IEOM Society International

The 5th North American International Conference on
Industrial Engineering and Operations Management
Detroit, Michigan, USA, August 10-14, 2020

Undergraduate Student Paper Competition Award
Sponsored by Siemens

This award is presented to

Dwi 'Sa Nu[1], Manik Mahachandra[1,2] and Heru Prastawa[1,2]
1 Industrial Engineering Department, Faculty of Engineering, Diponegoro University, Indonesia
2 Center for Biomechanics, Biomaterial, Biomechatronics, and Biosignal Processing, Diponegoro University, Indonesia

In Recognition of Winning the FIRST Place of the IEOM Undergraduate Paper Competition entitled *"Designing The Iron Sandbag for Knee Osteoarthritis Exercise Tool"*.

Dr. Muhammad Sohail Ahmed
Conference Co-Chair
Professor, Engineering Management
School of Engineering
Eastern Michigan University
Ypsilanti, Michigan, USA

Dr. Ahad Ali
Conference Co-Chair
Associate Professor
Director of Industrial Engineering Program
Lawrence Tech University
Southfield, Michigan, USA

Dr. Leslie Monplaisir
Conference Co-Chair
Professor and Chair
Department of Industrial and Systems Engineering
Wayne State University
Detroit, Michigan, USA

Dr. Wilkistar Otieno
Conference Co-Chair
Associate Professor and Chair
Department of Industrial and Manufacturing Engineering
University of Wisconsin-Milwaukee, USA

Sponsors and Partners

Proceedings of the International Conference on Industrial Engineering and Operations Management • Issue August • 2020 • Proceedings of the 5th NA International Conference on Industrial Engineering and Operations Management, IOEM 2020 • Virtual • 10 August 2020 through 14 August 2020 • Code 144118

Document type
Conference Paper

Source type
Conference Proceedings

ISSN
21698767

Designing the iron sandbag for knee osteoarthritis exercise tool

Nu D.'[a] ✉, Mahachandra M.[a, b], Prastawa H.[a, b]

[a] Industrial Engineering Department, Faculty of Engineering, Diponegoro University, Semarang, Indonesia
[b] Center for Biomechanics, Biomaterial, Biomechatronics, and Biosignal Processing, Diponegoro University, Semarang, Indonesia

Abstract

One of major joint disease in Indonesia is knee osteoarthritis, but unfortunately, this condition is not well supported for the patients to do their treatment due to lack in accessibility of physical exercise therapy which required an expensive and big-sized equipment. In order to solve those problems, this research aims to make a concept of therapeutic aid that has an affordable price and portable size but still has its functionality to help patients with doubtful to moderate severity knee osteoarthritis do physical exercise to reduce their knee's pain. This research applied the stages of product design

Preliminary Program

Proceedings

Proceedings of Full Papers Only

5th North American International Conference on Industrial Engineering and Operations Management

Detroit, Michigan, USA, August 10-14, 2020, Virtual via Zoom

Call for Papers – Flyer

Due to many requests, submission deadline is extended to July 10, 2020

IEOM Paper Template **PAPER/ABSTRACT TEMPLATE** IEOM Abstract Template

Submission Link: https://www.xcdsystem.com/IEOM/abstract/index.cfm?ID=M6q7kay

Registration Link: https://www.xcdsystem.com/IEOM/attendee/index.cfm?ID=r1Asg1V

Three Sponsorship Levels for 2020 Detroit Conference: $2,000, $1,000 and $500 – Sponsors Page

JOIN IEOM Member

IEOM Society International Site

IEOM Chapters

IEOM Awards

IEOM Papers SCOPUS In

IEOM Proceedings ONLINE

Find us on Facebook

Join us on LinkedIn

FOLLOW US ON twitter

Photos:

- 2019 Riyadh
- 2019 Toronto
- 2019 Pilsen
- 2019 Bangkok
- 2018 South Africa
- 2018 Washington DC
- 2018 Paris

5th NA International Conference on
Industrial Engineering and Operations Management
August 10-14, 2020, Detroit, MI, USA
Virtual Conference
IEOM Society

Keynote

Keynote Speakers – 2020 IEOM Detroit Conference

Conference Co-Chair Remarks: Monday, August 10, 2020, 9:30 – 9:40 am

Dr. Leslie Monplasir, Chair and Professor, Industrial and Systems Engineering Department, Wayne State University

Opening Keynote I: Monday, August 10, 2020, 9:40 – 10:20 am

Dr. Donna Bell

Global Director
Technology and Features Strategy and Planning
Ford Motor Company
Dearborn, Michigan

Dr. Donna Bell is Global Director, Technology and Features Strategy and Planning at Ford Motor Company, a $150B company. Collaborating with key stakeholders, Donna establishes and communicates customer driven strategies that increase corporate growth in areas such asconnectivity, artificial intelligence (AI), driver assist technology (DAT), and robotics.

Previously, Donna served as the CTO Chief of Staff at Ford, where she improved research processes, managed strategic university alliances, and enhanced Ford's STEM strategy. She led strategic partnerships and external relationships, including Ford's involvement in US CAR (U.S. Council for Automotive Research).

Donna also served as research operations director at Ford's Palo Alto Innovation Labs. Her transformational leadership was important in building the new facility, acquiring the highestcaliber talent, managing a multi-million dollar operating budget, creating a culture of innovation, and connecting new technologies and innovations that were created in Silicon Valley to Ford's winning portfolio. Trained in design thinking, Donna was instrumental in promoting and delivering transformational technologies including AI, Machine Learning, Autonomous Driving Technology including LiDAR, in-vehicle infotainment (IVI), and Connectivity.

From 2014 to 2017, Donna served as the electrical Global Product Development (PD) Quality manager at Ford. She collaborated with product development to ensure designs delivered revenue generating customer experiences. Through Donna's continuous

improvement experience and using proven quality tools such as failure mode avoidance, quality function deployment, and customer driven quality design electrical quality improved by more than 35%.Bell's inspirational leadership led to the electrical organization achieving best in class quality for Lincoln vehicles multiple times, and Ford being recognized by the 2017 JD Power Initial Quality Study for overall quality improvement.

Donna's proven delivery and technical excellence led to her receiving multiple patents and delivering many revenue generating 1st to Ford technologies including the award-winning Sync infotainment system, the fuel saving stop-start technology, and the first-to-industry MyEnergi Lifestyle project, in conjunction with Georgia Tech, projected a 60% energy cost savings and CO2 improvements of over 8,000 kg by incorporating key energy efficient solutions into an average U.S. home.

Donna's involvement in the community is extensive and involves creating programs that educate and develop students in science, technology, engineering, and mathematics (STEM). She has held multiple leadership positions in professional organizations including National Society of Black Engineers, Society of Women Engineers, and Ford's first employee resource group, FAAN (Ford African Ancestry Network).

Donna holds a Bachelor of Science degree in Electrical Engineering from Lawrence Technological University (Southfield, MI), Master of Science degrees in Electronics and Computer Control Systems and Engineering Management, and a PhD in Industrial and Systems Engineering all from Wayne State University (Detroit, MI).

Opening Keynote II: Monday, August 10, 2020, 10:20 – 11:00 am

Dr. Jiju Antony

Professor of Quality Management
School of Social Sciences, Edinburgh Business School
Operations and Logistics Group
Heriot-Watt University
Edinburgh, Scotland, UK

Editor of International Journal of Lean Six Sigma
Associate Editor of TQM and Business Excellence(Taylor and Francis)
Associate Editor of TQM Journal (Emerald)
Associate Editor of Quality in Education (ASQ)

Professor Jiju Antony is recognised worldwide as a leader in Lean Six Sigma (LSS) methodology for achieving and sustaining process excellence. He is a Professor of Quality Management and certified LSS Master Black Belt in the Edinburgh Business School at Heriot-Watt University, Edinburgh, Scotland. He has a proven track record for conducting internationally leading research in the field of Quality Management and Lean Six Sigma. Professor Antony has authored over 400 journal, conference and white papers and 10 text books. He has published **over 250 papers** on Six Sigma and Lean Six Sigma topics and is considered to be one of the highest in the world for the number of Six Sigma publications. Two of his papers published in 2002 entitled (**Critical Success Factors for the successful implementation of Six Sigma projects in organisations (over 900 google citations) and Key Ingredients for the effective implementation of Six Sigma program (over 900 google citations))** have the highest citations making them the most referred to papers in the world in the field of Six Sigma and Continuous Improvement. **He has an h-index of 79** according to Google Scholar **with a total of over 14000 citations on Six Sigma and Lean Sigma topics alone**. He is currently serving as the Editor of the International Journal of Lean Six Sigma, Associate Editor of the TQM and Business Excellence Journal, Associate Editor of TQM Journal (Emerald) and Associate Editor of Quality in Education (ASQ). He is serving on the Editorial Board of six international journals. Professor Antony has worked on a number of consultancy projects with several blue chip companies such as Rolls-Royce, Bosch, Siemens, Parker Pen, Siemens, Johnson and Johnson, GE Plastics, Ford, Scottish Power, Tata Motors, Thales, Nokia, Philips, General Electric, NHS, Glasgow City Council, ACCESS, Scottish Water, Police Scotland,

University Sectors and a number of Small and Medium Sized Enterprises. Professor Antony is a Fellow of the Royal Statistical Society, UK; Fellow of the Chartered Quality Institute, UK; Fellow of the Institute of Operations Management, UK; Fellow of the American Society for Quality and Fellow of the Institute of Six Sigma Professionals. He has been elected to the International Academy of Quality as an Academician this year.

Program Industry Co-Chair Remarks: Tuesday, August 11, 2020, 9:30 – 9:40 am

Dr. Saso Krstovski, MBB, Lean Manufacturing Coach /Six Sigma Master Black Belt, Van Dyke Transmission Plant, Ford Motor Company, Michigan, USA

Tuesday Keynote I: August 11, 2020, 9:40 – 10:20 am

Dr. Raj Kawlra

Director, Global Manufacturing Methods and Measurements
Fiat Chrysler Automobiles (FCA)
Auburn Hills, Michigan

Dr. Raj Kawlra is Director of Global Manufacturing Methods and Measurement at Fiat Chrysler Automobiles. He has 35 years of automotive experience in concurrent engineering, advanced manufacturing engineering, quality, lean manufacturing, launching products, and manufacturing planning functions. He has had the opportunity to work in both powertrain and vehicle assembly. Over the years, he has successfully developed and implemented major strategies to drive improvements in throughput, quality, and cost.

Dr. Kawlra spent the first 16 years of his automotive career at GM Tech Center with responsibilities ranging from lead process engineer for the first "lights out" Flexible Manufacturing System in Powertrain in the late 80s to leading the development of a simple plant floor problem solving toolkit that leveraged advanced statistics and enabled GM to achieve world-class dimensional quality levels during the MY97 launch of their full size trucks at (3) plants. He also had the opportunity to work with the best lean gurus to develop GM's Global Manufacturing System and implement it for their greenfield plant that launched Cadillac CTS in CY01.

Dr. Kawlra joined Chrysler in CY01 with the responsibility to develop and implement the Black Belt program at all of their (28) plant locations. Over the years, he has held numerous leadership positions ranging from Manufacturing Quality Director to Dimensional Quality Director to Industrial Engineering Director to the Manufacturing Planning Director. Over the last 5 years, he has also led the development and implementation of World Class Technology (WCT) – application of lean principles to manufacturing engineering function that designs and implements equipment and processes for all launches – first of its kind in the industry. WCT has been successfully applied across all regions and divisions at FCA, with savings ranging from $5 to 10M for each launch. In his current role as Director of Global Manufacturing, his responsibilities include leading global benchmarking activities, setting competitive targets and driving improvements in operational business metrics, long-term manpower planning, and global data analytics strategy.

Dr. Kawlra is a Big 10 fan, having received degrees from University of Wisconsin (MS, Mech Engr), University of Illinois (MS, IE), and University of Michigan (PhD, IOE). He has a BS in Mechanical Engineering from Indian Institute of Technology. He also has an Executive Management Certification from INSEAD. Over the years he has been on the Department of Defense Oversight Committee (CY09- 11) and has served on the Advisory Board of University of Wisconsin's Industrial and Systems Engineering department

(CY11-17). Dr. Kawlra served as Industrial Advisor of two doctoral students of Doctor of Engineering in Manufacturing Systems at Lawrence Technological University.

Tuesday Keynote II: August 11, 2020, 10:20 – 11:00 am

Dr. Seth Guikema

Professor
Department of Industrial and Operations Engineering and
Department of Civil and Environmental Engineering
University of Michigan
Ann Arbor, Michigan, USA
President, Society of Risk Analysis

Dr. Seth Guikema is a Professor in the Department of Industrial and Operations Engineering and the Department of Civil and Environmental Engineering at the University of Michigan as of August 2015. Prior to this, he was an Associate Professor in the Department of Geography and Environmental Engineering (DoGEE) at Johns Hopkins University. He is also an adjunct Professor II in the Department of Safety, Economics, and Planning at the University of Stavanger in Norway, and a Data Science Research Fellow at One Concern, Inc., a Silcon Valley start-up.

His academic training includes a B.S. in Civil & Environmental Engineering (Cornell University), a M.S. in Civil & Environmental Engineering (Stanford University), a M.E. by thesis in Civil Engineering (University of Canterbury in New Zealand), a Ph.D. in Management Science & Engineering with a concentration in Engineering Risk & Decision Analysis (Stanford University), and a postdoctoral research position in Civil & Environmental Engineering (Cornell University). He began his faculty career at Texas A&M University in Civil Engineering and moved to DoGEE at JHU in 2008. He received tenure at JHU in 2014 and became the Carol Linde Croft Faculty Scholar there in 2015. He moved to the University of Michigan in August 2015. Seth is currently the Area Editor for Mathematical Modeling in the journal Risk Analysis, was an Associate Editor for the ASCE Journal of Infrastructure Systems until 2018, and is on the editorial boards of the journals Reliability Engineering and System Safety and Performability Engineering. He previously completed a three-year terms on the governing Councils of the International Society for Risk Analysis and the INFORMS Decision Analysis Society.

Dr. Guikema's research is highly interdisciplinary. Much of his group's recent work is focused on the problems of urban and infrastructure resilience and sustainability in a changing climate, though areas of application are broad. It is grounded in risk analysis, particularly data-drive risk analysis and complex systems simulation. One major topic is developing, testing, and implementing risk analysis methods based in machine learning, stochastica and agent-based simulation, game theory, and decision analysis. Another strong research thrust in the group is using modern simulation methods to more fully understand the role of human behavior in the evoluation of vulnerabiltiy and risk in hazard-prone regions. This work is a combination of theory and practice, spanning from new methods development, testing, and validation to close interactions with utilities to develop and implement new methods for estimating performance and risk to infrastructure systems from disasters.

Industry Co-Chair Remarks: Wednesday, August 12, 2020, 9:30 – 9:40 am

Dr. Wilkistar Otieno, Associate Professor and Chair Industrial & Manufacturing Engineering, University of Wisconsin-Milwaukee, USA

Wednesday Keynote I: **August 12,** 2020, 9:40 – 10:20 am

Cheryl Thompson

Founder and CEO of CADIA
Center for Automotive Diversity, Inclusion & Advancement
Detroit, Michigan

Talk Title:

Cheryl Thompson is the founder of the Center for Automotive Diversity, Inclusion & Advancement (CADIA). CADIA supports Diversity and Inclusion for the Automotive Industry by providing professional development for individuals, along with resources, programs and tools that drive organizational evolution. A veteran of the automotive industry, Cheryl has over 30 years of experience at Ford Motor Company and American Axle and Manufacturing in positions ranging from skilled trades, operations, engineering and global leadership. She is trained in diversity and inclusion, career and leadership coaching and is Six Sigma trained and certified as a Black Belt. Cheryl has been recognized as a 2019 Influential Women in Manufacturing Honoree, a 2019 Corp Magazine Salute to Diversity award winner, and is the recipient of two Diversity and Inclusion Awards from Ford Motor Company. A sought-after voice and speaker in the automotive, manufacturing and aerospace & defense industries, Cheryl has performed keynote addresses, workshops and breakout sessions for a number of companies and events, including TEDx Windsor, Women in Manufacturing (WiM), the American Automotive Summit, and Society of Women Engineers (SWE).

Wednesday Keynote II: August 12, 2020, 10:20 – 11:00 am

Jeffrey Abell, Ph.D., FSME, PE

Director, Manufacturing Systems Research Lab
Chief Scientist for Global Manufacturing
Global Research & Development
General Motors Company
Warren, Michigan

Dr. Jeffrey Abell is Director and Chief Scientist of Manufacturing Systems Research at General Motors. He is responsible for manufacturing research in the company including vehicle electrification, lightweight materials processing, automation, and artificial intelligence/analytics. Previously, he was responsible for battery manufacturing research and his team played a key role in bringing the Chevy Volt advanced high power battery to production. He has successfully implemented various evolutionary based optimization methods to solve complex industrial design problems and was awarded the 2011 and 2014 General Motors Boss Kettering Awards for outstanding technical innovation. He has a Bachelor's of Mechanical Engineering degree from General Motors Institute (now Kettering University), and graduate degrees in Systems Engineering from Oakland University.

Dr. Abell has also held a number of positions in the product development and manufacturing engineering at GM, Delphi, and DaimlerChrysler, including two international assignments.

Committee

Conference Committee

Conference Chairs

- **Dr. Muhammad Sohail Ahmed,** Professor, Engineering Management, School of Engineering, Eastern Michigan University, Ypsilanti, MI, USA
- **Dr. Ahad Ali,** Associate Professor and Director of Industrial Engineering Program, Lawrence Technological University, Southfield, Michigan, USA
- **Dr. Leslie Monplaisir,** Professor and Chair, Department of Industrial and Manufacturing Engineering, Wayne State University, Detroit, MI, USA
- **Dr. Wilkistar Otieno,** Associate Professor and Chair, Industrial & Manufacturing Engineering, University of Wisconsin-Milwaukee, USA

Program Chairs

- **Dr. Daw Alwerfalli,** Professor and Director of Engineering Management Program, A. Leon Linton Department of Mechanical, Robotics and Industrial Engineering, Lawrence Technological University, Southfoeld, Michigan, USA
- **Dr. Jihong Yan**, Professor in Industrial Engineering and Deputy Dean of School of Mechatronics Engineering, Head of intelligent Manufacturing Scientific Research Team, Harbin Institute of Technology, Harbin, China

Industry Chairs

- **Steven Sibrel**, Se. Supplier Quality Manager, Harman International, Novi, Michigan, USA and Professional Development Chair & Past Chair-ASQ Greater Detroit
- **Dr. Saso Krstovski**, Lean Manufacturing Coach/Six Sigma Master Black Belt, Van Dyke Transmission Plant, Ford Motor Company, Michigan, USA

Diversity and Inclusion Chairs / Women in Industry and Academia Chairs

- **Shannon Dare**, Global Technology Planning & Strategy, Body & Chassis, Ford Motor Company
- **Cheryl Thompson,** Founder and CEO of CADIA, Center for Automotive Diversity, Inclusion & Advancement, Detroit, Michigan

Organizing Committee

- Dr. George Pappas, Assistant Professor, Electrical and Computer Engineering, Lawrence Technological University
- Dr. Hayder Zghair, Adjunct Professor, Lawrence Technological University

- Professor Dr. Norazman Mohamad Nor, Deputy Vice Chancellor (Research and Innovation), National Defence University of Malaysia in Kuala Lumpur
- Dr. Hamid R. Parsaei, Texas A&M University at College Station and Qatar
- Dr. Ismail Tag, SVP & Provost, The Petroleum Institute, Abu Dhabi, UAE
- Dr. Noordin Mohd. Yusof, Universiti Teknologi Malaysia

Advisory Committee

- Pr. Moulay Larbi Abidi, École Mohammadia d'ingénieurs, Rabat, Morocco
- Dr. Muhammad Abid, Ghulam Ishaq Khan Ins. of Eng. Sci. & Tech., Pakistan
- Dr. Olufemi Adetunji, University of Pretoria, South Africa
- Dr. Umar AL-Turki, KFUPM, Saudi Arabia
- Dr. Ronald G. Askin, Arizona State University, USA
- Dr. Mohammed Ben-Daya, KFUPM, Saudi Arabia
- Dr. Abdul Talib Bon, Universiti Tun Hussein Onn Malaysia
- Dr. Raj Das, University of Auckland, New Zealand
- Dr. Kudret Demirli, Khalifa University, Abu Dhabi, UAE
- Dr. Jose Arturo Garza-Reyes, University of Derby, UK
- Dr. Alireza Ghasemi, Dalhousie University, Halifax, NS, Canada
- Dr. Moncer Abdelhamid Hariga, American University of Sharjah, UAE
- Dr. Mohammad D. Al-Tahat, The University of Jordan, Amman, Jordan
- Dr. Arun Kumar, RMIT University, Australia
- Dr. Jay Lee, University of Cincinnati, USA
- Masaru Tezuka, Hitachi Solutions East Japan, Ltd., Sendai, Japan
- Dr. Abu Masud, Wichita State University, Kansas, USA
- Dr. Charles Mbohwa, University of Johannesburg, South Africa
- Dr. Samar Mukhopadhyay, GSB-Sung Kyun Kwan University, Seoul, Korea
- Dr. Nor Hasni Osman, Universiti Utara Malaysia
- Dr. Leonard Perry, University of San Diego, USA
- Dr. Ho Thanh Phong, International University – VNUHCM, Vietnam
- Dr. Abdur Rahim, University of New Brunswick, Canada
- Dr. Mehmet Savsar, Kuwait University, Safat, Kuwait
- Dr. Rapinder Sawhney, University of Tennessee – Knoxville, USA
- Dr. Rosemary Seva, De La Salle University – Manila, Philippines
- Dr. Devdas Shetty, University of the District of Columbia, Washington, DC, USA
- Dr. Hamid Seifoddini, University of Wisconsin-Milwaukee, USA
- Dr. Alfredo Soeiro, University of Porto, Portugal
- Dr. Robert de Souza, The Logistics Institute – Asia Pacific, Singapore
- Dr. Masine Md. Tap, Universiti Teknologi Malaysia
- Dr. Zulkifli Mohamed Udin, Universiti Utara Malaysia
- Dr. Alok Verma, Old Dominion University, Norfolk, Virginia, USA
- Dr. Hari Agung Yuniarto, Universitas Gadjah Mada, Indonesia
- Dr. Li Zheng, Tsinghua University, China
- Dr. Henk Zijm, University of Twente, Netherlands
- Dr. Ravi Inder S Jassar, Birla Institute of Technology and Sci., Pilani, India

Program Committee

- Dr. Rushan Ziatdinov, Department of Industrial & Management Engineering, Keimyung University, Daegu, South Korea
- Dr. Lina Aboueljinane, Industrial Engineering Program, École Nationale Supérieure des Mines de Rabat (ENSMR), Morocco
- Dr. Bouloiz Hafida, Industrial Engineering Department, National School of Applied Sciences (ENSA), Ibn Zohr University, Agadir, Morocco
- Dr. Jaouad Boukachour, Université Le Havre, France

- Dr. Vanajah Siva, Chalmers University, Sweden
- Vanessa Victoire, University of Mauritius
- Prof. Soumaya Yacout, École Polytechnique de Montréal, Canada

Technical Committee

- Maram Al-Shammari, Department of Statistics and Operations Research, King Saud University, Riyadh, Saudi Arabia
- Peter M. Tase, IFEES – GEDC Secretariat
- Dr. A.O. Adewumi, University of KwaZulu-Natal, South Africa
- Dr. Kondo H. Adjallah, Paul-Verlaine University, France
- Dr. Abdollah Aghaie, K.N. Toosi University of Technology, Iran
- Dr. Abdul-Rahman Al-Ali, American University of Sharjah, UAE
- Gasim Al-Hawarii, Senior Fleet Management Engineer, Dubai Municipality, UAE
- Ali I. Al-Mosawi, Miskolic University, Hungary
- Dr. Basel Alsayyed, University of Alberta, Edmonton, Canada
- Dr. Kuchkarov Atamurat, Uzbekistan National University, Uzbekistan
- Dr. Faieza Abdul Aziz, Universiti Putra Malaysia, Selangor, Malaysia
- Dr. Amir Azizi, Universiti Malaysia Pahang, Malaysia
- Dr. Bandar A. Alkhayyal, Department of Engineering Management, College of Engineering, Prince Sultan University, Riyadh, Kingdom of Saudi Arabia
- Amine Belhadi, Industrial Engineering Research Team, Higher School of Technology, Safi, Cadi Ayyad University, Marrakech, Morocco
- Dr. Behnam Bahrami, Eastern Mediterranean University, Famagusta, Cyprus
- Dr. D. K. Banwet, IIT-Delhi, India
- Dr. Abdelaziz Berrado, The Ecole Mohammadia d'Ingénieurs, Rabat, Morocco
- Dr. Mahdi Bashiri, Shahed University, Iran
- Dr. Vladimir Beresnev, Sobolev Institute of Mathematics, Russia
- Dr. Haider Ali Biswas, Khulna University, Bangladesh
- Dr. Miguel Sanz Bobi, Comillas Pontifical University, Spain
- Dr. Nejib Chouaibi, Polytechnic School of Tunisia, Tunisia
- Dr. Mohammad Ishak Desa, Universiti Teknologi Malaysia
- Dr. Omar Elmabrouk, Benghazi University, Libya
- Dr. Dinusha Gamage, University of Moratuwa, Sri Lanka
- Dr. Rodrigo Garrido, Universidad Adolfo Ibaez, Chile
- Dr. Vassilis Gerogiannis, Department of Project Management, Greece
- Dr. Jahara bint Ghani, UKM, Malaysia
- Dr. Ravi Gor, St. Kabir Institute of Professional Studies, Ahmedabad, India
- Dr. Kannan Govindan, University of Southern Denmark, Denmark
- Dr. Md. Mamun Habib, Universiti Utara Malaysia
- Dr. Ramy Harik, University of South Carolina, USA
- Dr. Maruf Hasan, University of New South Wales, Australia
- Dr. Ahmed Kadhim Hussein, Babylon University, Iraq
- Dr. Javad Khamisabadi, Islamic Azad University, Tehran, Iran
- Dr. Raja Kothandaraman, Alpha College of Engineering, Chennai, India
- Dr. Brigitte Jaumard, Concordia University, Canada
- Dr. Rashmi Jha, Gitarattan International Business School (GIBS), Affiliated to Guru Gobind Singh Indraprastha University, New Delhi, India
- Dr. Shahrul B. Kamaruddin, Universiti Sains Malaysia
- Dr. Francis Leung, City University of Hong Kong, China
- Dr. Boudouda Malik, University of Champagne-Ardenne, France
- Dr. Ilias Mamat, Quest International University Perak, Ipoh, Malaysia
- Dr. Fulufhelo Masithulela, University of South Africa
- Dr. Abderrahmane Mellak, University of Boumerdes, Algeria
- Dr. Yuan Xue Ming, SIMTech: Singapore Institute of Manufacturing Technology, Singapore

Proceedings

Proceedings – 5th NA Detroit 2020

ISSN: 2169-8767 (U.S. Library of Congress) **ISBN:** 978-0-9855497-8-7

Papers will be added in the ***IEOM Forefront*** Publication Database, Full papers will be indexed in Scopus and EBSCO.

ID 001 On Effectiveness Evaluation of Innovative Teaching Techniques- A Case Study in Engineering Education

Kapil Gupta, Department of Mechanical and Industrial Engineering Technology, University of Johannesburg, Johannesburg, South Africa

ID 002 Evaluation and Analysis of Students Feedback on Industry 4.0 Virtual Lab developed for Manufacturing Engineering Education

Kapil Gupta, Department of Mechanical and Industrial Engineering Technology, University of Johannesburg, Johannesburg, South Africa

ID 003 Some Insights on Engineering Education 4.0

Kapil Gupta, Department of Mechanical and Industrial Engineering Technology, University of Johannesburg, Johannesburg, South Africa

ID 004 Finite Element Analysis of Machining of Nickel based Superalloy Inconel 600

Adam Khan M and Kapil Gupta, Department of Mechanical and Industrial Engineering Technology, University of Johannesburg, South Africa

ID 005 On Power Consumption while Machining Inconel 600 using Textured Cutting Tools of Tungsten Carbide

Adam Khan M, Department of Mechanical and Industrial Engineering Technology, University of Johannesburg, Johannesburg, South Africa
Kapil Gupta, Department of Mechanical and Industrial Engineering Technology, University of Johannesburg, Johannesburg, Republic of South Africa

ID 006 Assessing the Synergies and misalignments between Lean and Industry 4.0 practices in today's manufacturing shop-floors

Terengganu, Malaysia
Nurfadhlina Abdul Halim, Faculty of Science and Technology, Universiti Sains Islam Malaysia (USIM), Baru Nilai, Nilai, Negeri Sembilan, Malaysia
Puspa Liza Ghazali, Salman Lambak, Hazimi Mohd Foziah, Juliana Arifin and Ahmad Shukri Yazid, Faculty of Business and Management, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Terengganu, Terengganu, Malaysia
Eni Noreni Mohamad Zain, Faculty of Entrepreneurship and Business, Universiti Malaysia Kelantan, Pengkalan Chepa, Kota Bharu, Kelantan, Malaysia
Abdul Talib Bon, Department of Production and Operations, University Tun Hussein Onn Malaysia, Malaysia

ID 537 Decision Factor Towards Product to Become Customer of Bank BNI Batam Branch in Indonesia

Dede Ansyari Guci, Puspa Liza Ghazali, Abdul Malek Bin A Tambi, Salman Lambak and Hazimi Mohd Foziah, Faculty of Business and Management, Universiti Sultan Zainal Abidin. 21300 Kuala Nerus, Terengganu. Malaysia
Dede Ansyari Guci and Amrin Mulia Nst, Faculty of Economic and Management, Universitas Medan Area. Medan Indonesia
Abdul Talib Bon, Department of Production and Operations, University Tun Hussein Onn Malaysia, Malaysia

538 Energy efficiency policy in Germany and Malaysia: key driving factors

Md. Mizanur Rahman, UTM

ID 539 Solar Panel Size for a Single Family House

Nuzhat Ahsan, CAI, Canton, MI, United States

ID 540 Daily Temperature Prediction Using Recurrent Neural Networks and Long-Short Term Memory

Ike Sri Rahayu, Esmeralda C Djamal, and Ridwan Ilyas, Department of Informatics, Universitas Jenderal Achmad Yani, West Java, Indonesia
Abdul Talib Bon, Department of Production and Operations, University Tun Hussein Onn Malaysia, Malaysia

ID 541 Determinre the Enterprise Risk Management Factors Effects on the Malaysian Mtun Universities Performance

Saleh Nasser Abdullah Al-Subari, Rumaizah Ruslan, Shafie Bin Mohamed Zabri, and Fazal Akbar, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia.

ID 542 Food Supply Chain Optimization Modelling in the Rice Crop Post Harvesting in the Philippines: An Agroecological Approach in Food Sustainability

Ma. Patricia Aiyn S. Ortañez, Ross Dale Marie Z. Villaruel, Renzel A. Marañon, Kimberly Kim S. Latorza, and Yoshiki B. Kurata, Industrial Engineering Department, Technological Institute of the Philippines, Cubao, Quezon City, Philippines

ID 543 Modelling an Automobile Assembly Layout Plant Using Probabilistic Functions and Discrete Event Simulation

Nurul Nadiah Abdul Halim, S. Sarifah Radiah Shariff and Siti Meriam Zahari, Centre for Statistics and Decision Science Studies, Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, 40450, Shah Alam, Selangor, Malaysia

ID 551 Prediction of Results of a so Soccer Match at the World Cup Using Backpropagation

Falano Rajib, Esmeralda C.Djamal, and Fatan Kasyidi, Department of Informatics, Jenderal Achmad Yani University, West Java, Indonesia
Abdul Talib Bon, Department of Production and Operations, University Tun Hussein Onn Malaysia, Malaysia

ID 556 Wireless Sensor Networks for Soil Nutrition to Increase Agricultural Productivity

Deden Ardiansyah, and Akbar Sugih Miftahul Huda, Departement of Computer Technologies, Vocational School, Pakuan University, Indonesia

Eneng Tita Tosida, Department of Computer Science, Faculty of Mathematics and Natural Sciences, Universitas Pakuan, Indonesia
Abdul Talib Bon, Department of Production and Operations, University Tun Hussein Onn Malaysia, Malaysia

ID 557 Application of Blockchain Technology in Optimizing E-tailer Supply Chain Costs: Public and Consortium Blockchains

Sahani Rathnasiri and Sardar M. N. Islam, Institute of Sustainable Industries and Liveable Cities, Victoria University, Australia
Pritee Ray, Department of Operations Management, Indian Institute of Management Ranchi, Jharkhand, India

ID 561 Designing The Iron Sandbag for Knee Osteoarthritis Exercise Tool

Dwi 'Sa Nu 1, Manik Mahachandra 1,2 and Heru Prastawa 1,2

1 Industrial Engineering Department, Faculty of Engineering, Diponegoro University, Semarang, Indonesia

2 Center for Biomechanics, Biomaterial, Biomechatronics, and Biosignal Processing, Diponegoro University, Semarang, Indonesia

ID 562 Variation in pain threshold and tolerance in high-risk school children

Mahbuba Sumiya, Detroit, Michigan, United States

ID 563 Use of Ultrasonic Sensor to Guide the Visually-Impaired Poster Competition

Mahbuba Sumiya, Detroit, Michigan, United States

ID 564 System Analysis: A Literature Review

Anouar Hallioui, Industrial Techniques Laboratory, Center for Doctoral Studies in Engineering Sciences, and Techniques – Faculty of Sciences and Techniques of Fez, SIDI MOHAMED BEN ABDELLAH University, Fez
Brahim Herrou, Superior School of Technology, BP. 2427 Route d'Imouzzer, Fez

ID 565 Testing Which Juice Loses the Least Amount of Vitamin C Over Time

Takiyah Ali, MIA, Ann Arbor, MI, United States

ID 566 A Parallel Randomized Approximation Algorithm for Single Machine Scheduling With Applications to Flow Shop Scheduling

HOSSEIN BADRI, Department of Computer Science, Wayne State University, Detroit, MI 48202, USA

ID 567 Stochastic Optimization Methods for Resource Management in Edge Computing Systems

HOSSEIN BADRI, Department of Industrial & Systems Engineering, Wayne State University, Detroit, MI 48202, USA

ID 568 Applying Structural Equation Model to Develop Enterprise Risk Management Model for Malaysian Mtun Universities Performance

Saleh Nasser Abdullah Al-Subari, Rumaizah Ruslan, Shafie Bin Mohamed Zabri and Fazal Akbar, Faculty of Technology Management and Business, University Tun Hussein Onn Malaysia, 86400, Johor, Malaysia

ID 574 Correlations Analysis of Hand Eye Coordination and Agility Athlete Cricket Bekasi City

Memet Muhamad, Mia Kusumawati and Janky Dewi Amar, Islam University "45", Department of Physical Education, Bekasi, Jawa Barat, Indonesia

ID 575 Innermost Hone Model To Enhance The Competency Of Teachers In Evolving Teaching Materials

DESIGNING THE IRON SANDBAG FOR KNEE OSTEOARTHRITIS EXERCISE TOOL

Dwi 'Sa Nu[1], Manik Mahachandra[1,2], Heru Prastawa[1,2]
[1] Industrial Engineering Department, Faculty of Engineering, Diponegoro University, Semarang, Indonesia
[2] Center for Biomechanics, Biomaterial, Biomechatronics, and Biosignal Processing, Diponegoro University, Semarang, Indonesia
[1]dwisanu@students.undip.ac.id

Abstract

One of major joint disease in Indonesia is knee osteoarthritis, but unfortunately, this condition is not well supported for the patients to do their treatment due to lack in accessibility of physical exercise therapy which required an expensive and big-sized equipment. In order to solve those problems, this research aims to make a concept of therapeutic aid that has an affordable price and portable size but still has its functionality to help patients with doubtful to moderate severity knee osteoarthritis do physical exercise to reduce their knee's pain. This research applied the stages of product design described by Ulrich and Eppinger (2012) and assisted by the House of Quality to determine the quality improvement of existing products. The results showed that the type of load used is the important factor that needs more attention. The final chosen concept in this research is a design of ankle weights with additional ties with a bag clip and have adjustable weight. This concept is also received good responses based on the result from willingness to pay (WTP) and willingness to use (WTU) which majority of participants would like to use and buy this therapeutic aid.

Keyword(s): *Product Design, Physical Exercise, Therapeutic Aid, Knee Osteoarthritis, House of Quality.*

1. Introduction

Osteoarthritis (OA) is a disease that affects the musculoskeletal system that is not yet known clearly and precisely what causes it. Usually, this disease attacks old people (Ikeda, Tsumura, & Torisu, 2005). One of the most common joints affected by osteoarthritis is the knee-joint where the knee becomes stiff and painful when moved or given pressure and causes joint space become limited than usual (Buckwalter, Mankin, & Grodzinsky, 2005).

In Indonesia, OA is also the most common joint disease compared to cases of other joint diseases. Based on WHO (2017), around 8.1% of the total population is infected with osteoarthritis. However, only 29% of them do a doctor's examination directly, the rest only rely on themselves by consume pain-free drugs. This is because of their lack of knowledge related to the disease and the limitations of access in therapeutic tool for physical exercise to reduce pain due to osteoarthritis because of the high price and large size.

As explained by Zhang et al. (2013) this form of physical exercise may help prevent the progression of osteoarthritis. However, not all physical exercise can be carried out by most of the patients because usually only patients with the lowest to moderate severity of the disease can do it (Holland & Morrison, 2018). Prevention by doing physical exercise is considered to reduces levels of cytokines in the synovial fluid of the joints and inhibit the process of cartilage degradation and improve symptoms that arise. In other words, this form of therapy can also be carried out by a healthy person who has risk factors. The physical exercise consists of strengthening muscles, flexibility, and aerobics. There are several therapeutic devices which are usually used in hospitals in the city of Semarang which have been researched and proved to be beneficial in reducing knee-pain related to osteoarthritis, such as En-Tree (Kusumawati, 2003) sandbags, static bikes (Karman, 2016), *Theraband* (rubber band) and Quadricep Bench (Suriani & Lesmana, 2013). Based on an interview with one of the medical doctor, Dr. Hari Peni Julianti, Sp.KFR, M.Kes, there are some disadvantages from each tool such as the high cost of the tool and its large size, especially the En-Tree and static bicycles. Other than that, usually the problem is lack of attention to the comfort and safety factors in the

DETERMINRE THE ENTERPRISE RISK MANAGEMENT FACTORS EFFECTS ON THE MALAYSIAN MTUN UNIVERSITIES PERFORMANCE

Saleh Nasser Abdullah Al-Subari,
Faculty of Technology Management and Business,
Universiti Tun Hussein Onn Malaysia
86400 Parit Raja, Batu Pahat, Johor,
Malaysia.
snalsubari@gmail.com
Rumaizah Ruslan,
Faculty of Technology Management and Business,
Universiti Tun Hussein Onn Malaysia
86400 Parit Raja, Batu Pahat, Johor,
Malaysia.
rumaizah@uthm.edu.my
Shafie Bin Mohamed Zabri,
Faculty of Technology Management and Business,
Universiti Tun Hussein Onn Malaysia
86400 Parit Raja, Batu Pahat, Johor,
Malaysia.
shafie@uthm.edu.my
Fazal Akbar
Faculty of Technology Management and Business
University Tun Hussein Onn Malaysia,
86400, Johor, Malaysia
fazal.akbar22@gmail.com

ABSTRACT

Enterprise risk management (ERM) has been the centre of focus for many private organizations especially financial institutions. Like their counterparts, non-profit organizations are not safe from risk exposures and it is more crucial when their funding originated from the public. There is little work done on the enterprise risk management factors in the public organizations and research is needed to find out whether these organizations are serious in managing their risk and do they have a formal structure and framework to handle that. therefore, this study intended to develop enterprise risk management model (ERMM) that can be used to improve MTUN universities performance. Also, data will be collected from academicians at Malaysian Technical University Network (MTUN) which bring together four technology-based universities in Malaysia (the University Malaysia Perlis (UNMAP), Technical University of Malaysia Malacca (UTEM), the University of Tun Hussein Onn Malaysia (UTHM) and University of Malaysia Pahang (UMP). The outcome of the study will be encouraging, as it indicated that ERM factors of this study would have varying levels of influence on university performance. The contribution of the current study would be the improvement of the operations management (performance) and risk management practices by producing high quality publications, get good quality of international students, get high ranking and good reputation. It would assist top management in make the right decision that lead to improve the university performance in control the risk in the university.

Keywords: *Enterprise Risk Management, ERM Factors, Malaysian MTUN and Performance*

1. Introduction of Study

Enterprise risk management in higher education is viewed as a comprehensive process of managing risks across universities that may affect the achievement of the university's objectives as it relates to its core activities in Teaching & Learning, research and service (Abraham, Baird, & Neugebauer, 2013; Association of Governing Boards of Universities & Colleges & United Educators, 2014 and Cameron, 2017). Because of this, Cameron, (2017) explains that there are five distinguishing features of ERM in higher education in comparison with traditional perspectives of risk and risk management. In the first instance, there is a dual perspective of risk in higher education. Risks are considered opportunities (positives) and threats or hazards (negatives) to the HEI (Clyde-Smith, 2014). In this instance, Cameron, (2017) argues that ERM involves managing the opportunities and

Food Supply Chain Optimization Modelling in the Rice Crop Post Harvesting in the Philippines: An Agroecological Approach in Food Sustainability

Ma. Patricia Aiyn S. Ortañez, Ross Dale Marie Z. Villaruel, Renzel A. Marañon, Kimberly Kim S. Latorza, and Yoshiki B. Kurata*
Industrial Engineering Department
Technological Institute of the Philippines
Cubao, Quezon City, Philippines
qmpasortanez@tip.edu.ph, qrdmzvillaruel@tip.edu.ph, qramaranon@tip.edu.ph, qkklatorza@tip.edu.ph, ykurata.ie@tip.edu.ph

Abstract

The agricultural sector contributes fourteen percent to the Philippines' gross domestic product; however, the country's staple food requirement is still insufficient as data show a 16.4% loss in the post-harvesting process of rice crops due to the conventional way of harvesting. The purpose of this study is to provide an optimized process flow model that will lessen the loss incurred in the agro-food supply chain process. Literature reviews were done to validate the gathered data among government agencies, and through the use of Analytical Hierarchy Process (AHP), key variables were identified in determining the relative weights and criteria fitted in the model. Results show that type of seeds, timely harvest, temperature management, moisture content, and ethylene production are relevant factors that cause food loss in the agro-food supply chain. The recommendation includes the establishment of an integrated internet of things (IoT) process incorporating the key variables beneficial for the stakeholders.

Keywords:
Food Supply Chain, Rice Production, Post-harvest, AHP, Optimization

1. Introduction

The Philippines has a population of 104 million people, and seventy percent (70%) of its people depend on its agricultural sector (FAO, 2018). According to FAO (2007), rice is considered to be the most important staple crop in the country with its wide diversity, as eighty-nine percent (89%) of the entire population depends on it. Among the Southeast Asian nations, the Philippines ranked fourth as a rice producer with an estimated yield of 4.08 tons per hectare (USDA, 2015); however the country is not self-sufficient in its staple food requirements (Andales and Gragasin 2000; Castro, 2006) as 16.4 percent loss recorded in the post-harvesting process of rice crops due to the traditional production practiced (PhilMech, 2010) and lack of proper handling and equipment (Mopera, 2016). The Filipinos recorded a total waste of 987,952 kilograms of rice daily (FNRI, 2015). About one-third of the total food produced goes to waste in both developing and developed countries, equivalent to 1.3 billion tons of food loss per year, which can feed about 2 billion people each year (FAO, 2013).

The food supply chain is a process in which food travels from the producers to reach the consumers (Wunderlich & Martinez, 2018) and the impact of losses affect the economic standing of the Philippines' rice production, provided the agricultural sector contributes 14 percent to the Philippines' gross domestic product. Seventeen percent (17%) of rice losses are associated with the absence of poor post-harvesting facilities and practices (Philippine Star, 2018) and attributed due to factors such as the type of seeds, timely harvest, temperature management, moisture content, and ethylene production (IRRI, 1999). Based on the interview, the farmers' lack of experience and knowledge in post-harvesting aside from poor harvesting techniques incurs losses such as manual drying that resulted in the susceptibility of grain. In addition, storage also incurs losses as rodents and other pests cause the rice not to be fit for consumption.

Application of Blockchain Technology in Optimizing E-tailer Supply Chain Costs: Public and Consortium Blockchains

Sahani Rathnasiri, Sardar M. N. Islam
Institute of Sustainable Industries and Liveable Cities, Victoria University, Australia
liyanawaduge.rathnasiri@live.vu.edu.au, Sardar.Islam@vu.edu.au

Pritee Ray
Department of Operations Management, Indian Institute of Management Ranchi, Jharkhand, India
pritee.r@iimranchi.ac.in

Abstract

Blockchain technology implementation is becoming an increasing trend in supply chain operations around the globe. However, the blockchain costs and its impact on the supply chain operational outcomes are still unclear in the literature. Specially, online retail (e-tailer) supply chains can derive significant benefits from blockchain implementation, as they heavily rely on accurate information and proper information sharing among the supply chain members, who are located distantly and externally. The rapid sales growth in the e-tailer supply chains further reinforces the importance of identifying the costs of implementing a blockchain system to derive insights for strategic decisions to improve the operational effectiveness of these supply chains. Therefore, we investigate the cost determinants of public and consortium blockchains in an operational framework of the e-tailer supply chain. The findings emphasize that the transaction fee is a determining factor, and the public blockchain operations are costly in long term operations than the consortium blockchain operations.

Keywords
Blockchain technology, Consortium blockchain, Cost minimization, E-tailer supply chain, Public blockchain

1. Introduction

E-commerce supply chain operations are growing at an exponential rate around the globe due to the lifestyle changes of consumers towards online shopping, thus enabling a large number of e-tailing networks (Li et al. 2020). The present global pandemic skyrocketed the online retailing as consumers have shifted towards online shopping even for the basics such as groceries (Savage 2020). It also generates extreme levels of uncertainty for the e-commerce supply chain operations, along with the increased demand levels (Elrhim and Elsayed 2020). Therefore, e-commerce supply chains require innovative strategies to improve and streamline the operations, which can be obtained by implementing disruptive technologies such as blockchain. Blockchain is one of the best disruptive technologies, which has the potential to enhance the supply chain business processes and transform the traditional operations towards improved supply chain performances (Wamba et al. 2020). The inherent features of blockchain such as decentralized operations, immutable data storage and management create an impact on the supply chain relationships, data management, and enhanced visibility of the supply chain operations (Wang et al. 2019). For e-commerce supply chains, effective information sharing is an essential requirement, as the operations mainly rely on the information than the physical attributes, which blockchain technology showcase a promising impact. The exponential growth of the e-tailer networks increases competition among the supply chains, thereby emphasizing the need for minimizing costs while streamlining the processes (Strand and Strandänger 2016). Even though the benefits of blockchain are widely identified, the investigations of blockchain applications in the supply chains are still in primary stages (Queiroz et al. 2019, Schmidt and Wagner 2019, Wamba and Queiroz 2020) and the knowledge related to the implications of blockchain in supply chain management is scant (Treiblmaier 2018). Moreover, no study is found in the literature, which explores the cost analysis of blockchain implementation in supply chain networks.

Blockchains are segregated into three main frameworks based on their operational setting and the level of decentralization as public, private and consortium blockchains (Zheng et al. 2017, Dib et al. 2018). The different