visible assets, whereas comparing them with Equally Likely (EL) portfolios formed from all 288 listed firms to act as a rational diversification benchmark. Portfolio simulations are performed at RRFs ranging from 0.1 to 1.0, and differences in average return, volatility, and cumulative performance are tested under the assumptions of investor behavior and rationality. The portfolio mean return is examined for statistical significance above zero, applying a paired return difference t-test. Empirical results show that investments following the CPT-based pattern outperform the EL-based diversified strategy at moderate to high levels of RRF. This suggests that probability distortion, behavioral concentration, and selective risk-taking play key roles in portfolio outperformance. The findings suggest that integrating behavioral portfolio optimization into standard mean–variance models offers a flexible and empirically effective means of constructing portfolios in sentiment-related emerging markets, such as the PSE.

EM0147

Portfolio Analysis using Safety-First in a 30-year (1993-2022) Historical Returns of Service Sectors and Subsectors of the Philippine Stock Exchange

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Abstract-Portfolio selection aims to maximize investment returns while maintaining an acceptable level of risk. It aims to maximize returns while keeping risk within acceptable limits. This approach involves choosing investments that yield the highest possible return without exceeding a defined risk threshold. This study explores a framework for building portfolios that could outperform a benchmark, using a safety-first approach and analyzing 30 years of historical returns from nine subsectors within the Service Sector. Back testing indicates that some portfolios from these subsectors have the potential to outperform both the broader Market and the overall Service Sector. However, t-test results do not provide strong statistical evidence that any of these portfolios significantly outperform the Market. The selected portfolios are determined based on their mean and cumulative returns, specifically including Telecommunications (SF_1), and Casino and Gaming (SF_1). The study identifies a statistically acceptable portfolio for some subsectors, as the t-test results are significant across varying portfolio parameters, while the comparison with the benchmark using the t-test result stated otherwise.

EM0163

Assessment of Risk-Return Efficiency using the Mean-Variance Portfolio of the selected 30 Financial Firms recognized by the Philippine Stock Exchange from 1992 to 2022

Mariane Angeline Kiawan[1], Maria Gizella Diaz[1], Reiver Elrich De Vera[1], Jykidd Sebastian Roxas[1], Gabriel Angelo Rios[1], Michael Young[1], Michael Calamba[2] and Benigno Agapito Jr.[3]

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Abstract-This study aims to analyze the risk and return efficiency from the selected 30 financial firms that are recognized by the Philippine Stock Exchange (PSE) from 1992 to 2022. The Mean-Variance Portfolio is used in order to create an optimal portfolio that will balance the risk and return efficiency. The gathered data from the following financial firms' documented stocks are meticulously studied and will be compared and analyzed depending on the performance of the processed portfolios in the PSE Index (PSEI). The study also underwent descriptive analysis, including a one-sample t-test on paired-return differences, to assess the comparison between the portfolio's performance and the benchmark. In accordance with this, the top three companies were identified per risk-return factor (RRF) based on their percentage. The results showed a selective difference in the performance of portfolios depending on the level of the risk-return rate. This study suggests that when the RRF level is lower, it is likely beneficial and practical for conservative investors, but it has a lower return, compared with a higher RRF level, it has the potential to have a higher return, with higher risk. This study may serve as a guide for investors or other organizations that will also undergo the same research discussion on portfolio optimization.

EM0168

K-Means Clustering Approach to Return,Volume, and Risk for Portfolio Optimization in the Philippine Stock Exchange Using Safety First Model

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Abstract-This study examines the effectiveness of integrating K-means clustering with the Safety-First portfolio optimization model in the Philippine Stock Exchange (PSE), an emerging market characterized by liquidity constraints, sector concentration, and heightened volatility. Using monthly stock data from 1995 to 2024, stocks were clustered based on three dimensions—return, trading volume, and risk—using rolling five-year averages to refine the investment universe prior to optimization. The highest-performing clusters in return and volume, together with the lowest-risk cluster, were intersected to form a liquidity-aware and risk-averse investment pool. Portfolio construction was then carried out using the Safety-First model, which prioritizes minimizing the probability of returns falling below a minimum acceptable level. Portfolio performance was evaluated using mean returns, volatility, cumulative returns, and paired t-tests against alternative clustering strategies and the market benchmark. Empirical results show that portfolios derived from risk-based clustering significantly outperformed return- and volume-based counterparts, exhibiting superior stability and the only sustained positive cumulative returns over the study period. These findings highlight the suitability of Safety-First optimization for emerging markets and demonstrate that incorporating liquidity and behavioral risk through clustering enhances downside protection and long-term portfolio resilience in the Philippine stock market.

EM0170

Mean-Variance Portfolio Selection Strategies Among Cautiously-Hopeful Investors Considering 36 PSE Holding Firms and Using 1993-2022 Trading Data

Marcus Kevin Roldan[1], Justin Armand Badiola[1], Ma. Francheska Sinae Carmelo[1], Khitz Sergie Ranque[1], Chian Gabriel Sy[1], Michael Young[1], Michael Calamba[2] and Benigno Agapito Jr.[3]

1. Mapúa University, Philippines
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Abstract-The study evaluates the optimal portfolio within the investment pool of Holding Firms. Mean-Variance Theory is applied in Modern Portfolio Theory in order to find portfolios with the lowest risk. The framework of portfolio selection involves the identification of the investment pool, return estimation, probability assignment, utilization of the selection model and the evaluation of the portfolio's performance. The main objective of the study is to compare the performance of Mean-Variance Model Portfolios using Behavioural Probability Assignment and Equal Probability Assignment. 30 years of historical data from the Philippine Stock Exchange in the Holding Firms sector is used in order to estimate returns over 1000 scenarios across an RRF range of 0.1 to 1.0. Cautiously Hopeful SP/A Probability Assignment and Equal Probability Assignment are used. Mean-Variance Model is applied for portfolio selection. Simple statistical techniques are used for the analysis of data pre-cleanup while pairwise t-test comparison and % composition are used for data after outliers are removed.

SESSION 20 (Online)

April 25th, 2026
Time Zone: GMT+7

Topic: Marketing Budget Allocation and Resource Optimization Based on Portfolio Theory
Time: 16:45-18:45 (Duration for Each Presentation: 15 minutes)
Zoom Link: https://zoom.us/j/83353043204
Session Chair: Assoc. Prof. Charles Ramendran SPR Subramaniam, Universiti Tunku Abdul Rahman, Malaysia

Online

EM2004-A

The Impact of Branding on EV's Consumer Purchase Intention in Zhejiang Province, China

Ziang Wang
Rajamangala University of Technology Thanyaburi, Thailand

Abstract-The rapid development of the electric vehicle industry has increased the importance of branding in influencing consumer behavior. In competitive markets such as Zhejiang Province, China, understanding how brand awareness affects consumers' purchase intentions has become a critical issue for both researchers and practitioners. This study adopted a quantitative research design. Data were collected through a structured questionnaire distributed to consumers in Zhejiang Province using convenience sampling, resulting in 400 valid responses.

The results indicate that all four dimensions of brand awareness have a significant positive effect on consumer purchase intention. Brand loyalty showed the strongest influence, followed by brand image, brand recall, and brand recognition. The regression model explained 46% of the variance in purchase intention, and the overall model was statistically significant.

These findings suggest that brand awareness plays a critical role in shaping consumers' intentions to purchase electric vehicles. The study contributes to the literature on branding and consumer behavior in the EV sector and provides practical implications for EV manufacturers, particularly BYD, in developing effective branding and marketing strategies to enhance consumer engagement and market competitiveness. Future research may consider additional influencing factors or comparative studies across different regions or brands.

EM0027

Application of the EPIC and CRI Models to Evaluate the Effectiveness and Public Awareness of Roadside Advertising: A Study on ABC Brand Advertising Consumers

Jonny, Bagus Harsa Aprianto and Richie Devon Sumantri
Bina Nusantara University, Indonesia

Abstract-Car advertising, as a form of outdoor media, faces growing challenges in maintaining competitive revenue compared to digital and broadcast advertising platforms. This research aims to explore strategies to improve the revenue performance of car advertising companies by evaluating the effectiveness of this medium, using ABC—a prominent travel service platform operating across Southeast Asia—as the focal case study. Data

was collected through a structured survey administered to 101 respondents who had observed car advertisements featuring ABC branding.

The study employs two analytical frameworks: the EPIC model (Empathy, Persuasion, Impact, and Communication) to assess advertising effectiveness, and the Communication Response Index (CRI) to evaluate consumer response stages, including awareness, comprehension, interest, intention, and action. Findings reveal an EPIC score of 3.93, indicating moderate effectiveness, while the CRI measurement shows a high overall awareness rate of 96%. However, deeper analysis uncovers that only 40.2% of respondents—particularly those residing outside Jakarta—could specifically recall the ABC brand from car advertisements. This case highlights the limitations of car advertising in generating brand recall in diverse geographic and demographic contexts, particularly within a transnationally mobile consumer base. The study suggests that while car advertising remains a viable medium in urban Southeast Asia, its strategic integration with digital and cross-border marketing channels is essential for maximizing impact in the region's evolving media landscape.

EM0090

Interactive Effects of Streamer Count and Product Type on Consumer Purchase Intention

Yurui Lin, Hang Yin, Wanzhao Liu and Jiawen Liu
University of Science and Technology Liaoning, China

Abstract-Dual-streamer collaboration has grown prevalent in live-stream e-commerce, yet how streamer count matches product types remains underexplored. Drawing on the Number Effect Theory, Elaboration Likelihood Model (ELM) and Perceived Value Theory, this study conducted two 2×2 between-subjects experiments with 372 valid responses, exploring interactive effects of streamer count (single vs. dual) and product type (search vs. experience goods) on consumers' purchase intention, plus the mediating role of perceived value. Results reveal a significant interaction: single streamers boost purchase intention for search products, while dual streamers do so for experience products. Perceived value mediates this interaction, with the path moderated by product type. This study enriches live e-commerce marketing research and offers theoretical and practical guidance for enterprises to optimize streamer configuration and operational strategies.

EM0111

Behavioral Finance and Portfolio Optimization: A 30-Year Empirical Analysis of Cumulative Prospect Theory Utilizing 288 PSE-Listed Companies

Allen Alvi D. Chin[1], Eduardo Rafael R. Cruz[1], Russell Janrick L Jose[1], Jadel N. Cruz[1], Paul Lanbert C. Lorenzo[1], Michael N. Young[1], Michael G. Calamba[2] and Benigno B. Agapito Jr.[3]
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Abstract-This study utilized a 30-year historical dataset of all listed PSE companies as its investment pool. For return estimation, the past 1000 days' returns were used as return scenarios for each test day. The probability assignment compared two frameworks: Equally Likely (Pe) portfolios and the behavioral CPT-based (Pc) portfolios. The Selection Model employed was the Markowitz Mean-Variance Theory (MVT), in which investor preferences were modeled using the Relative Risk Factor (RRF), ranging from 0.1 to 1.0, covering the risk-averse to risk-seeking investors. Portfolio Evaluation involved determining the mean return and risk (Standard Deviation), with a one-sample t-test used to verify statistical significance. The findings showed that the Pe portfolio

statistically outperformed the Pc portfolio at six of the ten RRF levels tested, whereas Pc was superior only at RRF 0.1 and 0.8. Despite the high statistical significance (p-value as low as 0.0001), the maximum difference the average daily difference between the two portfolios, indicates that the complex behavioral mechanism of the Pc portfolio does not translate into a worthwhile economic edge over the simple Pe baseline.

EM0113

Portfolio Selection using Stochastic Oscillator and Comparative portfolio Analysis in the Philippine Market using Mean-Variance Theory

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Abstract-Portfolio selection is a multi-criteria decision-making process where investors both focus on the balance between return maximization, risk exposure and diversification. This study computes and evaluates the average daily returns of portfolios constructed using the Stochastic Oscillator (PSO) strategy across various Relative Risk Factors (RRF) which is then compared to the Equally Likely Portfolio. The data used in this study is from a 30-year historical Data of the Philippine Stock Exchange (PSE) that contains various companies trading data from 1993 to 2022. Using a Python-based script for performance analysis, results confirm that both PSO and PE portfolios adhere to the Mean-Variance Theory, demonstrating that higher risk is associated with higher return. A Pair-Return Difference T-Tests is performed on the RRF results revealed that the Stochastic Oscillator Portfolio consistently outperformed the Equally Likely portfolio at RRF levels of 0.1, 0.3, 0.4, 0.8, and 1.0, establishing PSO as a superior investment strategy. A key finding was the difference in portfolio composition: PSO (0.1) showed the largest concentration of investment in fewer companies, leading to superior risk-adjusted performance. The results also showed that for other RRF, the investment is more diverse and spread throughout the whole portfolio.

EM0124

Portfolio Evaluation of Service Industry Investments in the Philippines

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Abstract-This study explores the topics of portfolio selection and performance analysis based on the interdisciplinary decision science and optimization lenses to the Philippine service industry. It is a combination of operations research, behavioral finance, and quantitative decision analysis to deal with investment decision-making in the face of uncertainty. Behavioral portfolios are created to embody different types of sentiment by the investor: fearful, cautiously hopeful, hopeful, and equally weighted, in a Safety-First optimization. The time-series evaluation of these portfolios is compared to a benchmark of the market. To address the issue of period effects and heterogeneity of the financial returns series, the research employs statistical hypothesis tests consisting of t-tests, one-sample, and a pair of t-tests in addition to the statistical tests to measure the difference in mean returns of portfolios and compared to the benchmark. The empirical results indicate that several behaviorally adjusted portfolios are significantly higher than the benchmark, aiming to provide positive and statistically significant

portfolio-goal differentials. This leads to the conclusion that the found benefits in performance are not necessitated by accident but rather by systematic decision arrangements within the portfolio construction process. The findings also indicate significant trade-offs between risk and returns across behavioral classifications, which implies that important weightings come to play in portfolio performance through investor sentiment and decision attitudes. Through a combination of optimization methods, behavioral modeling, and statistical inference, the study proves that hybrid decision frameworks are able to improve the quality of decision-making in complex and uncertain environments. In general, the study has implications for interdisciplinary decision science because it demonstrates that behaviorally informed optimization enhances the performance and risk management of portfolio. The results confirm the application of combined decision model in investment planning of service industries and market economies.

EM5047

A Reproducible Human-AI Collaborative Workflow for Quality Assurance in Domain-Specific Translation: A Case Study of "Luban Workshop/EPIP" Discourse

Yunrong Zheng
Tianjin University of Technology and Education, China

Abstract-LLMs have significantly advanced general machine translation, yet they perform inadequately in domain-specific translation, especially when the source text contains cultural specific items. This study proposes a reproducible human-in-the-loop collaborative workflow to systematically diagnose and correct translation errors in specialized domains. We used the "Luban Workshop/EPIP" corpus as a case study and built a gold-standard dataset of 540 sentence pairs and 76 key terms, including standard forms and variants. To address the limitations of general evaluation metrics, we designed a multi-dimensional evaluation pipeline, integrating SacreBLEU, BERTScore, and a LaBSE-based TAM to diagnose the errors in AI-generated translations (GPT-5.1, Kimi 2.5, Qwen 3), which were then refined in two steps: terminology forcing and context-aware post-editing. The same metrics were used to compare the original and revised translations. Experimental results indicate that this workflow increased the average TAF1 score by 9.6% while maintaining the stability of SacreBLEU and BERTScore. Furthermore, human evaluation revealed a moderate but highly significant correlation between the TAF1 metric and expert judgments on terminological consistency ($r = 0.397$, $p < 0.001$). This workflow provides a practical, auditable, and effective solution for quality assurance in domain-specific translation tasks.

EM0138

A Computational Decision-Support Optimization Framework for Capital Allocation Under Uncertainty Using Mean–Variance and Regret–Safety Modeling

Ma. Kathleen L. Duran[1,2] and Michael Nayat Young[1]
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2. National University, Philippines

Abstract-This study proposes a computational decision-support optimization framework for capital allocation under uncertainty using a hybrid Mean–Variance (MV) and Regret–Safety (RS) model. The framework integrates engineering-based multi-objective optimization, probability-distorted scenario generation, and behaviorally parameterized risk constraints to support decisions for moderately risk-averse investors in volatile environments. Using daily data from 30 Philippine Stock Exchange (PSE) blue-chip equities (2020–2022), the system models market uncertainty through simulation and optimizes asset weights using Gurobi. The MV component minimizes

portfolio variance for target returns, while the RS component maximizes reliability and safety probability under cumulative prospect theory weighting. Backtesting shows that the MV-0.10 configuration achieved the highest computational efficiency (11.12% cumulative return; 3.96% volatility), whereas RS-0.40 produced the most robust and stable performance trajectory with enhanced regret-resilient allocation. The results highlight that integrating behavioral parameters into optimization enhances decision resilience, reduces performance degradation under uncertainty, and improves human-centered decision quality. The proposed hybrid framework extends industrial engineering approaches in risk modeling, optimization, and decision support for sustainable financial systems in emerging markets.

NOTES