



IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)

IEEM2022

KUALA LUMPUR, MALAYSIA
07 - 10 December 2022

www.ieem.org

Organizers & Supporting Organizations

Organizers



IEEE TEMS Hong Kong Chapter
IEEE TEMS Malaysia Chapter
IEEE TEMS Singapore Chapter

Supporting Organizations



Partner



IEEE Catalog Number: CFP22IEI-ART
ISBN: 978-1-6654-8687-3

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For reprint or republication permission, email to IEEE Copyrights Manager at pubs-permissions@ieee.org. All rights reserved. Copyright ©2022 by IEEE.

Organisers and Committees

Organizing Chairs

Kah Hin CHAI,
National University of Singapore

Seung Ki MOON,
Nanyang Technological University

Pei-Lee TEH,
Monash University Malaysia

Program Chairs

Roger JIAO,
Georgia Institute of Technology

Min XIE,
City University of Hong Kong

Members

Nan CHEN,
National University of Singapore

Songlin CHEN,
Nanyang Technological University

Edwin CHEUNG,
*Hong Kong Institute of Vocational
Education (Tuen Mun)*

Walter FUNG,
City University of Hong Kong

Andrei O. J. KWOK,
Monash University Malaysia

Carman Ka Man LEE,
*The Hong Kong Polytechnic
University*

Ewilly Jie Ying LIEW,
Monash University Malaysia

Szu Hui NG,
National University of Singapore

**Annapoornima M.
SUBRAMANIAN,**
National University of Singapore

Program Committee

Michel ALDANONDO,
University of Toulouse

Luciana ALENCAR,
*Universidade Federal de
Pernambuco*

Meshach Ileanwa ALFA,
University of Jos

Philipp BAUMANN,
University of Bern

Zhiqiang CAI,
*Northwestern Polytechnical
University*

Ayon CHAKRABORTY,
Federation University

Long-Sheng CHEN,
Chaoyang University of Technology

Mu-Chen CHEN,
*National Yang Ming Chiao Tung
University*

Zhi Lin CHONG,
Universiti Tunku Abdul Rahman

Mohammed DAHANE,
Université de Lorraine

Ahmed El-BOURI,
Sultan Qaboos University

Akram EI-TANNIR,
Lebanese American University

Jakub GAJEWSKI,
Lublin University of Technology

Siana HALIM,
Petra Christian University

Janne HARKONEN,
University of Oulu

Markus HARTONO,
University of Surabaya

Adnan HASSAN,
*Universiti Teknologi Malaysia
(Adjunct)*

Yu-Hsiang HSIAO,
National Taipei University

Qingpei HU,
Chinese Academy of Sciences

Jiage HUO,
Hong Kong Science Park

Supachart IAMRATANAKUL,
*King Mongkut's Univ of
Technology Thonburi*

Tatsuya INABA,
Kanagawa Institute of Technology

Ville ISOHERRANEN,
*Oulu University of Applied
Sciences*

Shino IWAMI,
NEC Corporation

Raja JAYARAMAN,
Khalifa University

Rathimala KANNAN,
Multimedia University

Sharfuddin Ahmed KHAN,
University of Regina

Hadi KHORSHIDI,
The University of Melbourne

Gitae KIM,
Hanbat National University

Vikas KUMAR,
University of the West of England

Yong-Hong KUO,
The University of Hong Kong

Ming Foong LEE,
*Universiti Tun Hussein Onn
Malaysia*

Gwo-Liang LIAO,
National Taitung University

S.C. Johnson LIM,
*Universiti Tun Hussein Onn
Malaysia*

Shieu-Hong LIN,
Biola University

Tyrone T. LIN,
National Dong Hua University

Weidong LIN,
Singapore Institute of Technology

Hongrui LIU,
San Jose State University

Bin LIU,
University of Strathclyde

Jing Hong LOW,
Multimedia University

Shuang MA,
*University of Science & Technology
Beijing*

Ippei MACHIDA,
MEIJI University

Harekrishna MISRA,
*Institute of Rural Management
Anand*

Indrajit MUKHERJEE,
IIT Bombay

Saravanan MUTHAIYAH,
Multimedia University

Nabil NAHAS,
Université de Moncton

Kam K.H. NG,
*The Hong Kong Polytechnic
University*

Dinh Son NGUYEN,
The University of Danang

Edoghogho OGBEIFUN,
University of Johannesburg

Sanjay Kumar PALEI,
*Indian Institute of Technology
(BHU)*

Alan PILKINGTON,
University of Westminster

Fernando ROMERO,
University of Minho

Mojahid SAEED OSMAN,
American University of Sharjah

**Premaratne
SAMARANAYAKE,**
Western Sydney University

**Karthik
SANKARANARAYANAN,**
Ontario Tech University

Kiyoshi SAWADA,
*University of Marketing and
Distribution Sciences*

Ronnachai SIROVETNUKUL,
Mahidol University

Rawinkhan SRINON,
Mahidol University

Aries SUSANTY,
University of Diponegoro

Quang Minh TA,
Nanyang Technological University

Yoshinobu TAMURA,
Yamaguchi University

Monika TANWAR,
IIT Jodhpur

Ai Chin THOO,
Universiti Teknologi Malaysia

Anders THORSTENSON,
Aarhus University

Norbert TRAUTMANN,
University of Bern

David VALIS,
University of Defence in Brno

Iwan VANANY,
*Institut Teknologi Sepuluh
Nopember*

Elise VAREILLES,
ISAE SUPAERO

Ehsan VAZIRI GOUDARZI,
*Islamic Azad University, South
Tehran Branch*

Junfeng WANG,
*Huazhong University of Science
and Technology*

Yue WANG,
*The Hang Seng University of Hong
Kong*

Gangyan XU,
*The Hong Kong Polytechnic
University*

Haiyan XU,
*Institute of High Performance
Computing*

Om Prakash YADAV,
*North Carolina A&T State
University*

Keng-Chieh YANG,
*National Kaohsiung University of
Science and Technology*

Michael YOUNG,
Mapua University

Anies Faziehan ZAKARIA,
Universiti Kebangsaan Malaysia

Linda ZHANG,
*IESEG School of Management
(LEM-CNRS 9221)*

Yaoming ZHOU,
Shanghai Jiao Tong University

Table of Contents

Human Factors 4

Analysis of Non-fatal Occupational Accidents in a Ready-mixed Concrete Company <i>Yogi Tri PRASETYO, Maria Cristina SARIO, Thanatorn CHUENYINDEE, Reny NADLIFATIN, Satria Fadil PERSADA, Thaninrat SITTIWATETHANASIRI</i>	1
Color Preferences Captured by Children in Space through Virtual Reality Simulation. An Analysis in the Pediatric Chemotherapy Room <i>Asri DINAPRADIPTRA, Anggra AYU RUCITRA, Purwanita SETIJANTI</i>	6
Cultural Transformation of Industries Through Creation of New Collaboration Concepts Driven by Employee Engagement <i>Milan MARINKOVIC, Mario MÜNNICH, Jens SCHLÜTER</i>	11
Laboratory Errors and Their Effects on Quality Management <i>Sambil Charles MUKWAKUNGU, Nita SUKDEO, Alice Kabamba LUMBWE, Mudimeli FARISANI</i>	17

Engineering Education and Training

Board Game as Financial Literacy Education Media for Indonesian High School Students <i>Rabendra Yudistira ALAMIN, Ellya ZULAIKHA, I Ketut GUNARTA</i>	22
Malaysian Working Women’s Mental Health in the SME Sector <i>Nor Farhanis ZAIDI, Ming Foong LEE</i>	27
Evaluation of Student Learning Success When Using Augmented Reality Experiences in Engineering Education <i>Carsten STECHERT, Mohamed Habib YENGUI, Hans-Patrick BALZERKIEWITZ</i>	32
Microlearning in Human-centric Production Systems <i>Elisa ROTH, Mirco MOENCKS, Arne FREIGANG, Gunter BEITINGER, Thomas BOHNÉ</i>	37
Preference Forecasting Proposal for Career Development Service Design From Engineering Educators’ Perspective <i>Ummu Sakinah SUBRI, Anies Faziehan ZAKARIA, Mohamad Fariz MOHAMED NASIR, Mohd Syafiq Syazwan MUSTAFA</i>	42
Improvement of Inspection Training Tools and Validation of the Accuracy of Machine Learning Discriminant Models Using the Results <i>Harumi HARAGUCHI, Shingo KUBOTA, Riku AKAISHI, Masatsuki SUGITANI</i>	47

Human Factors 1

Towards Self-adaptive/Reflective Co-managed Open Generativity to Augment Absorptive-multiplicative-relational Capabilities/Capacities <i>Chien-Sing LEE, K. Daniel WONG</i>	52
Human Resources Strategies in High-tech Startups during the Seed Phase: The Relationship between Recruitment, Career, and Tolerance of Uncertainty <i>Yushi NAKAYA, Shuichi ISHIDA</i>	57

Integration of Text Mining, Railqual, Kano Model, and Kansei Engineering for Train Service Excellence <i>Markus HARTONO, Dina Natalia PRAYOGO, Gusti Anandia SAYLENDRA</i>	62
Searching for the Gaps in Mental Workload Assessment of Assistive Technologies <i>Andreas DÖRNER, Marek BURES, Gerald PIRKL</i>	67
Investigating the User Experience and Identifying User Needs for Kitchen Appliances Using Thematic Analysis <i>May Jorella LAZARO, Joong Hee LEE, Gyungbhin KIM, EunJeong YANG, Myung Hwan YUN, Woochul JUNG</i>	71
The Mediating Role of Organizational Culture in Managing the Relationship Between Quality and Innovation: A Conceptual Model Proposal <i>Andre M. CARVALHO, Paulo SAMPAIO, Raíssa HERINGER</i>	76
 Information Processing and Engineering	
Building a Natural Language Processing Model to Extract Order Information from Customer Orders for Interpretative Order Management <i>Mingyan Simon LIN, Chi XU, Clara Ga Yi TANG, Xing Jing KOM, Jia Yi EYU</i>	81
Development of a New Type of Carousel-based Compacted Work System for Mixed-model Assembly in Mechanical Engineering <i>Sven HINRICHTSEN, Alexander NIKOLENKO, Nils BECKMANN, Frederic MEYER</i>	87
Application of Identity Resolution System under Industrial Internet: Taking Cold Chain Traceability as an Example <i>Ruirui WANG, Xinguo MING, Ziding MENG, Yuguang BAO</i>	91
Adaptive Genetic Algorithm Based S-box Design for Artificial Neural Network <i>Runtao REN, Ban YANG, Raymond Y. K. LAU</i>	96
Part Recognition in Additive Production Systems using a Computer-vision Approach <i>Jan Marvin SCHÄFER, Günther SCHUH, Gerret LUKAS, Steffen HOHENSTEIN, Lukas DRESCHER</i>	101
 Human Factors 2	
Effects of Different Interface Color Modes and Textbox Design on Users' Reading Efficiency and Accuracy <i>Xiaozhou FANG, Danni CHANG, Zhen ZHANG</i>	107
User-perception-oriented Website Design Optimization for University Portals: Using Kansei Engineering and Neural Networks <i>Jia-He ZHOU, Yuming ZHU, Hao-Jing SONG</i>	112
Voice of the Workforce: Integrating the Workforce's Perspective on Operator Assistance Systems into Human-centric Production <i>Jessica HORN, Elisa ROTH, Mirco MOENCKS, Thomas BOHNÉ</i>	117
Factors in Credit Decision-making and Related Research Gaps in Indonesia: A Literature Review <i>Dewi SARI PINANDITA, Hilya ARINI, Budi HARTONO, Budhi WIBOWO</i>	122
Sociotechnical System Digital Twin as an Organizational-enhancer Applied to Helicopter Engines Maintenance <i>Eric VILLENEUVE, Quentin LORENTE, Guy André BOY, François THERMY, Christophe MERLO</i>	127

Poster Session

Bitcoin Data Analysis Using Deep Learning and Statistical Modeling <i>Joel LIU, Zijiang YANG, Younes BENSLIMANE</i>	132
Applying Three Deep Learning Techniques to Predicting Stock Price <i>Keng-Chieh YANG, Chieh-Yow CHIANGLIN, Chia Chun KAO</i>	137
Identification of Factors Affecting the Application of Additive Manufacturing Technology in Mass Customization Based on Structural Equation Model <i>Danping LIN, Yuting ZHANG, Ben JIANG</i>	142
Research on the Joint Strategy of Advance Selling and Resalable Return for Upgrading Products <i>Xiaowen SUN, Qing XIA</i>	147
Research on Lean Logistics Performance Evaluation Index System of Tobacco Commercial Enterprises in the Context of National Unified Market <i>Jiangtao XIA, Yong ZHAO, Caihong LIU</i>	152
Prediction of Returns of Taiwan 50 Index Constituents Using Random Forest Algorithm <i>Keng-Chieh YANG, Wen-Ping CHAO, Yu-Min HONG, Chyan YANG</i>	157
The Impact of E-commerce Delivery Alternatives on Urban Freight Movements and Cost: A Carrier Perspective <i>Wilna BEAN, Elizna CILLIERS</i>	162
Challenges of Digital Twin Application in Manufacturing <i>Marc FETTE, Jens Peter WULFSBERG, Christian KOBER</i>	167
Reform and Innovation of Undergraduate Graduation Project (Thesis) Based on AHP Fuzzy Grey Comprehensive Method <i>Meijuan GAO, Xiaoxiao XIE, Maosen FU</i>	174
RF MEMS Resonance Sensor for Measuring Microplastics Concentration <i>JinHyoungh KIM, Cheolung CHA, KwonHong LEE, Yongtaek HONG</i>	179
An ERP-based Icon Contour Similarity Perception Research <i>Yixuan ZHOU, Haiyan WANG, Lulu GAN, Jinchun WU, Chengqi XUE</i>	182
Study on Simulation and Fatigue Assessment Method for Shipbuilding Manual Operation in Narrow Space <i>Junqi CAI, Xiumin FAN, Xu YANG, Qichang HE</i>	187
Optimization of Fighter Head-up Display Layout Based on Fitness Function <i>Jiaxin HE, Yafeng NIU, Xiaoyue TIAN, Wenjun YANG</i>	194
Factors Affecting Perceived Decision Making Among Filipinos in National Elections: An Integration of Theory of Planned Behavior and Behavioral Decision Theory <i>Betsy Dhanna RAMOS, Yoshiki KURATA, Xiarlene Joyce CAÑARES, Lady Lalaine ESTIPULAR, Tisha May PROTACIO, Joehanna NGO</i>	199
Text Mining for Exploring UX Issues of Qualitative Think Aloud Data on EV Sound <i>Cai WANG, Myung Hwan YUN, Soo Yeon KIM, Minsik CHOI, Yein SONG, Sungho KIM, Donghoon SEU</i>	205
Short-term Prediction of Outbound Container Arrival Quantity Based on KNN with Deep Learning in Container Terminals	209

<i>Wuyin WANG, Wei QIN, Shitong SHEN</i>	
Prioritizing Customer Requirements for Science and Technology Service Platform Based on Improved TF-IDF and Sentiment Analysis <i>Yushan XU, Wenyan SONG, Chu ZHANG</i>	215
Sorting System for Ship Outfitting Pipes Based on Enhanced Object Detection <i>Kunbo LI, Xu YANG, Xiumin FAN</i>	220
A Multi-stage 6D Object Pose Estimation Method of Texture-less Objects Based on Sparse Line Features <i>Hongwei ZHANG, Hengling CAO, Kunbo LI, Xiumin FAN, Xu YANG</i>	226
Research on BOM Prediction for Cutterhead System of TBM based on Quality Function Deployment <i>Jian SHI, Yaoguang HU, Wuhong WANG, Yongchao ZHU, Tao ZHOU, Yue PAN</i>	231
An Integrated Digital Twin Simulation and Scheduling System under Cyber-physical Digital Twin Environment <i>Weidong LIN</i>	236
User-based Battery Swapping Strategy in an Electric Bike-sharing System <i>Yaoming ZHOU, Wei QIN, Hang YANG</i>	241
A Dynamic Maintenance Task Scheduling Method Considering Maintenance Mode <i>Danping LIN, Shu CHEN, Leilei WEI</i>	246
Reinforcement Learning-based Job Shop Scheduling for Remanufacturing Production <i>Yaqiong LV, Yue BAI</i>	251
Energy-conscious Single-machine Scheduling Problem with Release Dates under Time-of-use Electricity Tariffs <i>Peng WU, Yun WANG, Junheng CHENG, Nan LI</i>	257
Applying Refined Kano Model to Classify and Rank Customer Requirements, Case Study: Automotive Industry in Portugal <i>Ahmad HARIRI, Jose Pedro TEIXEIRA DOMINGUES, Paulo SAMPAIO</i>	262
Identification of Factors Affecting the Adoption of Home Intelligent Robots <i>Danping LIN, Shuang WU, Lingchao ZHU</i>	270
Research on the Product Design of Wood Identification based on Electronic Nose <i>Chenhao LI, Jinchun WU, Chengqi XUE</i>	275
Heuristic Decision for Static and Dynamic Service Facility Location in Agricultural Maintenance Service Network <i>Weibo REN, Yaoguang HU</i>	280
Traceable and Privacy-preserving Blockchain System Architecture for Remanufacturing Reverse Supply Chain <i>Tiegang GAO, Qiaolun GU</i>	285
Supply Chain Quality Management and Industry 5.0 - A Literature Review and Analysis <i>Joana LAZZARIS, Andre M. CARVALHO, Maria do Sameiro CARVALHO</i>	290
Effective Analysis and Investigation in COVID-19 Prevention Policies Based on Population Dynamics Modeling and Simulation <i>Mulang SONG, Xuejian GONG, Jianxin (Roger) JIAO, Yiyun (Cindy) FEI, Jianyuan PENG</i>	295

Multistage Configuration Systems Used to Streamline the Construction Value Chain <i>Irene CAMPO-GAY, Lars HVAM, Anders HAUG</i>	300
Mapping the Literature on Ecosystem Coopetition: A Bibliometric Analysis from 1993-2021 <i>Xiao SUN, Suli ZHENG, Luqi YANG</i>	305
A Research Framework of the Influencing Factors of Overseas Patent Application <i>Xiaohan ZHANG, Suli ZHENG, Xiaoran CHANG</i>	310
Political Connection, Technological Innovation Capability and Business Performance of Latecomer Firms in Emerging Economy <i>Xiaoya YANG, Tianwei HUANG, Yufei LIU, Haibing LIU</i>	315
 Human Factors 3	
How Being Healthy Helps to Get More: Evidence of Large-scale Start-ups <i>Arowofela GBEMISOLA, Mait RUNGI</i>	320
The Virtual Sensei: Using Assisted Reality to Digitalize Gemba Walks <i>Daryl POWELL</i>	325
Work Demand and Prevalence of Work-related Musculoskeletal Disorders: A Case Study of Pakistan Aviation Maintenance Workers <i>Muzamil MAHMOOD, Afshan NASEEM, Yasir AHMAD, Muhammad Zeeshan MIRZA</i>	329
Municipal Accessibility: A Multi-linear Regression Model with a Principal Component Analysis Approach <i>Christine GROßE, Leif OLSSON, Andreas NORIN</i>	334
Artificial Neural Network (ANN) for Performance Assessment in Virtual Reality (VR) Simulators: From Surgical to Maritime Training <i>Salman NAZIR, Steven MALLAM, Ziaul Haque MUNIM, Hasan Mahbub TUSHER</i>	339
Augmented Workforce: A Case Study on integrating Operator Assistance Systems for Repair Jobs into Human-centric Production <i>Mirco MOENCKS, Elisa ROTH, Thomas BOHNÉ, Arne FREIGANG, Gunter BEITINGER</i>	344
 Reliability and Maintenance Engineering 3	
Scalable and Data-driven Decision Support in the Maintenance, Repair, and Overhaul Process <i>Houkun ZHU, Helena EBEL, Dominik SCHEINERT, Florian SCHMIDT, Jens ALTENKIRCH, Odej KAO</i>	349
Performance Evaluation of Overhead Track Equipment and Prediction of Future Performance <i>Bheki MAKHANYA, Jan Harm PRETORIUS, Khimane MOTUPA, Hannelie NEL</i>	354
Maintenance 4.0 for Water Pumping Infrastructures <i>Bupe MWANZA, Siphon TLABU, Arnesh TELUKDARIE</i>	359
Selection of Maintenance Strategies using DMG <i>Bupe MWANZA, Arehone NEDZANANI, Arnesh TELUKDARIE</i>	364
Development of Integrated Stormwater Asset Management Framework <i>Bupe MWANZA, Tlou DINYAKE, Arnesh TELUKDARIE</i>	369

On the Enhanced Surveillance Methods for High-quality Processes 374
Tahir MAHMOOD

Prognostics for Small Bore Piping Undergoing Fatigue Degradation 379
Arvind KEPRATE, Nikhil BAGALKOT

Big Data and Analytics 1

Relating the Use of Different Type of HR Analytics in Different Strategic Firms with the Use of Social Media within the Organization 384
R.R.K. SHARMA, Sonal GUPTA

A Systematic Assessment of Genetic Algorithm (GA) in Optimizing Machine Learning Model: A Case Study from Building Science 389
Abdulrahim ALI, Raja JAYARAMAN, Andrei SLEPTCHENKO, Elie AZAR

Improving a Recommendation Engine for Traditional Trade Between Wholesalers and Retailers Using Association Rules 395
Krisda CHUGH, Nantachai KANTANANTHA

Engineering Economy and Cost Analysis

Operational Energy Optimizing in Office Buildings: A Simulation-Based Green Design Approach 400
Chandana Hemantha THEBUWENA, R.M. Chandima RATNAYAKE

Energy Storage Potential Model for Residential Photovoltaic Systems 407
Hongrui LIU, Vicente RIOS, Yupeng WEI

Technical and Economic Analysis of Solar Energy Powered Lighting System in a Smart Building at Tropical Region 412
S.C. Johnson LIM, Ming Foong LEE, Boon Tuan TEE, Peng Wah SIEW

Portfolio Selection Using Mean-variance Model for Financial Technology Sector in the Australian Market Before and During COVID-19 417
Rogel Angelo REBUALOS, Michael YOUNG, Yogi Tri PRASETYO, Reny NADLIFATIN

On the Necessity for Improving Effectiveness of Qualification Process for Spare Parts Additive Manufacturing in a Circular Economy Supply Chain 422
R.M. Chandima RATNAYAKE

Big Data and Analytics 2

Sentiment Analysis Model for KlikIndomaret Android App During Pandemic Using Vader and Transformers NLTK Library 428
Akhmad Ghiffary BUDIANTO, Budisantoso WIRJODIRDJO, Iffan MAFLAHAH, Diva KURNIANINGTYAS

Using Distance Measures and Cluster Algorithms for Production Logistics-oriented Evaluation of Products and Product Portfolios 433
Tim KÄMPFER, Sven A. KLAßEN, Peter NYHUIS

Data-based Approach for Reducing Process Complexity in Parts Manufacturing 439
Marius KRUG, Günther SCHUH, Andreas GÜTZLAFF, Jan MAETSCHKE, Julius BREITUNG

Semantic Analysis Using GloVe for Onomatopoeia in Cosmetics Review <i>Misaki MURATA, Syohei ISHIZU, Takashi ITO</i>	444
Process Model for the Data-driven Identification of Machine Function Usage for the Reduction of Machine Variants <i>Artur KRAUSE, Nikola BURSAC, Sebastian HUENEMEYER, Albert ALBERS, Simon RAPP, Steffen WAGENMANN</i>	449
Side-view Dimensional Profiling of Drive-through Vehicle and Features Extraction by Using LiDAR and Camera <i>Kin Lok KEUNG, Shek-Ping LI, H. Y. NG, Yuk Ting Hester CHOW, Yongshi LIANG, Y. Y. CHAN</i>	457

Reliability and Maintenance Engineering 1

Risk-Based Inspection and Maintenance Analysis of Distribution Transformers: Development of a Risk Matrix and Fuzzy Logic Based Analysis Approach <i>A. M. Sakura R. H. ATTANAYAKE, R.M. Chandima RATNAYAKE</i>	462
Cyclic Jump Diffusion Process Modeling Based on Different Effort Consumption Scenarios for OSS Multi Up-gradation <i>Yoshinobu TAMURA, Adarsh ANAND, Pramod Kumar KAPUR, Shigeru YAMADA</i>	468
On the Necessity of Using Supervised Machine Learning for Risk-based Screening of Distribution Transformers: An Industrial Case Study <i>A. M. Sakura R. H. ATTANAYAKE, R.M. Chandima RATNAYAKE</i>	473
Maintenance in Process Industries with Digital Twins and Mixed Reality: Potentials, Scenarios and Requirements <i>Linda RUDOLPH, Dorothea PANTFÖRDER, Fabrizio PALMAS, Manfred FISCHER, Peter NIERMANN, Gudrun KLINKER, Birgit VOGEL-HEUSER</i>	479
Residual Based Control Charts for Zero-inflated Poisson Processes <i>Tahir MAHMOOD, Abdulla Mosa AL-SAYED, Haitham H. SALEH</i>	487
Degradation Assessment of Drilling Head based on Stochastic Growth Models and Continuous Time Diffusion Processes <i>David VALIS, Jakub GAJEWSKI, Marie FORBELSKÁ, Jozef JONAK</i>	492

Reliability and Maintenance Engineering 2

Prediction of Gear Bending Fatigue Life Based on Grey GM (1,1) Prediction <i>Zhiqiang CAI, Shengwen HOU, Yinze YAN, Zhengjie TIAN</i>	497
Specific Fuel Consumption Prediction Model for Diesel Engines: A Preliminary Study <i>Tina Winayu Dwi HAPSARI, Wangi Pandan SARI, Bertha Maya SOPHA, Yun Prihantina MULYANI, Almas APRILANA, Hamdan Hartono ALIF</i>	502

Operations Research 4

FT-KMEANS: A Fast Algorithm For Fault-Tolerant Facility Location <i>Philipp BAUMANN</i>	507
Academic Timetabling for Online Executive Programs with Existing Schedules, Faculty Preferences and Partial Precedence	512

Nageswara Reddy KONDREDDY, Anand Jacob ABRAHAM

An Efficient Route Evaluation Method for the Vehicle Routing Problem with Linear Constraints 516
Hideki HASHIMOTO, Yannan HU, Yuta OKAMOTO

Operators Health and Safety Consideration in Sustainable Multi-objective Process and Production Planning for Reconfigurable Manufacturing System (RMS) 521
Imen KHETTABI, Lyes BENYOUCEF, Bakélé ASSOU

Operations Research 5

Mean-variance and Safety-first Portfolio Selection Utilizing Historical Returns of Forbes Asia's Fab50 Companies 526
Gerlyn ALTES, Michael YOUNG, Yogi Tri PRASETYO, Reny NADLIFATIN

Extension of the PROMETHEE Method to the Multicriteria Dual Clustering Problem 531
Yves DE SMET

Decision Support System for Selecting Robot Systems for Pick-and-place Operation of Robot Manipulator 535
Yushi OYAMA, Tatsushi NISHI, Ziang LIU, Md Moktadir ALAM, Tomofumi FUJIWARA

Barriers to The Transition from Supply Chain 4.0 (SC4.0) To Supply Chain 5.0 (SC5.0) 540
Jay Jayantkumar JOSHI, Sharfuddin KHAN, Arshil AHMAD, Hisham Fazal SYED

Analysis of Mean – Variance Theory and Safety-first Model for Portfolio Selection on Non-fungible Tokens (NFTs) and Collectibles 546
Justine Kyle CHAN, Michael YOUNG, Yogi Tri PRASETYO, Reny NADLIFATIN

Operations Research 1

Cabinet Location Optimization for E-bike Battery Swapping Systems 551
Yaoming ZHOU, Ziqi LI, Gangyan XU

A Vehicle Routing Problem in Plastic Waste Management Considering the Collection Point Location Decisions 556
Madeline TEE, Dennis CRUZ

Railway Rolling Stock Assignment for Passenger Trains 561
Amr B. ELTAWIL, Islam ALI, Alyaa M. YOUNES

A Heuristic Approach for the Robust Traveling Salesman Problem 566
Kazuki HASEGAWA, Wei WU

Optimization Models for Routing and Frequency Assignment in Wireless Mesh Networks 571
Tonguc UNLUYURT, Gulden Busra KARKILI

Pickup and Multi-delivery Problem with Time Windows 576
Aldy GUNAWAN, Pham TUAN ANH, Vincent F. YU, Chau TUAN CUONG

Operations Research 6

Edge Encoded Attention Mechanism to Solve Capacitated Vehicle Routing Problem with Reinforcement Learning 581

Getu FELLEK, Ahmed FARID, Goytom GEBREYESUS, Shigeru FUJIMURA, Osamu YOSHIE

On Defining Industrial Agility as a Strategic Capability for Competitive Performance of Engineering Assets: An Industrial Eco-systems Perspective 588
Lucas Peter Hoej BRASEN, Jayantha P. LIYANAGE

Applying a Capacitated Heterogeneous Fleet Vehicle Routing Problem with Multiple Depots Model to Optimize a Retail Chain Distribution Network 593
Amila THIBBOTUWAWA, W. Madushan FERNANDO, H. Niles PERERA, R.M. Chandima RATNAYAKE

Layout Redesign of a Shipbuilding and Repair Plant 598
Kuan Yew WONG, Hooi Siang KANG, Jing Shun LEOW, Jing Shuo LEOW

Operations Research 2

A Deep Reinforcement Learning Approach for Crowdshipping Vehicle Routing Problem 603
Chun-Cheng LIN, Hong HUANG, Yu-Sheng LIN, Jia-Rong KANG

Solving a Bus Routing Problem Arising in Doha 605
Mohamed KHARBECHÉ, Anas TAMMAM ALJUNDI, Maryam AL-KHATIB, Mohamed HAOUARI

Insight and Transfer of Learning Measurement on Discrete Event Simulation (DES) User Using Usability Method and Eye-Tracking 610
Siti Aghnia Salsabilla PURNAMA, Hilya ARINI, Titis WJAYANTO

Economic Production Quantity Model with Energy Consideration 615
Hong Nguyen NGUYEN, Matthieu GODICHAUD, Lionel AMODEO

Comparative Study of Multi-hole Drill Path Optimization using Evolutionary Algorithms 620
Om Prakash YADAV, Vijay RATHOD, Ajay Pal Singh RATHORE

Exploring Quantitatively Corporate Financial Performance and Social Performance Relationship with Net Impact Method 625
Saku MÄKINEN, Jorma TURUNEN, Deborah KUPERSTEIN-BLASCO

Operations Research 3

Customer Load Profile Clustering Using K-means Algorithm: A Case Study in an Electric Distribution Company in the Philippines Amidst the COVID-19 Pandemic 630
Maricar NAVARRO, Michael YOUNG, Yogi Tri PRASETYO, Reny NADLIFATIN

Exact Algorithms for Two-Machine Job-Shop Scheduling Problem with One Joint Job Considering Machine Repetition and Transportation Times 635
Hiroki NUMAGUCHI, Wei WU, Yannan HU

A New Deep Reinforcement Learning Algorithm for the Online Stochastic Profitable Tour Problem 640
Nicklas KLEIN, Jonas PRÜNTE

An Optimization Model for Priority-Based On-Demand Meal Delivery System 645
Siddhartha PAUL, Goda DORESWAMY

Analysis of Hotel Attributes and Service Opportunities in Indonesia on Covid-19 Pandemic Era through Online Reviews 650
Yun Prihantina MULYANI, Vira Laksita DEWI

Systems Modeling and Simulation 2

- The Role of Collaboration for a Circular Business Model in Indonesian Household Waste Management 655
Noorhan Firdaus PAMBUDI, Togar Mangihut SIMATUPANG, Samindi SAMARAKOON, Nur Budi MULYONO
- A Shortest Path Graph Attention Network and Non-traditional Multi-deep Layouts in Robotic Mobile Fulfillment System 660
Kin Lok KEUNG, Liqiao XIA, Carman Ka Man LEE, C. Y. LEUNG
- Ontology-based Synchronization of Automated Production Systems and Their Simulation Models 665
Mayank SINGH, Kilian VERNICKEL, Marco KONERSMANN, Jan JÜRJENS
- Stackelberg Game-theoretic Approach for Lead Time Hedging in Inland Transport 670
Xuhan ZHAO, Xuan QIU
- Combined Wind and Wave Energy System: A Review of Current Technology and State-of-the-art Simulation Tools 675
Chern Fong LEE, Muk Chen ONG
- Processing Cost Reduction of Lemon Products in Community Enterprises using Flexsim Simulation 680
Choat INTAWONGSE, Darunee WATNAKORNBUCHA, Wachira WICHITPHONGSA, Noppadol AMDEE, Alongkorn MUANGWAI
- Development of a Business Process Modelling Framework for Continuous Improvements in Organisations 685
Ilesanmi DANIYAN, Tshgefotjo Paul TSIRI, Khumbulani MPOFU

Systems Modeling and Simulation 3

- Simulation for Modeling and Analysis of Burn Center 691
Akshay Vilas UPASANY, Anurendra SINGH, Jayendran VENKATESWARAN, Gopika VINOD, Gurkirat WADHWA
- Epidemiological Model of COVID-19 based on Evolutionary Game Theory: Considering the Viral Mutations 696
Yu NISHIHATA, Ziang LIU, Tatsushi NISHI
- Stability Analysis of Emission-based Production and Inventory Control Systems (EPICS) 701
Rishav DEVAL, Jayendran VENKATESWARAN
- Energy Losses Analysis for Electrical Grid Systems 706
Indra GUNAWAN, Ashraf ZAGHWAN

Production Planning and Control 1

- Implementing Distribution Requirement Planning and Scheduling System for Lens Manufacturing Company 711
Wei Qing LEE, Tay Jin CHUA, Ravi Kumar KATRU, Tian Xiang CAI
- Batch Scheduling and Robust Batch Scheduling to Minimize Maximum Lateness 716
Keigo MIYAGAWA, Wei WU, Kazuki HASEGAWA, Liang TANG
- Effect of Lean Manufacturing Implementation: A South African Printing Industry Perspective 721
Nita SUKDEO, Kem RAMDASS, Kgabo MOKGOHLOA

Systemising Data-driven Methods for Predicting Throughput Time within Production Planning & Control 726
Tobias HILLER, Peter NYHUIS, Lukas DEIPENWISCH

Healthcare Systems and Management

Smart Wristwatch and Apps for Healthy People with Congenital Diseases and a Healthy Lifestyle 732
Geraldo RAFAEL, Caroline DE CANDRA, Ariawan GUNADI, Teuku Yuri M. ZAGLOEL, Maslin MASROM, Lina GOZALI

Healthcare Facility Location Selection: A Bibliometric Analysis and Scoping Review 737
Rentia FOURIE, Sara GROBBELAAR

A Rolling-based Multippeak Learning Model for COVID-19 Pandemic Predicting 742
Dian CHEN, Liping ZHOU

Criteria Determination of Lean and Green Practices Towards Sustainability for Secondary Hospitals in Thailand 747
Jaruda NGAMWITITWONG, Ronnachai SIROVETNUKUL

A Scoping Review and Critical Analysis of the Literature Surrounding a Systems-thinking Approach to Realist Evaluation, in the Context of Monitoring and Evaluation 752
Olivia HITCHCOCK, Sara GROBBELAAR, Euodia VERMEULEN

Optimization of Healthcare Problem using Swarm Intelligence: A Review 757
Diva KURNIANINGTYAS, Agus Wahyu WIDODO, Wayan Firdaus MAHMUDY

Production Planning and Control 2

Towards a Framework to Assess the Impact of Industry 4.0 Technologies & Services on Production Resources 762
A. S. M. Monjurul HASAN, Andrea TRIANNI

Impact of Customer Order Change Dimensions on Order Management 767
Christian FRIES, Thomas BAUERNHANSL, Ádám SZALLER, Günther SCHUH

Exploring the Basic Features and Challenges of Traditional Product Lifecycle Management Systems 772
Mubashir HAYAT, Herwig WINKLER

Dispatching Rules in a Job Shop: The Case of Dynamic Scheduling under Time-of-use Electricity Costs 777
Ahmed EL-BOURI, Amar OUKIL

Framework for the Selection of Sustainable Suppliers using Integrated Compensatory Fuzzy AHP-TOPSIS Multi-criteria Approach 782
Amit Kumar GUPTA

Systems Modeling and Simulation 1

Agent-based Simulation for Convenient Store's Promotion Strategy Selection 786
Naragain PHUMCHUSRI, Warot KOSAWANITCHAKARN, Sirawish SRIMOOK, Sirawich CHAWANAPRANEE

Adopting Pre- and Post-processing Weight Mechanisms to Improve Deep Learning-based Fault Localization 791
Chin-Yu HUANG, Chih-Chiang FANG

A System Dynamics Model of False News on Social Networking Sites 796
Charlle SY, Aleena Marie CONCEPCION

Supply Chain Management 4

An Iterated Local Search Algorithm for Commuting Bus Routing Problem with Latest Arrival Time Constraint 801
Yannan HU, Hideki HASHIMOTO, Tomoki SUGIURA, Mutsumori YAGIURA, Yosuke TAKADA

Block Layout Design Problem for Marine Container Terminals 806
Etsuko NISHIMURA, Yilong SU

A Conceptual Framework for Blockchain-based Cannabis Traceability in Supply Chain Management in an Emerging Country 811
Piwat NOWVARATKOOLCHAI, Natcha THAWESAENGSKULTHAI, Wattana VIRIYASITAVAT

Enablers and Barriers of Omnichannel in Traditional Grocery Retailers 817
Atik FEBRIANI, Bertha Maya SOPHA, Muhammad Arif WIBISONO

Designing Battery Swapping Stations for Electric Scooters with a Streamlined Supply Chain 822
Hongrui LIU, Meenakshi Ambabhavani SHANBOG

Optimal Dual-objective Inventory Strategies for a Two-echelon Capacitated Supply Chain 827
Lang XIONG, Tingting XIAO

Supply Chain Management 5

Decision Analysis Considering Government Double Subsidy and CSR under Green Technology R&D Uncertainty 832
Nan CHEN, Jianfeng CAI, Lei GAO

Analyzing Barriers Towards Implementing Circular Economy in Healthcare Supply Chains 837
Kartika ALFINA, R.M. Chandima RATNAYAKE, Dermawan WIBISONO, Nur Budi MULYONO, Mursyid Hasan BASRI

Capacity Planning of the Semiconductors Manufacturing Supply Chain: A Decision Method and Application 842
Jun-Der LEU, Fei-Pai LIU

Challenges in the Transition from Supply Chain 4.0 to Supply Chain 5.0 847
Tanveer CHOWDHURY, Sharfuddin KHAN, Kabita BHOWMIK, Akshith S. NAIDU

A Joint Economic Lot Size Model for a Single-manufacturer, Multiple Retailers, and Multi-product with Electric Trucks and Drone 853
Ivan Darma WANGSA, Iwan VANANY, Nurhadi SISWANTO

Incentive Strategy Considering Observation Period to Manage Supply Disruption under Uncertain Demand 858
Meimei ZHENG, Lingzi LI, Shuangshuang DONG, Wei WENG

Supply Chain Management 1

Optimizing Joint Sustainable Supply Chain Decision-making under Emission Tax: A Stackelberg Game Model 863

Linda ZHANG, Shuang MA, Sara SHAFIEE, Xiaotian CAI

- Pricing Strategies of AI-enabled and Regular Products 869
Yinmeng LI, Zhaojun YANG, Jun SUN, Xu HU
- How Big Data Analytics Mitigates Supply Chain Vulnerability? An Interpretive Structural Modeling 874
Xiaoting GUO, Zhaojun YANG, Jun SUN
- Data-driven Procurement Optimization in Fresh Food Distribution Market under Demand Uncertainty: A Two-stage Stochastic Programming Approach 879
Lu XU, Xinglu LIU, Wai Kin (Victor) CHAN, Jianfeng LIU, Qiruyi ZUO, Li XIAO
- Modelling Causal Loop Diagram for Measuring Performance of Indonesian Halal Prepared Food and Beverage Industry 886
Aries SUSANTY, Nia BUDI PUSPITASARI, Zainal Fanani ROSYADA, Habib ASHARI, Sumunar JATI

Supply Chain Management 6

- Evaluation Approaches for Measuring Economic Efficiency of Digitization Technologies in Transport Logistics: A Systematic Literature Review Protocol 891
Navid Julian SARDARABADY, John-Dean KASHER, Simon RIEDLE
- Model for the Determining Number and Location of Food Loss Processing Facilities on the Food Supply Chain 898
Iwan VANANY, Nurhadi SISWANTO, Ika Deefi ANNA
- Systematic Selection of Digitization Technologies in Transport Logistics Processes based on a Multi-criteria Decision Analysis 903
John-Dean KASHER, Navid Julian SARDARABADY, Simon RIEDLE, Markus E. SCHATZ
- Influence of the Degree of Centralization on the Decision Quality in Production Management 911
Tino Xaver SCHLOSSER, Günther SCHUH, Andreas GÜTZLAFF
- Goal Programming Approach of a Multi-vehicle Routing Problem on Waste Collection Considering Economic, Environmental, Time, and Health Objectives 916
Madeline TEE, Kent Louie WONG, Dennis CRUZ

Supply Chain Management 2

- The Three-dimensional Bin Packing Problem for Deformable Items 921
Qiruyi ZUO, Xinglu LIU, Chengyin XU, Jianfeng LIU, Wai Kin (Victor) CHAN, Lu XU, Li XIAO
- Development of a Supply Chain Disruption Optimization Model 929
Nur Aini MASRUROH, Alfina Budi KHOIRANI, Vincent F. YU
- E-procurement Performance Model for Construction Tendering: A Multiple Linear Regression Approach 934
Ferial HENDRATA, Iwan VANANY, Nurhadi SISWANTO, Patdono SUWIGNYO
- Digital IT Innovation to Improve Supply Chain Resilience: A Systematic Literature Review 939
Rui MENG, Zhaojun YANG, Jun SUN
- Approach to Determining and Comparing the Truck Parking Problem with Sustainability Factors 944
Simon RIEDLE, Jan BURKHARDT, John-Dean KASHER, Navid Julian SARDARABADY, Felix HACKBARTH

Are Two Heads Always Better Than One? Human-AI Complementarity in Multi-criteria Order Planning 949
Chin Sheng TAN, Abhishek GUPTA, Chi XU

Supply Chain Management 3

Sustainability Investigations based on Digitalization Technologies in the Field of Transportation Logistics: A Systematic Literature Review Protocol 954
John-Dean KASHER, Navid Julian SARDARABADY, Simon RIEDLE

Multi-objective Multi-compartment Split Delivery Location Routing Problem with Time Windows 960
Rachmat PARAYOGA, Anna Maria Sri ASIH

Prioritisation of Supply Chain Resilience Enabling Factors using the Fuzzy DEMATEL Approach: Integration Perspective 965
Premaratne SAMARANAYAKE, W.M. Samanthi Kamari WEERABAHU, Nisakorn SOMSUK, Tritos LAOSIRIHONGTHONG, Dotun ADEBANJO

Towards a Scalable Permissioned Blockchain Framework for Supply Chain Management 970
Aaliya SARFARAZ, Ripon K. CHAKRABORTY, Daryl L. ESSAM

Measuring the Performance Impact of a Decentralized Waterborne Container Transportation Service on Inland Waterway Hubs in Western Germany 975
Cyril ALIAS, Jonas ZUM FELDE, Sven SEVERIN, Frank Eduardo ALARCÓN OLALLA

Project Management 2

Feasibility Study of a BERT-based Question Answering Chatbot for Information Retrieval from Construction Specifications 980
Jungyeon KIM, Sehwan CHUNG, Seonghyeon MOON, Seokho CHI

Examining Recommended Practices for Information System Development Projects and the Effect of Standardization Frameworks: An Empirical Study 985
Younes BENSLIMANE, Zijiang YANG

Comparative Study of Bridge Inspection Practices in Indonesia and Foreign Countries 990
Nadia AVELINA, Taeyeon CHANG, Seokho CHI

Exploring the Themes of Focus for Change Management Applied to Multinational Corporations: A Scoping Review 995
Sara GROBBELAAR, Chiara OOSTHUIZEN

Incumbent Actions in Adopting Preventive Innovations: Cases in the Finnish Construction Sector 1000
Deborah KUPERSTEIN-BLASCO

Measuring China's Energy Efficiency with Different DEA Models 1005
Xu WANG, Takashi HASUIKE

Crisis Management

Developing Organizational Resilience Model to Sustain Business Performance 1010
Jonny JONNY, Dave MANGINDAAN

The Impact of COVID-19 Pandemic on Airport: An Empirical Study of Service Quality, Customer Satisfaction, and Travel Intention for Sustainable Airport Operations 1015

Yogi Tri PRASETYO, Darlene Gayle D. DELA FUENTE, Thanatorn CHUENYINDEE, Reny NADLIFATIN, Satria Fadil PERSADA

Supply Chain Disruptions during the COVID-19 Pandemic in General Trading Companies 1020
Anton SUKOCO, Iwan VANANY, Jerry Dwi Trijoyo PURNOMO

Concept for the Identification of Governmental Needs for Actions within the Technology Transfer of Deep Tech 1025
Tim LATZ, Günther SCHUH

Safety, Security and Risk Management 1

A Methodological Setting to Explore National Occupational Safety and Health Systems 1031
Gaia VITRANO, Guido J.L. MICHELI, Diego DE MERICH, Armando GUGLIELMI, Mauro PELLICCI

Public Perception on Safety of Autonomous Ferry in the Norwegian Context 1037
Ziaul Haque MUNIM, Marius IMSET, Olivier FAURY, Maire SUKKE, Hyungju KIM

A Conceptual Analysis of Green Shipping Practices, Rational Culture and Sustainability for a Safer and Sustainable Ocean 1043
Choon Hee ONG, Hui Ying YEO, Hooi Siang KANG, Yi Liu LIU, Owee Kowang TAN

Risk Analysis of Dynamic Positioning Systems based on Incident Data 1048
Yi Liu LIU, Imran NASEEM

A Data-driven Framework of Resilience Evaluation for Power Systems under Typhoon Disasters 1053
Wei WANG, Zhen YU, Mingce WANG, Yinguo YANG, Shuangxi WU, Qiuyu LU, Yu ZHU, Yang LIU, Chao FANG

Standards, Ethics, Legal Implications & Challenges of Artificial Intelligence 1058
Arvind KEPRATE, Sanjana CHAUHAN

E-Business and E-Commerce

Mapping the Digital, Innovative Start-up Venture Creation Process 1063
Alan PILKINGTON, Irma MÄKÄRÄINEN-SUNI, Maria GRANADOS, Sergio DE CESARE

Perceptions, Emotions and Motivations of Gig Workers: Insights from Malaysia 1068
Andrei O. J. KWOK, Borui FANG, Ewilly Jie Ying LIEW, Pei-Lee TEH

Customers' Usage and Brand Experience Toward Branded Mobile Payment Improve Continuous Usage Intention 1073
Li-Ting HUANG, Fei-Pai LIU

Exploring Factors That Customers' Concerns When Using the E-commerce Platform in Thailand 1078
Jiramate WADSUWAN, Tipavinee Suwanwong RODBUNDITH, Pornwasin SIRISAWAT

Assessing the Role of Minimum Viable Products in Digital Startups 1083
Javaria UMBREEN, Muhammad Zeeshan MIRZA, Yasir AHMAD, Afshan NASEEM

Safety, Security and Risk Management 2

Risk Assessment of Flammable Natural Refrigerant Application in Air Conditioning Systems 1088
Ardiyansyah YATIM, Ridho IRWANSYAH, Elang WIJAYA, Ahmad Syihan AUZANI, Yi Liu LIU

A Conceptual Framework for Assessing Risks for Data Protection Impact Assessment Process in Maritime Industries 1093
Sutthipong YUNGRATOG, Floris GOERLANDT, Wonsiri PUNURAI, Sotarath THAMMABOOSADEE

Exploration of Risky Riding Behavior on Last Mile Food Delivery using Motorcycle Rider Behavior Questionnaire: Evidence From Chiang Rai 1098
Tosporn ARREERAS, Krit SITTIVANGKUL, Sunida TIWONG, Pattaramon VUTTIPITTAYAMONGKOL

Assessment of Ship Emission Inventory in Strait of Malacca and Singapore based on Automatic Identification System Data 1102
Hooi Siang KANG, Ki Hong TEN, Chee-Loon SIOW, Kuan Yew WONG, Choon Hee ONG, Yi Liu LIU

Project Management 1

Complex Systems of Disaster Response: The Case of COVID-19 1107
Yuan CHAI, Indra GUNAWAN, Nam NGUYEN, Jian ZUO

Investigating Efficiency in Public Project Management: A Preliminary Analysis with the Use of Fuzzy Cognitive Maps 1112
Sara CARBONARI, Maurizio BEVILACQUA, Giovanni MAZZUTO, Filippo Emanuele CIARAPICA

SWOT Analysis for Implementation of Lean-Agile Mindset: A Case Study from an ETO Organisation 1117
Daria LARSSON, R.M. Chandima RATNAYAKE

Construction of a Quality Evaluation Index System for Construction Land Reduction Projects based on DEMATEL and Entropy Power Method 1124
Caihong LIU, Yuming ZHU, Jia-He ZHOU, Jiangtao XIA

Solving the Resource Renting Problem with an Adapted Fix-and-optimize Heuristic 1129
Juergen ZIMMERMANN, Max REINKE

Quality Control and Management

A System Approach for Integration of Human-centered Smart Problem-solving Process in Digital Shop Floor Management 1134
Turgut Refik CAGLAR, Roland JOCHEM

Optimization Model for Halal Gelatin Supply Chain with Carbon Emissions 1139
Iwan VANANY, Rizki Revianto PUTERA, Ivan Darma WANGSA, Niken Anggraini SAVITRI, Berto Mulia WIBAWA

Augmenting the Production Operators for Continuous Improvement 1144
Daryl POWELL, Emrah ARICA, Manuel Fradinho OLIVEIRA

Dynamic Sampling Plans using a Metrology Situation Indicator (MSI) 1149
Allwell DILOSI, Alaa HASSAN, Aymen MILI, Ali SIADAT

Quality Cost of 100% Inspection on Manufacturing Processes: Advantages of using a Simulation Approach 1154
Sergio SOUSA, Eusebio NUNES, Luis DIAS

Service Innovation and Management 1

Exploring the Relationship Among Experience Marketing, Customer Loyalty on Purchase Intention- A Case Study of Banking Sector 1159

Long-Sheng CHEN, Venkateswarlu NALLURI

The Strategic Role of Design of Identity Management and Reputation in Indonesia Higher Education Institutions 1164

Ellya ZULAIKHA, Syarifah HANOUM, Putri DWITASARI

Older Adults' Evaluations of Mobile Apps: Insights from a Mobility App-based Solution 1169

Pei-Lee TEH, Clarice Sze Wee CHUA, Weng Marc LIM, Sonja PEDELL

Four Initiatives to Standardize Warehouses to Increase Digitalization and Automation 1174

Tine MEIDAHL MÜNSBERG, Lars HVAM, Lydia TSINTZOU, Mads STØJFER-HØNBERG, Sofie AMALIE LUNDSTEEN, Maximilian CSIK

Adoption of Industry 4.0 in the TIC Industry: Systematic Review 1179

Norton H. Y. YUEN, Fanny TANG, Chi Ho LI

Decision Analysis and Methods 1

Experimental Design to Increase Productivity in Medium Sized Garment Industry with Three-way ANOVA Analysis Approach 1187

Lina GOZALI, Thomson RICHARD, Louis VALENTINO, Teuku Yuri M. ZAGLOEL, Habibah Norehan HARON, Ariawan GUNADI

A Reinforcement Learning Approach for Integrated Scheduling in Automated Container Terminals 1192

Yu TIAN, Zhanluo ZHANG, Chen YANG, Wei QIN, Zilong ZHUANG, Huaijin FANG, Shulin LAN

A Comparative Evaluation Model for Assessing Solar Energy Capacity Development of Multiple Geographical Alternatives 1197

Pratik RAI, Sasadhar BERA

The Application of Ambidextrous Organizational Design on the Founding of an Autonomous Vehicle Development Research Team – A Case Study 1202

Marek MILTNER

The Disruption Funnel: A Model for Fleet Asset Management During Sustainable Disruption 1206

Amr B. ELTAWIL, Mohamed GHEITH, Hossam ELHAMY

Service Innovation and Management 2

Understanding Challenges as Needs: Smartphone Usage Among Malaysian Older Women in Rural Areas 1211

Ewilly Jie Ying LIEW, Pei-Lee TEH, Sooyeong EWE, Chooi Ling CHONG

Evaluation of Subscription-based Sales of IoT-enabled Consumer Devices 1216

Tatsuya INABA

What Benefits Can SMEs in the Food Industry Gain from Innovative Products? 1221

Pittawat UEASANGKOMSATE

Local Governance of Future Regional Development in Remote Areas: Key Insights from a Co-creation Study in Sweden 1224

Christine GROßE

A Scoping Review Investigating the Use of Outcome-based Models to Improve Healthcare Outcomes and Reduce Healthcare Spending 1229

Decision Analysis and Methods 2

- Data-driven Industrial Machine Failure Detection in Imbalanced Environments 1234
Pattaramon VUTTIPITTAYAMONGKOL, Tosporn ARREERAS
- Stakeholder Value on the Concept of Sustainability Balanced Scorecard: Case Study of State-owned Plantation Enterprise (SOPE) in Indonesia 1238
Erlin TRISYULIANTI, Budhi PRIHARTONO, Made ANDRIANI, Kadarsah SURYADI
- Prioritizing Barriers for Reverse Logistics of Lubricating Oils using Fuzzy AHP 1243
Amit Kumar GUPTA

Decision Analysis and Methods 3

- Novel Kansei Design Method Based on Rough Set Theory 1247
Kotoru SATO, Syohei ISHIZU, Takashi ITO
- Method for the Semantic Modelling of the Product Context Using Text Mining for the Derivation of Innovation Potentials 1252
Hendrik LAUF, Michael RIESENER, Maximilian KUHN, Günther SCHUH
- Determining and Validating the Spare Parts Selection Criteria for Additive Manufacturing Using Delphi Technique 1257
Sagar GHUGE, Milind AKARTE, Alankrit PANDEY
- Evaluation of the Learning Effect of VR on Engineering Education – Case Study in Machine Elements 1262
Hans-Patrick BALZERKIEWITZ, Carsten STECHERT, Nick SCHADE
- Model Development for the Prediction of Marbling Score of Brangus Beef Fattening Using Logistic Regression 1267
Wachara NINPHET, Noppadol AMDEE, Adisak SANGSONGFA, Choat INTAWONGSE
- Fuzzy Logic Prioritization in Halal Risk Assessment (A Case Study of Halal Chicken Supply Chain in Indonesia) 1271
Harwati HARWATI, Anna Maria Sri ASIH, Bertha Maya SOPHA

Technology and Knowledge Management 4

- Capturing Citizens Experienced Value from Municipal Services: Developing an Evaluation Model in a Swedish Municipal Project 1276
Annika HASSELBLAD, Leif OLSSON, Ingela BÄCKSTRÖM, Pernilla INGELSSON
- Individual Characteristics and Technology Adoption in Asset Management 1281
Bheki MAKHANYA, Hannelie NEL, Jan Harm PRETORIUS
- Methodology for Automated Master Data Management using Artificial Intelligence 1286
Benjamin LENDER, Michael RIESENER, Günther SCHUH, Maximilian KUHN
- Concept for Databased Identification of Heuristics for Development Management using FAMD 1291
Benjamin LENDER, Michael RIESENER, Maximilian KUHN, Günther SCHUH

Influence of Goal Orientation on the Innovative Behavior of Basic Research Project Members 1296
Qun SHA, Yali ZHANG, Liaoliao LI

Concept for the Design of an Implementation Process for Continuous Innovation in Manufacturing Companies 1301
Stefan PERAU, Michael RIESENER, Maximilian KUHN, Günther SCHUH

Technology and Knowledge Management 5

Exploring the Relationships Between Artificial Intelligence Transparency, Sources of Bias, and Types of Rationality 1306
Laura VALTONEN, Saku MÄKINEN

Public Acceptance of Electric Vehicles in Indonesia 1311
Bertha Maya SOPHA, Fakhri WARDANA, Karsi WIDIAWATI

Organizational Structure for Improving R&D Exploration Degree of ICT Companies 1316
Iori NAKAOKA, Yousin PARK, Yunju CHEN, Hirochika AKAOKA, Seigo MATSUNO

Technology Adoption in Teaching and Learning Within Online Environment 1321
Irshaad MAHOMED, Wilson MALADZHI

A Review of Innovation Alliances from Game Theory Perspective 1326
Lei GAO, Jianfeng CAI, Zhengfeng LI

The Adoption Speed of Scientific Knowledge: The Moderating Role of Path Dependency on Scientific Knowledge 1331
Chia-I KUO

Technology and Knowledge Management 1

Global Innovation Networks of Japanese Companies, German Companies and US Companies 1337
Masayuki KONDO

A Consensus Clustering-based Label Propagation Method for Classification of Science & Technology Resources 1341
Yuqi TANG, Wenyan SONG, Caibo ZHOU, Yue ZHU, Jianing ZHENG, Wan RONG

Are Consumers Ready for Flying Taxis? A Choice-based Conjoint Analysis of eVTOLs in Germany 1347
Stanislav CHANKOV, Robert ZAPS

Technology and Knowledge Management 6

A Framework for Enhancement of Building Information Modeling using Internet of Things and Axiomatic Design Theory 1352
Omid FATAHI VALILAI, Elham ZAFARGHANDI, Alireza HAJI

Human-Centered Machine Learning Implementation in Banking: Case Study in BRILink (BRI Branchless Banking) Agent Acquisition, Upgrade, and Activation 1358
Faiq Iftirul MAHLIDAH, Agung Kharisma SUKARNO, Yoga YUSTIAWAN, M. Dendi Raditya BAKRY

Technology and Knowledge Management 2

- Smart-city Development Model: The Case of Ülemiste City 1365
Mait RUNGI
- Corporate Venturing as Catalyst for Transformation? Towards a Research Agenda 1373
Leonie Angela BUDWEISER, Günther SCHUH, Frederic LADEMANN
- Testing a Benefit Analysis Model to Evaluate the Benefits of IT Projects 1381
Annika HASSELBLAD
- Performance-based Decision Support for Business Process Analysis and Design 1386
Marco SCHOPEN, Seth SCHMITZ, Andreas GÜTZLAFF, Günther SCHUH, Alexander OBLADEN
- Dimension and Indicators for Assessing the SMEs Digital Readiness: A Systematic Literature Review 1391
Aries SUSANTY, Odilia Sefi ANINDYANARI

Technology and Knowledge Management 3

- Organizational Capabilities as the Critical Determinants for a Successful Adoption and Implementation of Fourth Industrial Revolution Technologies in Manufacturing Industries 1396
Steven ZULU, Marthinus PRETORIUS, Elma VAN DER LINGEN
- Methodology for a Startup Lifecycle-dependent Approach of Financing for Investors and Deep Tech Startups 1402
Carolin HAMM, Günther SCHUH
- Turbulence-induced Initiation of Technology Strategy Development in a Volatile Business Environment 1409
Marc PATZWALD, Günther SCHUH, Tim WARZAWA
- Explaining Willingness to Pay for Solar Panels in Finland 1416
Saku MÄKINEN, Deborah KUPERSTEIN-BLASCO
- Assessment for CO₂-reduced Production by using Additively Manufactured Lightweight Robot Grippers 1421
Christian HÖLTGEN, Georg BERGWEILER, Günther SCHUH, Falko FIEDLER

Manufacturing Systems 4

- Industry 5.0: From Manufacturing Industry to Sustainable Society 1426
Misbah IQBAL, Carman Ka Man LEE, J.Z. REN
- Integrated Scheduling of Production and Material Delivery in a Make-to-order Flow Shop 1432
Tianning LIANG, Liping ZHOU, Zhibin JIANG
- Application of Machine Learning for Sustainability in Manufacturing Supply Chain Industry 4.0 Perspective: A Bibliometric Based Review for Future Research 1437
Rajiv Kumar GARG, Anish Kumar SACHDEVA, Alok YADAV
- The Application of Business Process Re-engineering at a Fashion Retailer: A Case Study 1442
Nita SUKDEO, Kem RAMDASS
- Barriers to Additive Manufacturing Implementation in Plastic Waste Management – A Case Study from a Developing Economy 1448
H. Niles PERERA, R.M. Chandima RATNAYAKE, Amila THIBBOTUWAWA, W. Madushan FERNANDO, Banusha

ARUCHUNARASA

- Industry 4.0 and Indian SMEs: A Study of Espousal Challenges using AHP Technique 1453
Anish Kumar SACHDEVA, Vinay KUMAR SHARMA, Lakhwinderpal SINGH

Manufacturing Systems 5

- Experimental Investigation of Magnetic Force-assisted Powder-mixed EDM for Aluminium Based Metal Matrix Composite 1459
Ram SAJEEVAN, Avnish Kumar DUBEY
- The Impact of the COVID-19 Pandemic on the Organizational Commitment in Semiconductor Industry: The Mediator Effect of the Job Satisfaction 1464
Yogi Tri PRASETYO, Ardivin Kester S. ONG, Alaisa Marie A. CAGUBCOB, Thanatorn CHUENYINDEE, Remy NADLIFATIN, Satria Fadil PERSADA
- Factors Affecting Six Sigma Green Belt Deployment – Case of Company A 1469
Sambil Charles MUKWAKUNGU, Nita SUKDEO, Alice Kabamba LUMBWE, Vela MAZULA
- An Empirical Approach to the Implementation of Lean Manufacturing as a Strategy to Mitigate Industrial Waste in South Africa 1474
Sambil Charles MUKWAKUNGU, Nita SUKDEO, Eric Mikobi BAKAMA, Tshepiso THOBAKGALE
- Social Media Product Data Integration with Product Lifecycle Management; Insights for Application of Artificial Intelligence and Machine Learning 1479
Omid FATAHI VALILAI, Noushin MOHAMMADIAN, Nadhir MECHAI
- The Importance of Reliability Indicators in Preventative Maintenance 1484
Anup PRADHAN, Magano MOLEFE

Manufacturing Systems 1

- In-situ Melt Pool Monitoring of Laser Aided Additive Manufacturing using Infrared Thermal Imaging 1488
Lequn CHEN, Xiling YAO, Nicholas Poh Huat NG, Seung Ki MOON
- Agile and Continuous Cost Analysis and Forecasting in the HIP3D 1493
Shari WLECKE, Günther SCHUH, Andreas GÜTZLAFF, Seth SCHMITZ
- A Reference Data Model for Material Flow Analysis in the Context of Material Handling System Design and Reconfiguration 1498
Zakarya SOUFI, Pierre DAVID, Zakaria YAHOUNI
- Metric-based Identification of Target Conflicts in the Development of Industrial Automation Software Libraries 1503
Eva-Maria NEUMANN, Birgit VOGEL-HEUSER, Michael GNADLINGER, Juliane FISCHER, Laura REIMOSER, Sebastian DIEHM, Tobias ENGLERT, Michael SCHWARZ
- Reliability Modeling and Rework Strategy Evaluation of Manufacturing System based on Stochastic-flow Network 1510
Weiwei DUAN, Wei DAI, Yu ZHAO, Qinglin ZHENG

Intelligent Systems

Regression-based Business Decision Support: Application in Online Retail <i>Mait RUNGI, Bhavesh KHATRI</i>	1515
Systematic Literature Review of Real-time Risk Analysis of Autonomous Ships <i>Deepen Prakash FALARI, Hyungju KIM, Choungho CHOUNG, Seong NA</i>	1520
COVCOUGH: An Artificial Intelligence Application to Detect COVID-19 Patients through Smartphone-recorded Coughs <i>Dinh Son NGUYEN, Khoa TRAN DANG, Huyen Trang Ton NU</i>	1528
On Restricted Computational Systems, Real-time Multi-tracking and Object Recognition Tasks are Possible <i>Hamam MOKAYED, Thomas CLARK, Lama ALKHALED, Mohamad Ali MARASHLI, Hum YAN CHAI</i>	1533

Manufacturing Systems 2

Determination and Prioritization of Flexibility Types in the Context of Industry 4.0: A Use Case in Automotive Industry <i>Armand BABOLI, Behnam EINABADI, Anthony CHEHAMI, Eva ROTHER, Mojtaba EBRAHIMI</i>	1539
Detecting Multiclass Defects of Printed Circuit Boards in the Molded-interconnect-device Manufacturing Process Using Deep Object Detection Networks <i>Chun-Cheng LIN, Chun-Hsiang CHANG, Hao-Wei CHEN</i>	1546
Optimal Motion Planning and Layout Design in Robotic Cellular Manufacturing Systems <i>Tomoya KAWABE, Ziang LIU, Tatsushi NISHI, Md Moktadir ALAM, Tomofumi FUJIWARA</i>	1551
Integration of DFMEA and PFMEA for Enhanced Co-development of Product and Production <i>Camilla FASOLO, Fredrik ELGH</i>	1556
Lean Service-inventory Management Integrated Model to Improve the Service Level in a Metalworking Company <i>Jose C. ALVAREZ, Favio ALFARO, Diana JACINTO, Alberto FLORES, Andrea TRIANNI</i>	1561
Multi-UAV Route Planning for Data Collection from Heterogeneous IoT Devices <i>Gangyan XU, Yaoming ZHOU, Yuying LONG, Shukang WANG</i>	1566

Manufacturing Systems 3

Development of Wasted Non-woven Fabric Mask (NFM) Disposal Machine <i>Jimmy Chi Ho LI, Siu Kei LAM, Tsz Ting LEE, Fanny TANG, Shu Lun MAK, Wai Hang CHIU, Chi Chung LEE</i>	1571
A Modeling Method for Transient and Steady-state Analysis of Serial Production Systems with Exponential Machines Considering Periodic Preventive Maintenance <i>WenDa WANG, YuKan HOU, Shubin SI</i>	1578
Leanness Assessment of New Product Development in the Context of Smart Manufacturing Systems <i>B.A. PATIL, Makarand KULKARNI, P.V.M. RAO</i>	1583
Hybrid Production Management System in the Context of Industry 4.0 <i>Stefan SCHMID, Herwig WINKLER</i>	1588
Intelligent Manufacturing Cell for Implants <i>Sebastian KAISER, Berend DENKENA, Heinrich KLEMME, Maruan SHANIB</i>	1593

Proposition of Applying Markov Transfer State in Reliability Analysis of Manufacturing System with Different Configuration Orders	1598
<i>Tian ZHANG, Lazhar HOMRI, Jean-Yves DANTAN, Ali SIADAT</i>	

Author Index	1603
---------------------	-------------

IEEM2022

KUALA LUMPUR CONVENTION CENTRE, MALAYSIA

07 - 10 December 2022

www.ieem.org



PROOF OF ATTENDANCE

This is to certify that

Markus HARTONO

University of Surabaya

has participated in the

**2022 IEEE International Conference on Industrial
Engineering and Engineering Management**

on

07-10 December 2022

Organized by

IEEE TEMS Hong Kong Chapter

IEEE TEMS Malaysia Chapter

IEEE TEMS Singapore Chapter

INFORMATION & SUPPORT

IEEM Secretariat at Meeting Matters International

Website: www.ieem.org Email: info@ieem.org

Tel: (65) 6472 3108 Fax: (65) 6472 3208

#06-23 ONE COMMONWEALTH, 1 Commonwealth Lane, Singapore 149544

Integration of Text Mining, Railqual, Kano model, and Kansei Engineering for Train Service Excellence

M. Hartono¹, D. N. Prayogo¹, G. A. Saylendra¹

¹Department of Industrial Engineering, University of Surabaya, Surabaya, Indonesia

(markus@staff.ubaya.ac.id)

Abstract – Customer satisfaction is insufficient. It applies to all service industries including train services. Apart from weather conditions and safety issues, the challenges faced by train services are improving passenger comfort, sense of well-being, and emotional satisfaction. How to understand and satisfy the customer emotional needs is critical. Conventional methods such as survey and interview sometimes bring shortcomings. Hence, this study proposes the integrated approach of text mining, Railqual, Kano model, and Kansei Engineering (KE) in train services. Text mining is inserted in the KE methodology to refine the more representative Kansei words and service attributes experienced. The finding shows that there were 8 final Kansei words, namely, clean, extraordinary, comfortable, spacious, modern, friendly, cool, and cheap. Related to critical train service attributes, there were 3 items i.e., comfortable temperature in train, politeness of staff, and good quality meals served in train. Surely, the continuous scheduled air conditioner maintenance, training “dealing with people” for staff, and food supplier evaluation should be prioritized.

Keywords – Text Mining, Kansei Engineering, Railqual, Kano, Train Services

I. INTRODUCTION

If we talk about train services, we may be recalled by high-speed train Shinkansen in Japan or the Shanghai Maglev Train in China. They are known as the bullet train. The most dominant characteristic is that a high-speed train of 320 km/h carrying more than 500 passengers per day. Hence, the expected emotional needs (or Kansei words) were speedy, comfortable, and efficient.

Safety is always the basic need for any transportation mode, including the railway services. Technology-enabled features are hoped to be included in the service system, so that the trains run smoothly and correctly. As a result, the efficiency, safety, and reliability will be obtained. Surely, these are some service attributes highly expected by passengers. Once the number of service providers increasing, then the competition will be tightly increased as well. Moreover, the customer today is always much demanding.

This study is addressing the problem of state-owned railway service company located in Surabaya, Indonesia. It has huge challenges such as cost, comfort, speed, and safety compared to other transportation modes. In other words, those challenges lead to critical problems in the

future. The effort to identify and fulfill what the customers concern is a must.

Capturing the essential needs of customers have been done intensively through survey, observation, or even social experiment. However, it is quite often that the respondents are constrained by the time of survey and there is no comfort for them. Consequently, the responses given are not representative and they seem to be short-lived answers or solutions. Moreover, it is very challenging to seek and dig the deepest layer of customer needs [1]. Hence, more sophisticated yet affordable approach is needed. According to study by Hartono et al. [2], due to customer dynamics, more representative customer needs especially the emotional needs are required. In addition, there has been little academic exploration and study in evaluating the importance of perceived railway passenger service quality on emotions. Hence, text mining on the exploration of customer emotional needs related to perceived passenger service quality on railway services is proposed.

Hence, this study aims to propose an integrative framework of Kansei Engineering, Kano model, and Railqual incorporating text mining methodology in refining the representative customer emotional needs and service attributes for the improvement of train service excellence. Both practical and theoretical implications are presented.

II. LITERATURE REVIEW

A. The Milestones of Kansei Engineering

Kansei Engineering (KE) has been evolving steadily since its first introduction in the 1970s. The KE application ranges from physical products to intangible services. As a general methodology, it starts from what emotional needs expected by customers (Kansei) and ends with design characteristics connected to the fulfilment of those Kansei. This study discusses the evolution of KE in services, which is focusing on the service quality of train service excellence. It might be the extension of KE in services in different service settings.

In general, KE methodology highlights the relationship between Kansei and perceived service/product attributes. Kansei is positioned to be a dependent variable, as a function of perceived service/product attributes (independent variables). The application of KE is very broad. It covers both physical and non-physical products or known as products and services [3]. KE is classified into type I, II, and III. Type I KE is a famous methodology

addressing the identification of design elements for creating new product. Type II KE uses the computer technologies such as neural network, genetic algorithm, and expert system. Type III KE is Kansei mathematical modeling, expanding the Kansei as the function of perceived product/service experience. It ranges from automotive, construction and housing, electrical device, houseware, to service design and development. This study focuses on service design for train/railway service excellence.

B. Text Mining in Kansei Engineering for Train Service Excellence

According to the previous study of KE in services considering more representative Kansei [2], it is still huge opportunity to extend the study into other different service settings. Since the issues on comfort and safety of transportation modes, it is a challenge to promote the modified KE methodology in the train services. We will utilize a more structured way to collect and finalize the Kansei words as representative of passenger emotional needs. Hence, text mining with sentiment analysis is used. This approach will refine the collected Kansei words due to interference of short-lasting and imprecise responses, different culture and background of subjects, traditional methods for data collection, and cognitive inertia. Social media tweets are deemed to be potential source of data of Kansei.

Recent studies on KE in services show that there is an opportunity to explore the study of KE mining for service excellence in various service settings.

III. METHODOLOGY, PROPOSED FRAMEWORK, AND DATA COLLECTION

Following the previous studies [1; 2], the research methodology starts with the objective of study, i.e., to promote excellent railway service experience for passengers. In complementing the previous KE studies in services, this current study proposes text mining for sentiment analysis. Regarding the service excellence for railway services, it has been usually conducted through conventional survey through questionnaires. However, this study introduces a new approach of text mining integrated with KE in order to refine the existing methodology.

Afterward, the methodology continues to the stage of text mining for sentiment analysis. It is to determine two major parts in the methodology, i.e., emotional attributes (Kansei words) and railway/train passenger service attributes. Generic model of Railqual – railway service quality is used to represent railway/train service

quality which consists of 8 dimensions (i.e., tangible, reliability, responsiveness, assurance, empathy, comfort, connection, and convenience). The train/rail service attributes and Kansei words have been collected and finalized through two steps. First, they were collected and structured based on the result of sentiment analysis. The sentiment analysis process was carried out on all 918 reviews, resulting in a subjectivity value of 0.45 which means it is quite objective. The subjectivity of the review comes from the feelings, emotions, moods, opinions, and experiences of customers/visitors/passengers. Second, the determination of service attributes was also strengthened by previous research. The process of determining service attributes with a literature study was carried out to improve the sentence of a service attribute that has been compiled based on text mining output. More specifically, the refinement of Kansei words has been further strengthened by literature review on an enthusiast group called "Indonesian Railfans" on social media Facebook.

Following the previous study [2], Kano categorization and calculation of satisfaction score are done. Regarding the Kano categorization, this study focuses only on one dimensional (O) and attractive (A) as they are source of innovative improvement. After that, Kansei linear model is set (i.e., Kansei is a function of perceived railway service quality). This linear model will be reversed in order to identify and filter the most critical railway service attributes to be continued with the generation of improvement strategies using house of quality (HoQ). For details of methodology, please refer to Figure 1.

This study utilized the use of purposive sampling method and has collected 100 valid and reliable responses through online questionnaires. The participants rated their responses due to services provided by railway services of a state-owned company located in Surabaya, Indonesia, named as XYZ. User-generated content (UGC) on various social media is a driver for XYZ to understand customer needs more comprehensively. There has been an exponential increase in the number of reviews on several review provider platforms in recent years [4]. Therefore, text mining and sentiment analysis are used to determine the perception of long-distance train passengers. Both methods are considered superior to conventional methods such as surveys and interviews which are time-consuming and costly [5].

The sample criteria in this study were railfans (train enthusiasts) or railway enthusiasts in Indonesia, who have traveled by long-distance train 4 or more times in the last 2 years and boarded and/or disembarked from long-distance trains in one of the train stations in Surabaya. The results and discussion of the study are provided in Section IV.

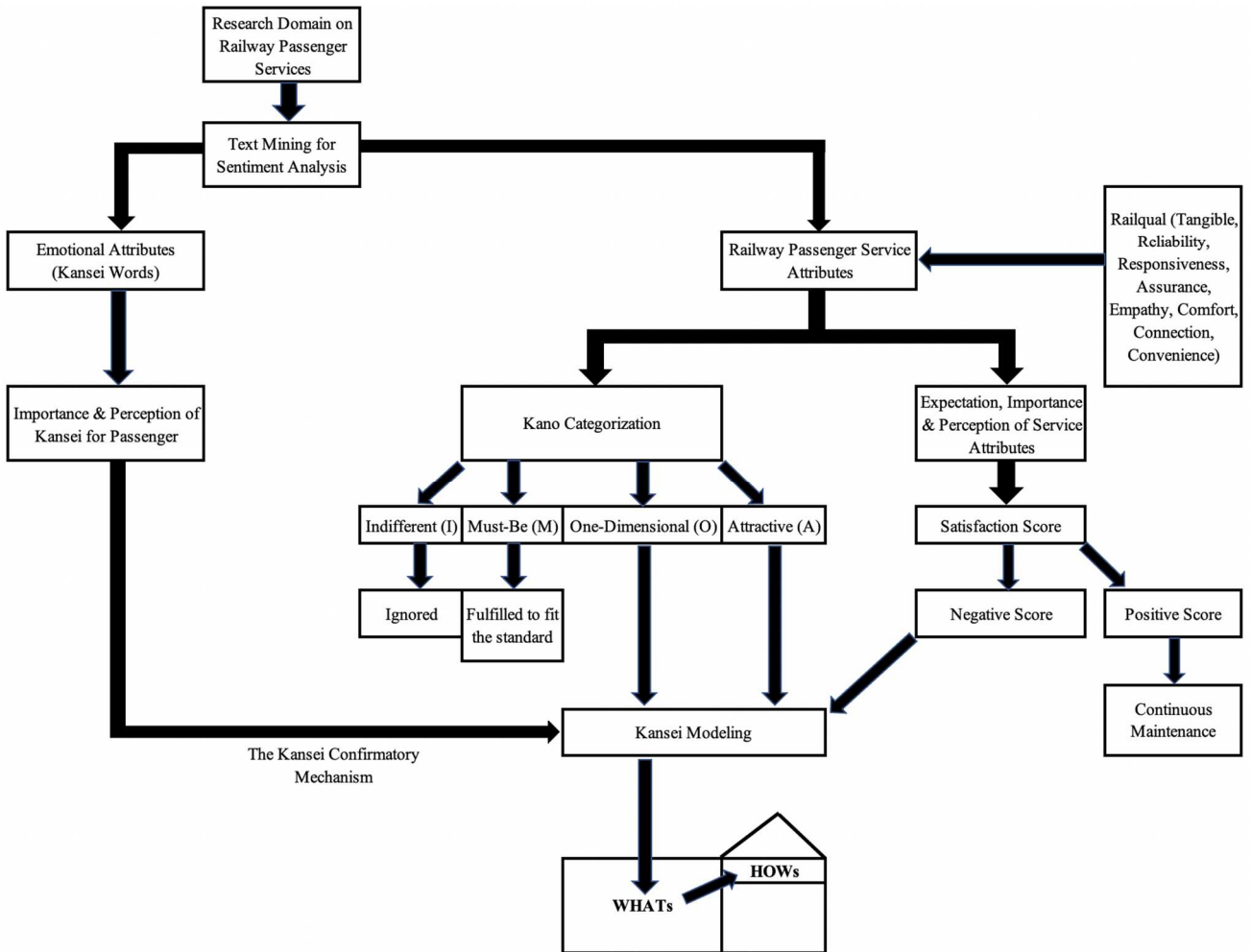


Fig. 1. The modified integrative model of Text Mining, Railqual, Kano, and Kansei Engineering for railway passenger service excellence

IV. RESULTS AND DISCUSSION

A. Kansei words to represent customer emotional needs for train services

The review data obtained from Google Maps Review at major stations in Surabaya were then processed using the Pandas library, Vader, with Textblob using the Python programming language. The process includes text corpus (document review from Google Maps), preprocessing (case folding, tokenizing, lemmatizing, stopwords removal), representation (bag of words or word frequencies), and knowledge discovery (sentiment analysis). The word frequencies that have been obtained are used in the preparation of 21 service attributes and 9 emotional needs in the form of Kansei words. In addition, the sentiment analysis of 917 data reviews categorized 41% as negative reviews and 59% as positive reviews and obtains a subjectivity value of 0.45 (quite objective). The emotional needs (Kansei words) of long-distance train passengers that have been validated are clean, extraordinary, comfortable, spacious, modern, friendly, cool, and cheap.

B. Finalized Railqual dimensions and service attributes to represent train service items

Railqual (Railway Service Quality) is a method developed from SERVQUAL (service quality) by adding new dimensions, namely comfort, connection, and convenience [6]. These three dimensions are closely related to the measurement of service quality in rail transportation services.

A service is said to be of quality if the offering meets the demands or expectations of customers. Therefore, service quality is the difference between customer expectations of service and the service received by customers. Customer dissatisfaction arises when the expectations of a service exceed the expectations of the service itself. This study finalized 21 railway service attributes as follow (available in Table 1), attached with service gap, satisfaction, significance of statistical test for service gap, and Kano category for each service attribute. Again, a set of 21 railway service attributes was adopted from Prasad & Shekar's RAILQUAL model with a modification based on the context in Indonesian railway services.

Table 1. The finalized service attributes of Railqual and their statistics *

Code	Attribute	P	E	I	Gap	p	S	Kano
Tangible								
Tan-1	The area is clean	4.07	4.10	4.63	-0.03	0.769	-0.14	I
Tan-2	The train is clean	3.80	4.21	4.64	-0.41	0.000	-1.90	M
Tan-3	The station building is modern	3.36	4.17	4.41	-0.81	0.000	-3.57	O
Tan-4	The meal is of good quality	3.15	4.14	4.59	-0.99	0.000	-4.54	O
Reliability								
Rel-5	The departure and arrival is on time	3.98	4.19	4.66	-0.21	0.038	-0.98	M
Rel-6	The staff is skillful in handling problem	3.68	4.19	4.37	-0.51	0.000	-2.23	O
Responsiveness								
Resp-7	The staff is responsive in helping passenger	3.70	4.23	4.38	-0.53	0.000	-2.32	O
Resp-8	The number of staff is sufficient	3.59	4.16	4.30	-0.57	0.000	-2.45	O
Assurance								
Assu-9	The staff is knowledgeable	3.76	4.20	4.45	-0.44	0.000	-1.96	O
Assu-10	The condition in station and train is safe	4.07	4.29	4.74	-0.22	0.051	-1.04	I
Assu-11	The staff in station is polite	3.27	4.25	4.61	-0.98	0.000	-4.52	O
Assu-12	The staff in train is polite	3.76	4.22	4.71	-0.46	0.000	-2.17	O
Empathy								
Emp-13	The staff acknowledges passenger need	3.57	4.20	4.33	-0.63	0.000	-2.73	O
Emp-14	The staff communicates well	3.74	4.21	4.37	-0.47	0.000	-2.05	O
Comfort								
Comf-15	The seat is comfortable for long-hour trip	3.03	4.38	4.68	-1.35	0.000	-6.32	M
Comf-16	The temperature in train is comfortable	3.08	4.20	4.63	-1.12	0.000	-5.19	O
Comf-17	Legroom is spacious	3.29	4.16	4.64	-0.87	0.000	-4.04	O
Connection								
Conn-18	The schedule fits to passenger need	3.31	4.24	4.48	-0.93	0.000	-4.17	O
Conn-19	Transportation options from/to station	3.45	4.15	4.44	-0.70	0.000	-3.11	O
Convenience								
Conv-20	Public facilities at station are adequate	3.97	4.16	4.60	-0.19	0.095	-0.87	I
Conv-21	Mechanism to buy or cancel ticket is easy	3.84	4.18	4.41	-0.34	0.001	-1.50	O

Note: *P=Perception, E=Expectation, I=Importance, Gap=Perception-Expectation, p=significance value, S=Satisfaction=(P-E)xI

Based on the results in Table 1 above, there were 15 service attributes (with Kano's category O – One Dimensional) selected to be linked with each Kansei word. After conducting the linear mathematical model using linear regression (with a defined Y is particular Kansei word, and defined Xs are perceived service attributes), the

importance of weight (called as IW) for each significant service attribute was calculated. It is critical to provide which service attribute(s) is/are prioritized for continuous improvement. The details of the importance of weight (IW) for each significant service attribute is provided in Table 2.

Table 2. The importance of weight of significant service attribute for prioritized improvement**

Code	Attribute	S	KW	Kansei Mean	Significant Kansei	IW
Comf-16	The temperature in train is comfortable	5.19	2	3.59	Extraordinary, comfortable, modern, spacious, cool, cheap	223.6
Assu-11	The staff in station is polite	4.52	2	3.77	Comfortable, spacious	204.4
Tan-4	The meal is of good quality	4.54	2	3.51	Cheap	191.4
Tan-3	The station building is modern	3.57	2	3.42	Modern, cool	146.6
Emp-13	The staff acknowledges passenger need	2.73	2	3.35	Cool	109.7
Rel-6	The staff is skillful in handling problem	2.23	2	3.98	Clean	106.4
Assu-9	The staff is knowledgeable	1.96	2	3.98	Clean	93.5
Emp-14	The staff communicates well	2.05	2	3.49	Modern	86.0
Conn-18	The schedule fits to passenger need	4.17	2	-		8.3

Comf-17	Legroom is spacious	4.04	2	-	8.1
Conn-19	Transportation options from/to station	3.11	2	-	6.2
Resp-8	The number of staff is sufficient	2.45	2	-	4.9
Resp-7	The staff is responsive in helping passenger	2.32	2	-	4.6
Assu-12	The staff in train is polite	2.17	2	-	4.3
Conv-21	Mechanism to buy or cancel ticket is easy	1.50	2	-	3.0

Note: $^{**}|S|$ =Absolute Satisfaction, KW =Kano weight, IW =Importance of Weight = $|S| \times KW \times$ Kansei Mean \times Number of Significant Kansei analysis using Structural Equation Modeling (SEM) is potentially conducted.

In order to prioritize which significant train service attributes to be improved, the Pareto diagram is used as shown in Figure 2. It is shown that there were three service attributes deemed as critical, i.e., Comf-16, Assu-11, and Tan-4.

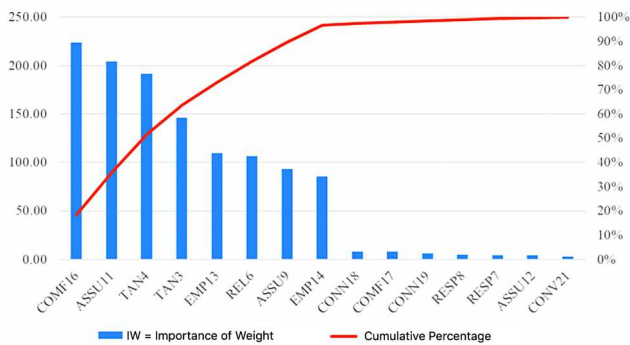


Fig. 2. The Pareto diagram for prioritization of improvement

Through focus group discussion (FGD) with enthusiasts, respondent feedbacks, and literature reviews, the proposed improvement strategies were formulated. They consisted of i) Regular check, provision of air conditioner, and ensuring the air conditioner is always on with temperature of 24-degree Celsius (i.e., the comfortable temperature), ii) Regular training and campaign for staffs regarding “dealing with people”, and (iii) Provision of self-service kiosk for meals and drinks.

V. CONCLUSION

The integration of Kansei Engineering-based mining, Kano model and SERVQUAL has shown its applicability to propose the prioritized improvement for excellent train service quality. It is not just identifying and finalizing what emotional needs (Kansei) are critical to customer/user, but also filtering the more representative Kansei. Even though some studies highlight that Kansei is dynamic, this study may offer a distinctive attribute of Kansei package which is more relevant to certain service encounter. At least, the Kansei package will last longer. Hence, this model produces more efficient resources in terms of what the exactly emotional needs of customer are, and how to prioritize the formulated solutions.

For further research, it is surely dealing with Kansei dynamics and potential discussion in other service settings using the same KE methodology. More relevant approaches are highly expected. A confirmatory factor

ACKNOWLEDGMENT

This study is fully supported by the research grant of Ministry of Education, Culture, Research and Technology Republic of Indonesia with a scheme of Higher Education Leading Basic Research (PDUPT) year 2022 with main contract number 073/E5/P6.02.00.PT/2022. The authors would like to thank the anonymous reviewers for their constructive feedbacks, so that the paper looks much better and good quality.

REFERENCES

- [1] M. Hartono and T.K. Chuan, “How the Kano model contributes to Kansei engineering in services”, *Ergonomics*, vol. 54, no. 11, pp. 987–1004, 2011.
- [2] M. Hartono, A. Santoso, D.N. Prayogo, and A. Salsabila “Kansei-based Mining and Robust Design for Internet Service Provider”, in *Proc. of the 2021 IEEE Int. Conf. on Industrial Engineering and Engineering Management (IEEM)*, pp. 1284-1288, 2021.
- [3] M. Nagamachi and A.M. Lokman, *Kansei Innovation – Practical Design Applications for Product and Service Development*. Boca Raton, FL, USA: CRC Press, Taylor & Francis Group, 2015.
- [4] Y. Liu, T. Teichert, M. Rossi, H. Li, and F. Hu, “Big Data for Big Insights: Investigating Language Specific Drivers of Hotel Satisfaction with 412,784 User-Generated Reviews”, *Tourism Management*, vol. 59, pp. 554–563, 2017.
- [5] W.M. Wang, Z. Li, Z.G. Tian, J.W. Wang, and M.N. Cheng, “Extracting and Summarizing Affective Features and Responses from Online Product Descriptions and Reviews: A Kansei Text Mining Approach”, *Engineering Applications of Artificial Intelligence*, vol. 73, pp. 149-162, 2018.
- [6] M.D. Prasad and B.R. Shekar, “Measuring service quality of Indian Rail passenger services using RAILQUAL model (A study of South Central Railways)”, in *Proc. of the 2010 IEEE Int. Conf. on Management of Innovation & Technology (ICMIT)*, pp. 292-296, 2010.