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Industrial Engineering & Engineering Management

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10-13 Dec, Singapore

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Organizers: IEEE Singapore Section IEEE TEMS Singapore Chapter IEEE TEMS Hong Kong Chapter

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IEEM2018

16-19 Dec • Bangkok, Thailand

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Paper Submission Closes 01 JUN

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CONFERENCE VENUE

SUNTEC Singapore
1 Raffles Boulevard, Suntec City,
Singapore 039593
Tel: +65 6337 2888

WELCOME MESSAGE

Dear Participants,

A very warm welcome to you to the 2017 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM2017) to be held from 10-13 December 2017 in Singapore.

Some eleven years ago, the first IEEM was held in Singapore in 2007. We were encouraged by the support and enthusiasm of our colleagues in Asia and had organized the conference every year without fail since then. It has grown into a high-quality conference in the fields of industry engineering and engineering management, with participants from all corners of the world. For this we are very gratefully to authors, reviewers, participants, and also our co-hosts in Hong Kong, Macau, Bali, Bangkok and Kuala Lumpur during this period. We can now confidently say that IEEM brings together the community's most innovative thinkers and dynamic researchers from around the world to share the latest research findings in industrial engineering and engineering management.

This year, IEEM2017 received nearly 1000 submissions from more than 50 countries. As in the past, each paper was sent to at least three reviewers. The acceptance decisions were based on at least two consistent recommendations, ensuring the quality and standard of the conference. These papers, organized around 20 topics, will be presented in oral and poster sessions. We are also privileged to have with us two distinguished speakers to deliver the keynote presentations:

Professor Andy Neely, Pro-Vice Chancellor, University of Cambridge, United Kingdom, will present on "Rethinking Operations Strategy in an Age of Digital Manufacturing".

Professor Benjamin W. Wah, Provost and Wei Lun Professor, Chinese University of Hong Kong, China, will discuss on "Using Kernels to Harness the Complexity of Big Data."

We are also honored to have Professor Jianjun Shi, editor-in-chief of IISE Transactions, who is also the Carolyn J. Stewart Chair and Professor at the H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, to run a workshop on "How to Publish in Top Journals".

We would like to thank all authors and participants for their interests, contributions and continued support to IEEM. Lastly, we are also grateful to the technical program committee members and reviewers for their help in the review process.

Have a fruitful conference, and we hope that you will enjoy the cultural experiences of Singapore.

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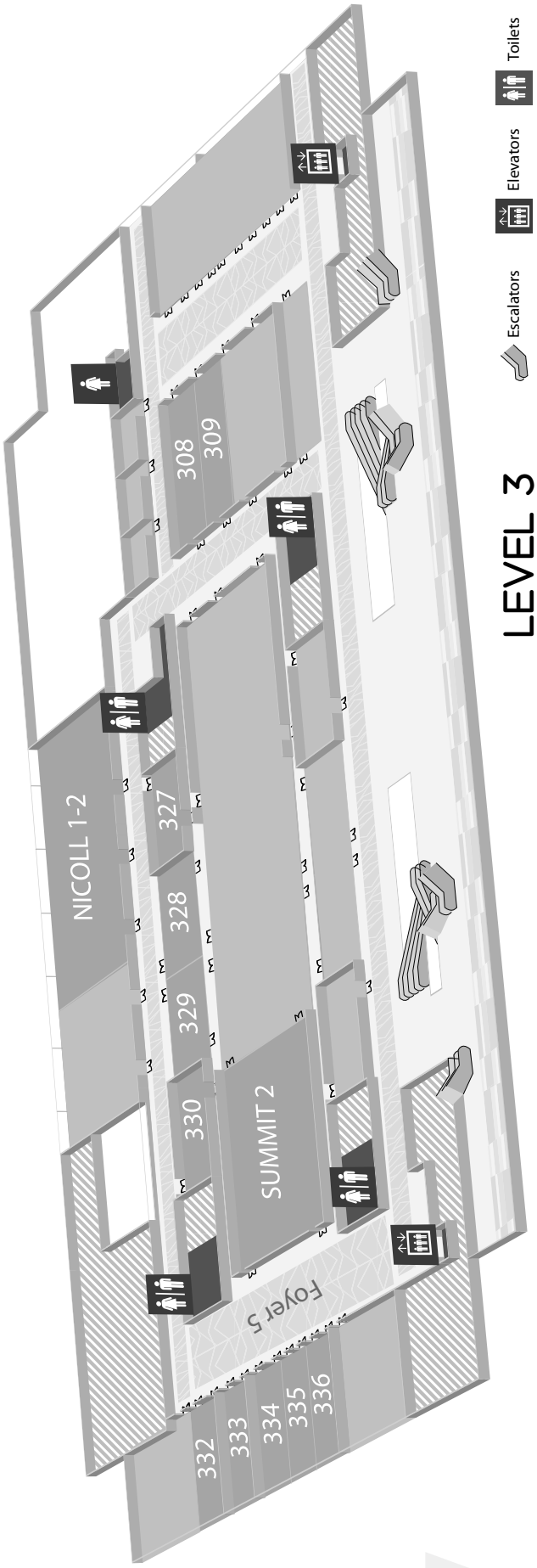
VENUE LAYOUT



Sunday, 10 December 2017 SUNTEC Singapore, Level 3						Venue
09:00 - 13:00	Pre-Conference Tour "Singapore Ethnic Treasures" (Requires Advance Booking) Collect Tour Ticket(s) between 08:00 to 08:45 from MR333					SUNTEC Big Screen, Level 1
13:00 - 17:00	Registration					*Foyer 5*
13:30 - 15:30	**Workshop** *(see also p8)* "How to Publish in Top Journals" **Jianjun SHI** - *Carolyn J. Stewart Chair and Professor, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology*					*MR334*
15:30 - 15.40	**General Chair's Welcome** **Arnoud DE MEYER** - *IEEM2017 General Chair* *President, Singapore Management University, Singapore*					
15:40 - 17:00	Welcome Reception					
Monday, 11 December 2017 **SUNTEC Singapore, Level 3**						**Venue**
08:00 - 17:30	Registration					*Foyer 5*
08:30 - 09:00	Morning Refreshments					
09:00 - 09:15	IEEM2017 Opening					*Summit 2*
09:15 - 10:00	**Keynote 1** *(see also p9)* "Rethinking Operations Strategy in an Age of Digital Manufacturing" **Andy NEELY** - *Pro-Vice Chancellor, University of Cambridge, United Kingdom*					
10:00 - 10:45	**Keynote 2** *(see also p10)* "Using Kernels to Harness the Complexity of Big Data" **Benjamin W. WAH** - *Provost and Wei Lun Professor, Chinese University of Hong Kong, China*					
10:45 - 11:15	AM Coffee/Tea Break					*Nicoll 1-2*
11:15 - 12:45	**MR308**	**MR309**	**MR327**	**MR328**	**MR329**	*Respective Rooms*
	Healthcare Systems and Management 1 *(see also p55)*	Big Data and Analytics 1 *(see also p54)*	Operations Research 1 *(see also p47)*	Engineering Education and Training 1 *(see also p48)*	Intelligent Systems *(see also p49)*	
	MR330	**MR332**	**MR333**	**MR334**	**MR335**	
	"Meet-the Editors" Panel Session	Supply Chain Management 1 *(see also p50)*	Information Processing and Engineering 1 *(see also p51)*	Production Planning and Control 1 *(see also p52)*	Project Management 1 *(see also p53)*	
12:45 - 13:45	Lunch					*Nicoll 1-2*
13:45 - 15:15	**MR308**	**MR309**	**MR327**	**MR328**	**MR329**	*Respective Rooms*
	Healthcare Systems and Management 2 *(see also p65)*	Big Data and Analytics 2 *(see also p64)*	Operations Research 2 *(see also p56)*	Engineering Education and Training 2 *(see also p57)*	Human Factors 1 *(see also 58)*	
	MR330	**MR332**	**MR333**	**MR334**	**MR335**	
	Systems Modeling and Simulation 1 *(see also p59)*	Supply Chain Management 2 *(see also p60)*	Information Processing and Engineering 2 *(see also p61)*	Production Planning and Control 2 *(see also p61)*	Project Management 2 *(see also p63)*	
15:15 - 15:45	PM Coffee/Tea Break					*Nicoll 1-2*
15:45 - 17:30	**MR308**	**MR309**	**MR327**	**MR328**	**MR329**	*Respective Rooms*
	Reliability and Maintenance Engineering 1 *(see also p79)*	Service Innovation and Management 1 *(see also p78)*	Operations Research 3 *(see also p66)*	Technology and Knowledge Management 1 *(see also p68)*	Human Factors 2 *(see also p70)*	
	MR330	**MR332**	**MR333**	**MR334**	**MR335**	
	Systems Modeling and Simulation 2 *(see also p71)*	Supply Chain Management 3 *(see also p72)*	Decision Analysis and Methods 1 *(see also p73)*	Manufacturing Systems 1 *(see also p75)*	Quality Control and Management 1 *(see also p77)*	

OVERVIEW

Tuesday, 12 December 2017 SUNTEC Singapore, Level 3						Venue
08:00 - 18:30	Registration					*Foyer 5*
08:30 - 09:00	Morning Refreshments					
09:00 - 10:45	**MR308**	**MR309**	**MR327**	**MR328**	**MR329**	*Respective Rooms*
	Reliability and Maintenance Engineering 2 *(see also p93)*	Service Innovation and Management 2 *(see also p92)*	Operations Research 4 *(see also p81)*	Technology and Knowledge Management 2 *(see also p82)*	Human Factors 3 *(see also p83)*	
	MR330	**MR332**	**MR333**	**MR334**	**MR335**	
	Systems Modeling and Simulation 3 *(see also p85)*	Supply Chain Management 4 *(see also p86)*	Decision Analysis and Methods 2 *(see also p88)*	Manufacturing Systems 2 *(see also p89)*	Quality Control and Management 2 *(see also p91)*	
10:45 - 11:15	AM Coffee/Tea Break					*Nicoll 1-2*
11:15 - 12:45	**MR308**	**MR309**	**MR327**	**MR328**	**MR329**	*Respective Rooms*
	Reliability and Maintenance Engineering 3 *(see also p103)*	Service Innovation and Management 3 *(see also p102)*	Operations Research 5 *(see also p94)*	Technology and Knowledge Management 3 *(see also p95)*	Safety, Security and Risk Management 1 *(see also p96)*	
	MR330	**MR332**	**MR333**	**MR334**	**MR335**	
	Systems Modeling and Simulation 4 *(see also p97)*	Supply Chain Management 5 *(see also p98)*	Decision Analysis and Methods 3 *(see also p99)*	Manufacturing Systems 3 *(see also p100)*	Quality Control and Management 3 *(see also p101)*	
12:45 - 13:45	Lunch					*Nicoll 1-2*
13:45 - 15:30	Poster Setup					
13:45 - 15:30	**MR308**	**MR309**	**MR327**	**MR328**	**MR329**	*Respective Rooms*
	Reliability and Maintenance Engineering 4 *(see also p113)*	E-Business and E-Commerce *(see also p112)*	Operations Research 6 *(see also p104)*	Technology and Knowledge Management 4 *(see also p105)*	Safety, Security and Risk Management 2 *(see also p106)*	
	MR330	**MR332**	**MR333**	**MR334**	**MR335**	
	Systems Modeling and Simulation 5 *(see also p107)*	Supply Chain Management 6 *(see also p108)*	Decision Analysis and Methods 4 *(see also p109)*	Engineering Economy and Cost Analysis *(see also p110)*	Project Management 3 *(see also p111)*	
15:30 - 16:00	Closing & Award Presentation					*Nicoll 1-2*
16:00 - 18:00	Poster Session & Chill-Chat-Connect! *(see also p114)*					
18:00 - 18:30	Poster Teardown					
18:30 - 22:00	Conference Dinner - 18:30 to 20:30 Open Top Bus Experience - 20:30 to 22:00 Ticketed Event - 1 Ticket Admits ONE Person Only *(see also p12)*					*The Edge, Pan Pacific Hotel*
Wednesday, 13 December 2017						**Venue**
08:30 - 13:00	Advanced Remanufacturing and Technology Centre (ARTC) and Air Traffic Management Research Institute (ATMRI) Technical Visit (Requires Advance Booking)					Gather at SUNTEC Big Screen, Level 1

Sun - 10 Dec | 13:30 - 15:30 | MR334
"How to Publish in Top Journals"

Jianjun SHI
Carolyn J. Stewart Chair and Professor
H. Milton Stewart School of Industrial and Systems Engineering,
Georgia Institute of Technology

Require Advance Booking

Abstract

This workshop will discuss how to identify promising research topics, and how to publish papers in top Journals. Publishing in top international journals is important to many researchers in educational and research institutions. This presentation will discuss various topics important for research and paper writing, including
- How to judge if a journal is among the top ranking?
- How to select and define a research topic?
- How to organize and write a paper?
- What is the reviewing and publishing process for a paper?

The presentation will highlight the "dos and don'ts". In addition, a "methodology tree" strategy will be introduced based on my experience of research and supervision of Ph.D. students. The "methodology tree" is a systematic strategy that can be used to organize the literature reviews, evaluate contributions of a research topic, facilitate communications among researchers, and provide a big picture of research problems involved.

The workshop should help scholars to reflect on their own experiences as researchers, authors, and reviewers. It will be interactive and tailored to the interests of those attending. Do bring along your questions and comments.

About the Speaker

Dr. Jianjun Shi is the Carolyn J. Stewart Chair and Professor in H. Milton Stewart School of Industrial and Systems Engineering, with joint appointment in the George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology. Prior to joining Georgia Tech in 2008, he was the G. Lawton and Louise G. Johnson Professor of Engineering at the University of Michigan. He received his B.S. and M.S. in Electrical Engineering from the Beijing Institute of Technology in 1984 and 1987, and his Ph.D. in Mechanical Engineering from the University of Michigan in 1992.

Dr. Shi is an early pioneer in the development and application of data enabled manufacturing. His methodologies integrate system informatics, advanced statistics, and control theory for the design and operational improvements of manufacturing and service systems.

Dr. Shi is the founding chairperson of the Quality, Statistics and Reliability (QSR) Subdivision at the Institute for Operations Research and Management Science (INFORMS). He is currently serving as the Editor-in-Chief of the IISE Transactions, the flagship journal of the Institute of Industrial and Systems Engineers. He also serves as Focus Issue Editor of IISE Transactions on Quality and Reliability Engineering, Editor of Journal of Systems Science and Complexity, Advisory Editor of International Journal of Quality Technology and Quantitative Management; and Senior Editor of Chinese Journal of Institute of Industrial Engineering. He is a Fellow of the Institute of Industrial Engineering (IIE), a Fellow of American Society of Mechanical Engineering (ASME), a Fellow of Institute of Operations Research and the Management Science (INFORMS), and an Academician of the International Academy for Quality.

Dr. Shi received various awards for his research and education, including the IISE David F. Baker Distinguished Research Award (2016), the IIE Albert G. Holzman Distinguished Educator Award (2011), Forging Achievement Award (2007), Monroe-Brown Foundation Research Excellence Award (2007) and the 1938E Award (1998) at The University of Michigan (2007).

KEYNOTES

Mon - 11 Dec | 09:15 - 10:00 | Summit 2
"Rethinking Operations Strategy in an Age of Digital Manufacturing"

Andy NEELY
Pro-Vice Chancellor
University of Cambridge, United Kingdom

Abstract

In the late 1960s Wickham Skinner wrote a classic article - Manufacturing: The Missing Link in Corporate Strategy. Published in the Harvard Business Review, this article heralded a stream of research on manufacturing strategy, much of which was devoted to the question of how leaders of manufacturing firms can ensure they configure their manufacturing operations appropriately. While there are different perspectives and nuances, in essence the manufacturing strategy literature introduced three key concepts: (i) competitive priorities, (ii) manufacturing decisions areas – which in turn as sub-categorised as structural and infrastructural decision areas. At its heart the literature on manufacturing strategy argued that investments in manufacturing (typically in the manufacturing decision areas) resulted in manufacturing operations building capabilities which in turn allowed them to deliver against their competitive priorities. If, for example, a manufacturing firm was trying to compete on cost, then investments would be needed to drive productivity and efficiency. If the firm was competing on quality, then investments would be needed to ensure processes operated smoothly and quality was assured. Generally the competitive priorities were defined in terms of quality (doing things right), speed (doing things quickly), dependability (doing things as promised), flexibility (changing what you do) and cost (doing things cheaply).

This presentation will explore the implications of digital technologies for the traditional manufacturing decision areas (and hence for manufacturing strategy). What, for example, does the industrial internet mean for how supply chains are managed? What do new technologies – such as additive manufacturing – mean for location and capacity decisions? How can platforms, including crowdfunding platforms such as kickstarter, be used to inform the new product development process? What does the gig economy mean for employment and staffing? How do platform businesses like Uber and Deliveroo manage quality when they don't own or directly control many of their operational resources?

Wherever you look in the manufacturing decision areas it becomes clear that digital technologies fundamentally change the nature of the choices that manufacturers face as they seek to build organisational capabilities.

About the Speaker

Professor Andy Neely is Pro-Vice-Chancellor: Enterprise and Business Relations at the University of Cambridge, Head of the Institute for Manufacturing (IfM) and Head of the Manufacturing and Management Division of Cambridge University Engineering Department. He is a Fellow of Sidney Sussex College and Founding Director of the Cambridge Service Alliance. He is widely recognized for his work on the servitization of manufacturing, as well as his work on performance measurement and management. Previously he has held appointments at Cranfield University, London Business School, Cambridge University, where he was a Fellow of Churchill College, Nottingham University, where he completed his PhD and British Aerospace. He was Deputy Director of AIM Research – the UK's management research initiative – from 2003 until 2012 and was elected a Fellow of the British Academy of Management in 2007, a Fellow of the Academy of Social Science in 2008 and a Fellow of the European Operations Management Association in 2009.

Mon - 11 Dec | 10:00 - 10:45 | Summit 2
"Using Kernels to Harness the Complexity of Big Data"

Benjamin W. WAH
Provost and Wei Lun Professor,
Chinese University of Hong Kong, China

Abstract

Big Data is emerging as one of the hottest multi-disciplinary research fields in recent years. Big data innovations are transforming science, engineering, medicine, healthcare, finance, business, and ultimately society itself. In this presentation, we examine the key properties of big data (volume, velocity, variety, veracity, and value) and their relation to some applications in science and engineering. To truly handle big data, new paradigm shifts will be necessary. Successful applications in big data will require in situ methods to automatically extracting new knowledge from big data, without requiring the data to be centrally collected and maintained. Traditional theory on algorithmic complexity may no longer hold, since the scale of the data may be too large to be stored or accessed. To address the potential of big data in scientific discovery, challenges on data complexity, computational complexity, and system complexity will need to be solved. We propose a new approach based on identifying kernels to harness the complexity of big data applications. Kernel data is a compact and manageable representation of the original data, with similar structure, data properties, or meta-properties. We illustrate these challenges and approaches by drawing on examples in various applications in science and engineering.

About the Speaker

Benjamin W. Wah is currently the Provost and Wei Lun Professor of Computer Science and Engineering of the Chinese University of Hong Kong, as well as the Chair of the Research Grants Council of the University Grants Committee, Hong Kong, and the Franklin W. Woeltge Emeritus Professor of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign. Before then, he served as the Director of the Advanced Digital Sciences Center in Singapore, as well as the Franklin W. Woeltge Professor of Electrical and Computer Engineering and Professor of the Coordinated Science Laboratory of the University of Illinois, Urbana-Champaign, IL. He received his Ph.D. degree in computer science from the University of California, Berkeley, CA, in 1979. He has received numerous awards for his contributions, which include the IEEE CS Technical Achievement Award (1998), the IEEE Millennium Medal (2000), the IEEE-CS W. Wallace-McDowell Award (2006), the Pan Wen-Yuan Outstanding Research Award (2006), the IEEE-CS Richard E. Merwin Award (2007), the IEEE-CS Tsutomu Kanai Award (2009), and the Distinguished Alumni Award in Computer Science of the University of California, Berkeley (2011). Wah's current research interests are in the areas of big data applications and multimedia design and processing.

Wah cofounded the IEEE Transactions on Knowledge and Data Engineering in 1988 and served as its Editor-in-Chief between 1993 and 1996. He currently serves as the Honorary Editor-in-Chief of Knowledge and Information Systems and is on the editorial boards of Information Sciences, International Journal on Artificial Intelligence Tools, Journal of VLSI Signal Processing, World Wide Web, and Journal of Computer Science and Technology. He has served the IEEE Computer Society in various capacities, including Vice President for Publications (1998 and 1999) and President (2001). He is a Fellow of the AAAS, ACM, and IEEE.

PRESENTER GUIDES

Presenter Guide – Oral

1. Prepare Your Presentation

Length of presentation material should be in accordance with your time allotted. Total duration including Q&A and speaker changeover is 15 minutes for each talk. Please refer to the Final Schedule for actual presentation times. You are kindly requested to be at the presentation room at least 15 minutes before the session starts.

2. Determine Your Audio-Visual Needs

Each meeting room comes equipped with a laser pointer and clicker, computer, LCD projector and screen. The computers in the meeting rooms are being provided to Windows-based PC users. The PC will be configured with Microsoft Windows operating system. Please bring your presentation files in Thumb drives only. For MAC-laptop users, please bring your own VGA adapter cable.

3. Create a Backup Copy of Your Presentation

We recommend that you bring at least 2 copies of your presentation to the meeting for backup purposes. Only thumb drives are acceptable.

4. Give Your Presentation

Be considerate to the other speakers and audience by staying within your allocated time. The allocated time for your presentation includes a discussion and a changeover to the next speaker. Session Chairs will hold you to the allotted time. This is essential to ensure adequate time for questions and discussion as well as adherence to the schedule. Please discuss the same material as reported in your abstract submission. At the end of the meeting, all presentation files will be destroyed.

Presenter Guide – Poster

Poster presentations will be held on Tuesday – 12 Dec 2017 in Nicoll 1-2 (Level 3). Poster boards are pre-assigned and marked with your Paper ID. Please feel free to approach the Poster Help Desk for assistance.

1. Poster Display and Viewing

Tuesday – 12 December 2017	
Poster Set-up	From 13:45 to 15:30
Poster Session (Presenter Attendance Required)	From 16:00 to 18:00
Poster Tear-down	By 18:30 latest

2. Prepare Your Poster

Each presenter is provided with a 1m x 2.5m high poster panel. The presentation must cover the same material as the paper submitted. The poster should be 1 x A0 size in vertical/portrait format, measuring 841 mm length x 1189 mm height maximum.

a. Place your Paper ID, Paper Title and Authors' names prominently at the top of the poster to allow viewers to identify your abstract easily.
   Presenter's Name must be underlined and in Bold Letterings.
b. Author's names, e-mails and address information must be provided in case the viewer is interested in contacting you for more information.
c. You have complete freedom in displaying your information in figures, tables, text, photographs, etc in the poster.
d. A successful poster presentation depends on how well you convey information to an interested (but not expert) audience. You may wish to structure your poster by including the background of your research followed by results and conclusions.

3. Set Up Your Poster (See also 1 above)

a. Posters should be set-up by the allocated timing of the assigned day.
b. Your poster presentation time is as shown in the session schedule and presenters are required to be at their posters during the poster viewing times.
c. Adhesive tapes and scissors are available at the Poster Help Desk, nearby the poster boards. If you have any special needs for your poster presentation, please bring those supplies with you to the meeting.

4. Remove Your Poster

a. Posters must be removed after the viewing time time by 18:30 latest.
b. After this time, posters remaining on the boards will be removed and discarded. IEEM2017 will not be responsible for posters and materials left on poster boards after the stated hours.

CONFERENCE DINNER

Date: Tue - 12 Dec 2017
Time: 18:30 to 20:30
Venue: The Edge, Pan Pacific Hotel (Level 3)
Address: 7 Raffles Boulevard
Singapore 039595

Open Top Bus Experience
Time: 20:30 to 22:00
Pick-up: Pan Pacific Hotel Entrance
(Please gather at the hotel lobby by 20:20 for departure)

This is a ticketed event. Each ticket admits one person only.
For enquiries, please see Registration Desk.

Join us this year at the IEEM 2017 conference dinner for an unforgettable evening and dining experience.

Located within the Pan Pacific Hotel and renowned as one of the best buffets in Singapore, Edge serves a plethora of Asian and Pacific delicacies that is guaranteed to leave you satisfied. Aptly named the "food theatre", you will be treated to a visual extravaganza as masterful chef prepares your meal right before your eyes in their various theatre kitchens.

With your bellies filled, a special tour will be arranged for you where you get to experience the city of Singapore in a whole different light (pun intended)! For six weeks every year from November to January, Orchard Road (a popular shopping boulevard) transforms into a Christmas wonderland, as countless glittering lights and beautifully decorated arches line the streets for 2.88 kilometers. So whip out your smartphones, put on your best smiles, and delve into the heart of Orchard Road as we bring you onboard a tour on open-top double decker buses!

We sincerely look forward to you joining us for the IEEM 2017 Conference Dinner, for an evening of delicious food and awesome company. See you in Singapore!

Sessions

Operations Research 1

11/12/2017 11:15 - 12:45
Room: MR327

Chairs: Kaushik NAG, *American University of the Middle East*
Sudhir YADAV, *Pandit Deendayal Petroleum University*

Abstracts: see page 47

IEEM17-P-0808
Evaluating Erlang C and Erlang A Models for Staff Optimization: A Case Study in an Airline Call Center
Kaushik NAG, Magdy HELAL
American University of the Middle East, Kuwait

IEEM17-P-0068
Analyzing the Effectiveness of Lean Manufacturing Practices in Indian Small and Medium Sized Businesses
Saumyaranjan SAHOO, Sudhir YADAV
Pandit Deendayal Petroleum University, India

IEEM17-P-0370
Robustness Through Possible Crew Swaps in Airline Operations
Ian Frederic ILAGAN, Charlle SY
De La Salle University, Philippines

IEEM17-P-0210
A Mixed Integer Programming Optimization of Bundling and Pricing Strategies for Multiple Product Components with Inventory Allocation Considerations
Paul Siegfried BARRIOS, Dennis CRUZ
De La Salle University, Philippines

IEEM17-P-0211
A Tool for Selecting Optimal Emergency Response Unit Locations Using an Integrated AHP-MILP Approach
Jayne Lois SAN JUAN, Christine FERNANDEZ, Bryanne LIM, Erika LIM, Richard LI
De La Salle University, Philippines

IEEM17-P-0241
Positive Behaviour Changes Through Learn-Practice-Implement Leadership Behavioural Standards
Bin MA, Roland LIM, Ming Hon TOH, Huey Yuen NG
Singapore Institute of Manufacturing Technology (SIMTech), Singapore

IEEM17-P-0639
Joint Decision Making About Price and Duration of Discount Airfares
Yanli FANG, Yan CHEN, Xin LI
Macau University of Science and Technology, China

Engineering Education and Training 1

11/12/2017 11:15 - 12:45
Room: MR328

Chairs: Margaret MORGAN, *Ulster University*
Miwa NISHINAKA, *The Graduate University for Advanced Studies*

Abstracts: see page 48

IEEM17-P-0229
Engaging with Industry to Improve Student Learning on Undergraduate Engineering Programmes
Margaret MORGAN, Pearse O'GORMAN
Ulster University, United Kingdom

IEEM17-P-0345
Analysis of the Stakeholders of Engineering Education System to Improve the Creativity of Engineering Education
Rufaidah Y. ALMAIAN
Kuwait University, Kuwait

IEEM17-P-0523
Towards the Best Method of Cross Cultural Training for IT Engineering Graduates from Eastern Indonesia Region: Ready to be Global Engineers
Agung PRABOWO[1], Sulistyowati SULISTYOWATI[1], Ika WINDIARTI[2]
[1]*STMIK Palangkaraya, Indonesia*
[2]*Tridharma University, Indonesia*

IEEM17-P-0845
Development of Needham Model Based e-Module for Electromagnetic Field & Wave
M.F. LEE, N.A. ZAINAL
Universiti Tun Hussein Onn Malaysia, Malaysia

IEEM17-P-0007
Industrial IoT Business Workshop on Smart Connected Application Development for Operational Technology (OT) System Integrator
Satoshi GOTO, Osamu YOSHIE, Shigeru FUJIMURA
Waseda University, Japan

IEEM17-P-0295
How to Improve Employee Education - Methodological Approach to Structure Specialist and Interdisciplinary Requirements
Barbara Theresia WULFKEN[1], Egon MUELLER[2]
[1]*Volkswagen Sachsen GmbH, Germany*
[2]*Technische Universität Chemnitz, Germany*

Intelligent Systems

11/12/2017 11:15 - 12:45
Room: MR329

Chairs: Arnesh TELUKDARIE, *University of Johannesburg*
Abdul-Wahid SAIF, *King Fahd University of Petroleum & Minerals*

Abstracts: see page 49

IEEM17-P-0184
Implementation of Industry 4.0 Technologies in the Mining Industry: A Case Study
Michael N. SISHI, Arnesh TELUKDARIE
University of Johannesburg, South Africa

IEEM17-P-0264
Application of the Agile Energy Model to the Procure to Pay Process
Megashnee MUNSAMY[1], Arnesh TELUKDARIE[2]
[1]*Mangosuthu University of Technology, South Africa*
[2]*University of Johannesburg, South Africa*

IEEM17-P-0641
Usage Frequency of Product Configuration Systems Relative to Integrations and Fields of Application
Sara SHAFIEE[1], Katrin KRISTJANSDOTTIR[1], Lars HVAM[1], Loris BATTISTELLO[2], Enrico SANDRIN[2]
[1]*Technical University of Denmark, Denmark*
[2]*University of Padova, Italy*

IEEM17-P-0278
Chatbots and Conversational Agents: A Bibliometric Analysis
Hio Nam IO, Chang Boon LEE
University of Macau, Macau

IEEM17-P-0760
Evaluation of Knowledge Acquisition from Document Clustering Based on Information Retrieval Scales
Shu OCHIKUBO, Kano KOMIYA, Fumiaki SAITOH, Syohei ISHIZU
Aoyama Gakuin University, Japan

IEEM17-P-0777
Extraction of Customer Satisfaction Topics Regarding Product Delivery Using Non-Negative Matrix Factorization
Tokuhiro KUJIRAOKA, Fumiaki SAITOH, Syohei ISHIZU
Aoyama Gakuin University, Japan

IEEM17-P-0515
A Framework for Knowledge-Intensive Design Decision Support in Model Based Realization of Complex Engineered Systems
Ru WANG[1], Guoxin WANG[1], Yan YAN[1], Shuting CHEN[1], Janet K. ALLEN[2], Farrokh MISTREE[2]
[1]*Beijing Institute of Technology, China*
[2]*The University of Oklahoma, United States*

Supply Chain Management 1

11/12/2017 11:15 - 12:45
Room: MR332

Chairs: Teng-Sheng SU, *Chaoyang University of Technology*
Cagatay IRIS, *Nanyang Technological University*

Abstracts: see page 50

IEEM17-P-0485
Integrated Supporting Cooperation Model with Fuzzy Approach for Staff Scheduling Problem in Service Supply Chain
Teng-Sheng SU, Su-Chuan LIU
Chaoyang University of Technology, Taiwan

IEEM17-P-0430
Models for Continuous Berth Allocation and Quay Crane Assignment: Computational Comparison
Cagatay IRIS, Jasmine Siu Lee LAM
Nanyang Technological University, Singapore

IEEM17-P-0299
Determining Quality Refining Rice Mill Location with Disruption Risks
Wichitsawat SUKSAWAT NA AYUDHYA
King Mongkut's Institute of Technology, Thailand

IEEM17-P-0351
Performance Analysis of Riceberry Rice Supply Chain in Thailand
Wassanai WATTANUTCHARIYA, Thammasak KUAITES
Chiang Mai University, Thailand

IEEM17-P-0543
Framework of Supply Chain Simulation Using SCOR Model in Newspaper Industry
Arinda Soraya PUTRI, Wahyudi SUTOPO, Muhammad HISJAM
Universitas Sebelas Maret, Indonesia

IEEM17-P-0253
Pricing Policy in Green Supply Chain Management with a Risk-Averse Retailer
Bo LI, Yushan JIANG, Xiaolong QU
Tianjin University, China

IEEM17-P-0271
Developing Innovative Supply Chain Using Crowdsourcing: A Conceptual Model
Mahmood ALI[1], Asim MAJEED[2]
[1]*University of Business & Technology, Saudi Arabia*
[2]*Birmingham City University, United Kingdom*

Information Processing and Engineering 1

11/12/2017 11:15 - 12:45
Room: MR333

Chairs: Urs BUEHLMANN, *Virginia Tech*
SC Johnson LIM, *Universiti Tun Hussein Onn Malaysia*

Abstracts: see page 51

IEEM17-P-0339
Estimating Component Yield for CLT Production
Urs BUEHLMANN[1], R. Edward THOMAS[2]
[1]*Virginia Tech, United States*
[2]*USDA Forest Service, United States*

IEEM17-P-0619
Meshes Optimization in Freeform and 3D Printing for Product Design
Chung-Chuan WANG[1], Chung-Shing WANG[2], Ching-Hu YANG[2], Kai-Jai YANG[2], Teng-Ruey CHANG[3]
[1]*Chung-Chou University of Science and Technology, Taiwan*
[2]*Tunghai University, Taiwan*
[3]*Nan Kai University of Technology, Taiwan*

IEEM17-P-0266
Analysis and Mode Establishment of Information Integration Activities - A Case Study Perspective
Te- King CHIEN[1], Hung-Lun CHANG[1], W.L. LAI[2]
[1]*National Formosa University, Taiwan*
[2]*Takming University of Science and Technology, Taiwan*

IEEM17-P-0668
Adaptation of a Product Maturity Model to Highly Iterative Product Development
Günther SCHUH, Jan-Philipp PROTE, Stefan DANY, Marco MOLITOR, Luca PAGANO
RWTH Aachen University, Germany

IEEM17-P-0455
Validation of an Optical System for Measuring the Absolute Angular Position
Tobias SCHNEIDER[1], B. EILERT[1], Malte STONIS[1], Ludger OVERMEYER[2]
[1]*Institut für Integrierte Produktion Hannover, Germany*
[2]*Leibniz Universität Hannover, Germany*

IEEM17-P-0407
Integration of an Automated Load Management in a Manufacturing Execution System
Cedric SCHULTZ, Christina BAYER, Martin ROESCH, Stefan BRAUNREUTHER, Gunther REINHART
Composite and Processing Technology IGCV, Germany

Production Planning and Control 1

11/12/2017 11:15 - 12:45
Room: MR334

Chairs: Gopinath CHATTOPADHYAY, *Federation University*
Nidhal REZG, *University of Lorraine*

Abstracts: see page 52

IEEM17-P-0269
Data Analysis on Applying Real Time Tracking in Production Control of Construction
Jianyu ZHAO, Hylton OLIVIERI, Olli SEPPÄNEN, Antti PELTOKORPI, Behnam BADIHI, Pontus LUNDSTRÖM
Aalto University, Finland

IEEM17-P-0168
Job Scheduling Integrated with Imperfect Preventive Maintenance Considering Time-Varying Operating Condition
Jiawen HU, Zuhua JIANG
Shanghai Jiao Tong university, China

IEEM17-P-0528
A Genetic Algorithm for Unrelated Parallel Machine Scheduling Minimizing Makespan Cost and Electricity Cost Under Time-of-Use (TOU) Tariffs with Job Delay Mechanism
Bobby KURNIAWAN, Alfian Akbar GOZALI, Wei WENG, Shigeru FUJIMURA
Waseda University, Japan

IEEM17-P-0719
Group Production Scheduling Model with Due Window and Maintenance
Wen-Zhu LIAO, Min JIANG, Xiu-Fang ZHANG
Chongqing University, China

IEEM17-P-0123
Product Variety Management Using Data-Mining Methods – Reducing Planning Complexity by Applying Clustering Analysis on Product Portfolios
Jan HOCHDÖRFFER, Clemens LAULE, Gisela LANZA
Karlsruhe Institute of Technology (KIT), Germany

IEEM17-P-0132
Age-Differentiated Analysis of the Influence of the Duration of Breaks on Learning Sensorimotor Tasks
Francoise KUHLENBÄUMER, Simone POLIS, Philipp M. PRZYBYSZ, Susanne MÜTZE-NIEWÖHNER
RWTH Aachen University, Germany

IEEM17-P-0471
In Lean Manufacturing, if the Customer is a King, then the Frontline Worker is a "Knight": A Case Study
Pulek KHOLOPANE, Kehinde SOBIYI
University of Johannesburg, South Africa

Project Management 1

11/12/2017 11:15 - 12:45
Room: MR335

Chairs: Budi HARTONO, *Universitas Gadjah Mada*
Zhe ZHANG, *Nanjing University of Science and Technology*

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IEEM17-P-0473
Effective Knowledge Management Strategy and Firm's Size: Evidence from Indonesia Construction Firms
Budi HARTONO[1], Sinta SULISTYO[2], Kah-Hin CHAI[3], Nurul INDARTI[2]
[1]*University of Gadjah Mada, Indonesia*
[2]*Universitas Gadjah Mada, Indonesia*
[3]*National University of Singapore, Singapore*

IEEM17-P-0356
Context-Oriented Strategy for Modularization of Engineering Design Processes: An Automotive Case Study
Christoph HOLLAUER, Gregor PAVLITZEK, Markus MÖRTL, Udo LINDEMANN
Technical University of Munich, Germany

IEEM17-P-0726
Applicability of Earned Value Management for Deadline Energy Constrained Applications
Shunichiro SUENAGA, Kenji TEI, Shinichi HONIDEN
National Institute of Informatics, Japan

IEEM17-P-0732
Implementation and Assessment of a Predictive Analytics Model for Development Project Management
Günther SCHUH, Michael RIESENER, Christian DÖLLE
RWTH Aachen University, Germany

IEEM17-P-0814
Challenges of Agile Development Implementation in Mechatronic Development Processes
Kristin GOEVERT[1], Attila GÖKDEMIR[1], Christoph PEITZ[2], Udo LINDEMANN[1]
[1]*Technical University of Munich, Germany*
[2]*OSRAM GmbH, Germany*

IEEM17-P-0797
Conflict Management in Outsourced Engineering Projects in South Africa
Bulali MDONTSANE, Hannelie NEL, Annlizé MARNEWICK
University of Johannesburg, South Africa

Big Data and Analytics 1

11/12/2017 11:15 - 12:45
Room: MR309

Chairs: Feng YANG, *Agency for Science Technology and Research (A*STAR), Singapore*
Shen REN, *Agency for Science Technology and Research (A*STAR), Singapore*

Abstracts: see page 54

IEEM17-P-0550
Feature Importance-Guided Multi-Regression Ensemble with Application to Remaining Useful Life Prediction
Feng YANG[1], Ching HUANG[2], M. Salahuddin HABIBULLAH[1], Xulei YANG[1], Yan SHEN[1], Raymond NEO[2]
[1]*Agency for Science Technology and Research (A*STAR), Singapore*
[2]*PSB Academy, Singapore*

IEEM17-P-0336
Status Quo and Future Potential of Manufacturing Data Analytics – An Empirical Study
Sebastian GROGGERT[1], Marian WENKING[2], Robert H. SCHMITT[1], Thomas FRIEDLI[2]
[1]*RWTH Aachen University, Germany*
[2]*University of St. Gallen, Switzerland*

IEEM17-P-0104
Monitoring of an Aluminum Melting Furnace by Means of a 3D Light-Field Camera
Sara MOHAMMADIFARD[1], Jan LANGNER[1], Malte STONIS[1], Hubertus SEMRAU[2], Sven-Olaf SAUKE[2], Hossein LARKI HARCHEGANI[3], Bernd-Arno BEHRENS[3]
[1]*Institut für Integrierte Produktion Hannover, Germany*
[2]*ZPF GmbH, Germany*
[3]*Leibniz Universität Hannover, Germany*

IEEM17-P-0577
Large-Scale Clustering Using Mathematical Programming
Mario GNÄGI, Philipp BAUMANN
University of Bern, Switzerland

IEEM17-P-0842
Association Rules and Collaborative Filtering on Sparse Data of a Leading Online Retailer
Yongzhong WU, Mianmian HUANG, Yuxin LU
South China University of Technology, China

IEEM17-P-0027
A Comparison Between MODWT-SVM-DE Hybrid Model and ARIMA Model in Forecasting Primary Energy Consumptions
Thoranin SUJJAVIRIYASUP[1], Komkrit PITIRUEK[2]
[1]*University of the Thai Chamber of Commerce, Thailand*
[2]*Khon Kaen University, Thailand*

Healthcare Systems and Management 1

11/12/2017 11:15 - 12:45
Room: MR308

Chairs: Xiuzhu GU, *Tokyo Institute of Technology*
Hamid ALLAOUI, *University of Artois*

Abstracts: see page 55

IEEM17-P-0174
Developing an Error Taxonomy System for Patient Handoff Events
Xiuzhu GU, Tsuyoshi SEKI, Kenji ITOH
Tokyo Institute of Technology, Japan

IEEM17-P-0665
Scheduling Patients in Emergency Department: A Case Study
Dorsaf DALDOUL[1], Issam NOUAOURI[2], Hanen BOUCHRIHA[1], Hamid ALLAOUI[2]
[1]*University of Tunis Elmanar, Tunisia*
[2]*University of Artois, France*

IEEM17-P-0796
Simulation Analysis to Improve Outpatient Turnaround Times in Specialty Clinics
Sung SHIM[1], Arun KUMAR[2], J. JIAO[3]
[1]*Seton Hall University, United States*
[2]*RMIT University, Australia*
[3]*Georgia Institute of Technology, United States*

IEEM17-P-0839
Applying Lean Principles to Health Economics Transactional Flow Process to Improve the Healthcare Delivery
Ibrahim ALRASHED, Parminder Singh KANG
De Montfort University, United Kingdom

IEEM17-P-0586
Does Policy of Delayed Retirement Affect Individual Health
Yan ZENG, Qifan JIA, Jie ZHOU
Chinese Academy of Sciences, China

IEEM17-P-0698
An Integer Programming Model for Radiographer Scheduling Considering Skills and Training
Hisashi YUURA[1], Toshiyuki MIYAMOTO[1], Kuniyuki HIDAKA[2]
[1]*Osaka University, Japan*
[2]*Osaka University Hospital, Japan*

Operations Research 2

11/12/2017 13:45 - 15:15
Room: MR327

Chairs: Norbert TRAUTMANN, *University of Bern*
Nur Aini MASRUROH, *Gadjah Mada University*

Abstracts: see page 56

IEEM17-P-0615
An Assignment-Based Continuous-Time MILP Model for the Resource-Constrained Project Scheduling Problem
Tom RIHM, Norbert TRAUTMANN
University of Bern, Switzerland

IEEM17-P-0288
A Robust Optimisation Approach to the Aircraft Sequencing and Scheduling Problem with Runway Configuration Planning
Kam Hung NG, Carman Ka Man LEE, Felix CHAN
The Hong Kong Polytechnic University, Hong Kong SAR

IEEM17-P-0409
A Cut-Off Grade Optimization Model in the Open Pit Mining Considering Reclamation and Valuable Waste Materials
Benazir IMAM ARIF MUTTAQIN, Cucuk Nur ROSYIDI, Eko PUJIYANTO
Universitas Sebelas Maret, Indonesia

IEEM17-P-0499
Comparison of PSO and DE for Truck Scheduling in Multi-Door Cross Docking Terminals
Warisa WISITTIPANICH, Piya HENGMEECHAI
Chiang Mai University, Thailand

IEEM17-P-0836
Worst Case Scenario Lemma for Γ-Robust Combinatorial Optimization Problems Under Max-Min Criterion
Jiabao ZHANG[1], Wei WU[2], Mutsunori YAGIURA[1]
[1]*Nagoya University, Japan*
[2]*Seikei University, Japan*

IEEM17-P-0393
Multi-Skilled Manpower Scheduling with Part-Time Consideration: Case Study
Ping Chong CHUA, Hendra Teja WIRAWAN, Tay Jin CHUA
Singapore Institute of Manufacturing Technology, Singapore

Engineering Education and Training 2

11/12/2017 13:45 - 15:15
Room: MR328

Chairs: Miwa NISHINAKA, *The Graduate University for Advanced Studies*
Margaret MORGAN, *Ulster University*

Abstracts: see page 57

IEEM17-P-0350
Visualization of the Influence by Conceptual Leadership Promoting High Quality Output
Miwa NISHINAKA[1], Kunio SHIRAHADA[2], Youji KOHDA[2]
[1]*The Graduate University of Advanced Studies, Japan*
[2]*Japan Advanced Institute of Science and Technology, Japan*

IEEM17-P-0581
Emotional Intelligence and Information Technology Professionals
Chang Boon LEE, Wing Han Brenda CHAN, Chi Ming LEE
University of Macau, Macau

IEEM17-P-0121
Factors Influencing Research in an Engineering Faculty
Nicoline REYNECKE, Annlizé MARNEWICK, Jan-Harm PRETORIUS
University of Johannesburg, South Africa

IEEM17-P-0192
Vocational Pedagogy Among Technical Vocational Education and Training Teachers
Jailani MD. YUNOS[1], Siti Nur Kamariah RUBANI[1], Faizal AMIN NUR YUNUS[1], Maizam ALIAS[1], Syahril ST[2], Marina IBRAHIM[1], Lee MING FOONG[1], Tee TZE KIONG[1], Sri SUMARWATI[1], Dedy Irfan D[2], Junita SULAIMAN[1]
[1]*University Tun Hussein Onn Malaysia, Malaysia*
[2]*University National Padang, Indonesia*

IEEM17-P-0018
Group Technology Application to Investigate Learning/Teaching Style of Engineering Students
Abdelhakim ABDELHADI
Prince Sultan Univesity, Saudi Arabia

IEEM17-P-0394
Entering the Testing and Certification Industry: A Review of Job and Competency Requirements
Fanny TANG[1], Anne O'GRADY[2], Andrew CLAPHAM[2]
[1]*The Open University of Hong Kong, Hong Kong SAR*
[2]*Nottingham Trent University, United Kingdom*

Human Factors 1

11/12/2017 13:45 - 15:15
Room: MR329

Chairs: Bertha Maya SOPHA, *Gadjah Mada University*
Seng Fat WONG, *University of Macau*

Abstracts: see page 58

IEEM17-P-0203
Knowledge Engineering: Exploring Evacuation Behavior During Volcanic Disaster
Bertha Maya SOPHA[1], Anna Maria Sri ASIH[1], Dini Graita ILMIA[2], Hari Agung YUNIARTO[2]
[1]*Universitas Gadjah Mada, Indonesia*
[2]*Gadjah Mada University, Indonesia*

IEEM17-P-0884
Multi-Control and function Design of Ergonomic Electric Wheelchair for Reducing Pressure Ulcer Problem
Seng Fat WONG, Bin LIN, Z. C. LUO
University of Macau, Macau

IEEM17-P-0896
Ergonomic Assessment and Design Improvement of Shopping Carts for the Satisfaction of Buyers in Grocery Stores and Supermarkets
Rene ESTEMBER, Mara Hiyasmin BERDAN
Mapua University, Philippines

IEEM17-P-0406
Research on Low Cost Virtual Assembly Training Platform Based on Somatosensory Technology
Shengqian JIANG, Peng LIU, Dawei GAO, Yang XU, Xian MENG, Zhaoyi LIU, Zhuo HUANG, Ruolan XU
Jilin University, China

IEEM17-P-0571
A Short Review of Mental Models of Operators in Main Control Rooms of Nuclear Power Plants
Yingzhi ZHANG, Zhizhong LI
Tsinghua University, China

IEEM17-P-0296
An Identification of Dimensions Able to Attract the Potential Workforce for I.T. Industry in India
Bhartrihari PANDIYA, Vijayshri TEWARI, Richa SINGH DUBEY
Indian Institute of Information Technology, Allahabad, India

IEEM17-P-0915
Design Thinking and Semiotics to Increase Socio-Cognitive-Affective Engagement: An Inclusive Design Human Factors Case Study
Chien-Sing LEE[1], K. Daniel WONG[2]
[1]*Sunway University, Malaysia*
[2]*Daniel Wireless Software Pte. Ltd, Singapore*

Systems Modeling and Simulation 1

11/12/2017 13:45 - 15:15
Room: MR330

Chairs: Dinh Son NGUYEN, *University of Science and Technology, The University of Danang*
Karthik SANKARANARAYANAN, *University of Ontario Institute of Technology*

Abstracts: see page 59

IEEM17-P-0809
Topology Optimization as an Innovative Design Method for Additive Manufacturing
Dinh Son NGUYEN[1], Frédéric VIGNAT[2]
[1]*The University of Danang, Viet Nam*
[2]*University of Grenoble Aples, France*

IEEM17-P-0084
Neural Network Analysis of Behavioral Agent-Based Service Channel Data
Karthik SANKARANARAYANAN[1], Ralph LAITE[1], Nataliya PORTMAN[2]
[1]*University of Ontario Institute of Technology, Canada*
[2]*TradeRev, Canada*

IEEM17-P-0505
Agent Based Simulation of a Payment System for Resilience Assessments
Aron LARSSON[1], Osama IBRAHIM[2], Leif OLSSON[1], Joeri VAN LAERE[3]
[1]*Mid Sweden University, Sweden*
[2]*Stockholm University, Sweden*
[3]*University of Skövde, Sweden*

IEEM17-P-0417
A Hybrid Regression Technique for House Prices Prediction
Sifei LU[1], Zengxiang LI[2], Zhen QIN[1], Xulei YANG[1], Rick Siow Mong GOH[1]
[1]*Agency for Science Technology and Research (A*STAR), Singapore*
[2]*Agency for Technology and Research (A*STAR), Singapore*

IEEM17-P-0440
Modeling of Power Profiles of Milling Machines for the Use in Factory Models to Optimize Energy Efficiency
Matthias MEISSNER, Andreas WIRTZ, Johanna MYRZIK
TU Dortmund University, Germany

IEEM17-P-0448
A System Model to Improve the Productivity of a South African Steel Industry
Thomas MUNYAI[1], Charles MBOHWA[2], Olasumbo MAKINDE[1], Boitumelo RAMATSETSE[1]
[1]*Tshwane University of Technology, South Africa*
[2]*University of Johannesburg, South Africa*

Supply Chain Management 2

11/12/2017 13:45 - 15:15
Room: MR332

Chairs: Ravi KANT, *Sardar Vallabhbhai National Institute of Technology*
Akram EL-TANNIR, *Beirut Arab University*

Abstracts: see page 60

IEEM17-P-0237
Examining the Solutions to Overcome the SCKFBs Using Fuzzy AHP and Fuzzy TOPSIS Method
Vishal BHOSALE, Ravi KANT
Sardar Vallabhbhai National Institute of Technology, India

IEEM17-P-0032
Mitigating the Bullwhip Effect in Supply Chains Using Variance Reduction Techniques
A. A. EL-TANNIR
Beirut Arab University, Lebanon

IEEM17-P-0595
Factors Influencing Attitude Toward Behavior in Using Mass Transit System in Bangkok: A Case Study in Car Users
Panisara VANICHKITPISAN, Chivalai TEMIYASATHIT
King Mongkut's Institute of Technology Ladkrabang, Thailand

IEEM17-P-0802
Determining Medical Aid Distribution Route Using Multi-Objective Optimization
Sinta SULISTYO, Rizka RATNASARI
Universitas Gadjah Mada, Indonesia

IEEM17-P-0887
Distribution Planning for Single-Manufacturer Single-Distributor Multi-Retailer Supply Chain
Pachara CHATAVITHEE, Kullapapruk PIEWTHONGNGAM
Khon Kaen University, Thailand

IEEM17-P-0904
Towards a Collaborative Supply Chain Balanced Score Card Framework to Analyse Collaborative Value-Added
Ridha DERROUICHE[1], Samia GAMOURA[1], David DAMAND[1], Hanene BOUGUESSAS[2]
[1]*University of Strasbourg, France*
[2]*WES-Sup, France*

IEEM17-P-0673
Development of Fuzzy Logic and Genetic Fuzzy Commodity Price Prediction Systems – An Industrial Case Study
Joseph C. CHEN, Xiaoyun WANG
Bradley University, United States

Information Processing and Engineering 2

11/12/2017 13:45 - 15:15
Room: MR333

Chairs: SC Johnson LIM, *Universiti Tun Hussein Onn Malaysia*
Urs BUEHLMANN, *Virginia Tech*

Abstracts: see page 61

IEEM17-P-0517
Research Evolution in Design Engineering Education: A Visual Approach Using Thematic Network
S.C. Johnson LIM, Izzat Syahmi GHAZALI
Universiti Tun Hussein Onn Malaysia, Malaysia

IEEM17-P-0909
A Cloud-Based Dynamic Random Software Testing Strategy
Hanyu PEI[1], Beibei YIN[2], Min XIE[1], Kai-Yuan CAI[2]
[1]*City University of Hong Kong, Hong Kong SAR*
[2]*Beihang University, China*

IEEM17-P-0222
The Effective Route Selection for East-West Economic Corridor in the Greater Mekong Subregion: Machine Vision Approach
Woramol Chaowarat WATANABE[1], Takumi ASADA[2], Mikiharu ARIMURA[2]
[1]*Naresuan University, Thailand*
[2]*Muraran Institute of Technology, Japan*

IEEM17-P-0401
Analyzing the Impact of Investor Sentiment in Social Media to Stock Return: Survival Analysis Approach
Aldila RIZKIANA, Hasrini SARI, Pamoedji HARDJOMIJOJO, Budhi PRIHARTONO, Titah YUDHISTIRA
Bandung Institute of Technology, Indonesia

IEEM17-P-0302
Business Process Modelling Tool Selection: A Review
Chuks MEDOH, Arnesh TELUKDARIE
University of Johannesburg, South Africa

IEEM17-P-0834
Implementing Industry 4.0 - A Technological Readiness Perspective
Premaratne SAMARANAYAKE[1], Krishamurthy RAMANATHAN[1], Tritos LAOSIRIHONGTHONG[2]
[1]*Western Sydney University, Australia*
[2]*Thammasat University, Thailand*

Production Planning and Control 2

11/12/2017 13:45 - 15:15
Room: MR334

Chairs: Nidhal REZG, *University of Lorraine*
Rui PENG, *University of Science and Technology Beijing*

Abstracts: see page 62

IEEM17-P-0325
Critical Success Factors for Instrumentation and Control Projects Within the Power Industry in South Africa
Sheeba MATHEW[1], Jan-Harm PRETORIUS[2]
[1]*Matla Power Station, South Africa*
[2]*University of Johannesburg, South Africa*

IEEM17-P-0490
A Benders Decomposition-Based Heuristic Algorithm Framework for Unrelated Parallel Machine Scheduling Problem with Weighted Maximum Earliness and Tardiness
Shijin WANG, Benyan YE
Tongji University, China

IEEM17-P-0236
Parallel Machines Scheduling Problem with Maintenance Using Greedy Algorithm
Wen-Zhu LIAO, Xiaoxia YANG
Chongqing University, China

IEEM17-P-0496
Service Time Effects of Distancing from the Customer, A Case Study from the Swedish Emergency Call Center
Klas GUSTAVSSON
Mid Sweden University, Sweden

IEEM17-P-0484
Package Designs that Enhance Firm Performance in the Japanese Food Industry
Tomofumi MIYANOSHITA[1], Tohru YOSHIOKA-KOBAYASHI[2], Daisuke KANAMA[1]
[1]*Tokyo University of Agriculture, Japan*
[2]*The University of Tokyo, Japan*

IEEM17-P-0631
The Link Between the Use of Advanced Planning and Scheduling (APS) Modules and Factory Context
Jesper KRISTENSEN, Jesper ASMUSSEN, Brian Vejrum WÆHRENS
Aalborg University, Denmark

Project Management 2

11/12/2017 13:45 - 15:15
Room: MR335

Chairs: Zhe ZHANG, *Nanjing University of Science and Technology*
Egon MULLER, *Chemnitz University of Technology*

Abstracts: see page 63

IEEM17-P-0746
A Bi-Level Model with Rough Coefficients for Multi-Mode Resource-Constrained Scheduling Problems
Zhe ZHANG[1], Yang WANG[2]
[1]*Nanjing University of Science and Technology, China*
[2]*Sichuan University, China*

IEEM17-P-0022
An Integrated Approach for Automatic Execution of BIM-based Assemblies Using Light-Framed Constructions
Boya JIANG[1], Lau SSY[2], Qianning ZHANG[2]
[1]*Nanjing Tech University, Singapore*
[2]*National University of Singapore, Singapore*

IEEM17-P-0287
Towards an Integrated Controlling Tool Based on a Time-Varying Project Risk Management Concept
Zoltan SEBESTYÉN, Tamas TÓTH
Budapest University of Technology and Economics, Hungary

IEEM17-P-0291
Agile-Waterfall Hybrid Product Development in the Manufacturing Industry – Introducing Guidelines for Implementation of Parallel Use of the Two Models
Günther SCHUH[1], Eric REBENTISCH[2], Michael RIESENER[1], Frederic DIELS[1], Christian DÖLLE[1], Steffen EICH[2]
[1]*RWTH Aachen University, Germany*
[2]*Massachusetts Institute of Technology, United States*

IEEM17-P-0245
Exploring Risks Causing Schedule Overrun in Upstream Natural Gas Projects-A Critical Review and Implications for Future Research
Munmun BASAK, William Vaughan COFFEY, Robert PERRONS
Queensland University of Technology, Australia

IEEM17-P-0341
An Approach for Managing Project-Communicated Content
Wen-Lung TSAI, Bo-Wei DU, Ying-Hsi CHEN, Yu-Xun LIN
Oriental Institute of Technology, Taiwan

Big Data and Analytics 2

11/12/2017 13:45 - 15:15
Room: MR309

Chairs: Satya SHAH, *University of Greenwich UK*
Shen REN, *Agency for Science Technology and Research (A*STAR), Singapore*

Abstracts: see page 64

IEEM17-P-0580
Is Big Data for Everyone? The Challenges of Big Data Adoption in SMEs
Satya SHAH, Cristina BARDON SORIANO, Alec COUTROUBIS
University of Greenwich, United Kingdom

IEEM17-P-0891
Spatial-Temporal Traffic Speed Bands Data Analysis and Prediction
Shen REN[1], Lin HAN[2], Zengxiang LI[1], Bharadwaj VEERAVALLI[2]
[1]*Agency for Technology and Research (A*STAR), Singapore*
[2]*National University of Singapore, Singapore*

IEEM17-P-0194
A New Data-Driven Intelligent Fault Diagnosis by Using Convolutional Neural Network
Long WEN, Liang GAO, Xinyu LI, Minzhao XIE, Guomin LI
Huazhong University of Science and Technology, China

IEEM17-P-0228
Data Analytics in Product Development: Implications from Expert Interviews
Julian WILBERG, Fabian SCHÄFER, Peter KANDLBINDER, Christoph HOLLAUER, Mayada OMER, Udo LINDEMANN
Technical University of Munich, Germany

IEEM17-P-0871
Investigate Human Behavior During Ramadan Through Network Structure: Evidence from Twitter
Aamna AL-SHEHHI, Wei Lee WOON, Zeyar AUNG
Khalifa University of Science and Technology, United Arab Emirates

IEEM17-P-0885
Predictive Modeling of Aircraft Systems Failure Using Term Frequency-Inverse Document Frequency and Random Forest
Weili YAN, Jun-Hong ZHOU
Singapore Institute of Manufacturing Technology, Singapore

Healthcare Systems and Management 2

11/12/2017 13:45 - 15:15
Room: MR308

Chairs: Carlotta PATRONE, *E.O. Ospedali Galliera*
Hamid ALLAOUI, *University of Artois*

Abstracts: see page 65

IEEM17-P-0565
Managing and Evaluating Different Projects in a Hospital Trough the Analytic Hierarchy Process: Methodology and Test Case
Carlotta PATRONE[1], Adriano LAGOSTENA[1], Roberto REVETRIA[2]
[1]*E.O. Ospedali Galliera, Italy*
[2]*University of Genoa, Italy*

IEEM17-P-0594
Teachers' Mental Health: Perceived Social Justice and Life Satisfaction
Yan LI, Qifan JIA, Jie ZHOU
Chinese Academy of Sciences, China

IEEM17-P-0870
Applying Bayesian Network for Noncommunicable Diseases Risk Analysis: Implementing National Health Examination Survey in Thailand
Kanogkan LEEROJANAPRAPA[1], Walailak ATTHIRAWONG[1], Wichai AEKPLAKORN[2], Kittiwat SIRIKASEMSUK[1]
[1]*King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand*
[2]*Mahidol University, Thailand*

IEEM17-P-0303
Exploring the Internet Resource for Senior Citizens in Taiwan
Shann-Bin CHANG[1], K. Y. HUANG[2], Shu-Min CHANG[3]
[1]*Chaoyang University of Technology, Taiwan*
[2]*Ling Tung University, Taiwan*
[3]*Nankai University of Technology, Taiwan*

IEEM17-P-0858
Transformation of Health Care System Using Internet of Things in Villages
A.S. KARTHIKA, Kavyashree PRAKASHAN, R. ANKAYARKANNI, J. BRIGHT JOSE
St. Xavier's Catholic College of Engineering, India

IEEM17-P-0715
A Deeper Look at the Causes of Hospital Readmissions
Zhongyuan YU, William B. ROUSE
Stevens Institute of Technology, United States

Operations Research 3

11/12/2017 15:45 - 17:30
Room: MR327

Chairs: Nur Aini MASRUROH, *Gadjah Mada University*
Wei WU, *Seikei University*

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IEEM17-P-0597
Optimal Pricing Considering Customer Categories: Case on Car Rental Industries
Nur Aini MASRUROH, Vivian Prislyane TJAKRA, Ririh Rahma RATINGHAYU
Gadjah Mada University, Indonesia

IEEM17-P-0840
A Comparison of Integer Programming Formulations and Variable-Fixing Method for the Nurse Scheduling Problem
Masaya HASEBE[1], Takamasa YAMAZAKI[1], Masakazu RYUMAE[1], Wei WU[1], Koji NONOBE[2], Atsuko IKEGAMI[1]
[1]*Seikei University, Japan*
[2]*Hosei University, Japan*

IEEM17-P-0522
Optimization of Product Bundling Strategy Decisions and Inventory Allocation with the Integration of the Degree of Contingency and Dead Stock Levels in a Multiple Time Period Setting
Edward John FRANCO, Mikhaela Carissa SANTOS, Denise Ericka SUYOM, Dennis CRUZ
De La Salle University, Philippines

IEEM17-P-0768
Agent Scheduling of Call Center Using Decomposition Technique
Netnawee UM-IN, Wipawee THARMMAPHORNPHILAS
Chulalongkorn University, Thailand

IEEM17-P-0767
A Mathematical Model for Double Layer Precast Production Scheduling
Nuntiya IAMSUMANG, Wipawee THARMMAPHORNPHILAS
Chulalongkorn University, Thailand

IEEM17-P-0065
A New Two-Stage Stochastic Model for Reverse Logistics Network Design Under Government Subsidy and Low-Carbon Emission Requirement
Hao YU, Wei Deng SOLVANG
UiT - The Arctic University of Norway, Norway

IEEM17-P-0318
Supply Chain Network Reconfiguration in New Products Launching Phase
Hamed JAHANI, Babak ABBASI, Farzad ALAVIFARD
RMIT University, Australia

IEEM17-P-0795
An Optimal Scheduling Policy for Satellite Constellation Deployment
Sunil SINDHU, Goutam SEN
Indian Institute of Technology Kharagpur, India

Technology and Knowledge Management 1

11/12/2017 15:45 - 17:30
Room: MR328

Chairs: Ville ISOHERRANEN, *University of Oulu*
Yongrae CHO, *Science and Technology Policy Institute*

Abstracts: see page 68

IEEM17-P-0813
A Framework for Lean Knowledge Dissemination: Enhancing Innovation Excellence
R.M. Chandima RATNAYAKE[1], Ville ISOHERRANEN[2]
[1]*University of Stavanger, Norway*
[2]*University of Oulu, Finland*

IEEM17-P-0851
The Effects of Cooperative Activities with Competitors on the Performances of Innovation and Management
Yongrae CHO[1], Choonghyun LEE[2], Eunji MOK[1]
[1]*Science and Technology Policy Institute (STEPI), South Korea*
[2]*Korea Institute of Science & Technology Evaluation and Planning, South Korea*

IEEM17-P-0162
Perceived Distance as a Reflection of an Organizational Culture of Learning from Failure
Jun NAKAMURA[1], Sanetake NAGAYOSHI[2]
[1]*Shibaura Institute of Technology, Japan*
[2]*Shizuoka University, Japan*

IEEM17-P-0073
Relationship Among Knowledge Sharing, Open Innovation and Green Poduction: A Multiple Stakeholders Perspective in Batik Tulis Industries
Augustina Asih RUMANTI[1], T.M.A. Ari SAMADHI[2], Iwan Inrawan WIRATMADJA[2], Indryati SUNARYO[2]
[1]*Telkom University, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

IEEM17-P-0062
From Potential to Realized Technological Capability: The Case of Indonesian Vessel Component Industry
Dian PRIHADYANTI, Budi TRIYONO, Dudi HIDAYAT
Indonesian Institute of Sciences, Indonesia

IEEM17-P-0731
The Influence of Information Technology Infrastructure and Leadership Style on Knowledge Management Implementation
Saide SAIDE[1], Rahmat TRIALIH[2], Azhiah PUTRI [1], Putri Nadya FAZRI[1], Winda HAFIZA[1]
[1]*State Islamic University of Sultan Syarif Kasim, Indonesia*
[2]*Brawijaya University, Indonesia*

IEEM17-P-0603
Research on the Development of General Aviation Industry Chain in Shaanxi Province Based on the Model of GEMD
Qinglin BAO, Huaqi CHAI, Kang WU
Northwestern Polytechnical University, China

IEEM17-P-0224
Creating an Ability to Respond to Changing Requirements by Systematic Modelling of Design Assets and Processes
Samuel ANDRÉ, Fredrik ELGH
Jönköping University, Sweden

Human Factors 2

11/12/2017 15:45 - 17:30
Room: MR329

Chairs: Tarun VERMA, *Indian Institute of Technology, Varanasi,*
Bertha Maya SOPHA, *Gadjah Mada University*

Abstracts: see page 70

IEEM17-P-0617
Injury Analysis of Mine Workers: A Case Study
Vivek THIRUMALA, Tarun VERMA, Suprakash GUPTA
Indian Institute of Technology (Banaras Hindu University), India

IEEM17-P-0788
Reflective Learning in Engineering Education: A Case Study of Shell Eco-Marathon
Sune VON SOLMS, Hannelie NEL
University of Johannesburg, South Africa

IEEM17-P-0558
Implementation of High Performance Work Practices (HPWP) in R&D Organizations: Empirical Evidence from Malaysia
Arnifa ASMAWI, Kok-Wai CHEW
Multimedia University, Malaysia

IEEM17-P-0903
Workplace Diversity and its Outcomes in the Arctic Area
Maryam BARABADI, Abbas BARABADI
UiT The Arctic University of Norway, Norway

IEEM17-P-0576
Integration of a Digital Twin as Human Representation in a Scheduling Procedure of a Cyber-Physical Production System
Iris GRAESSLER, Alexander POEHLER
Paderborn University, Germany

IEEM17-P-0460
Design of an Assistant System for Industrial Maintenance Tasks and Implementation of a Prototype Using Augmented Reality
Ruben SCHLAGOWSKI[1], Claudia MEITINGER[1], Lukas MERKEL[2]
[1]*University of Applied Sciences, Germany*
[2]*Composite and Processing Technology IGCV, Germany*

IEEM17-P-0459
A Soft Approach Towards Gaining Employability in IT Professionals
Richa SINGH DUBEY, Vijayshri TEWARI, Bhartrihari PANDIYA
Indian Institute of Information Technology, Allahabad, India

Systems Modeling and Simulation 2

11/12/2017 15:45 - 17:30
Room: MR330

Chairs: Seng Fat WONG, *University of Macau*
Karthik SANKARANARAYANAN, *University of Ontario Institute of Technology*

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IEEM17-P-0775
Developing Advanced Traffic Violation Detection System with RFID Technology for Smart City
Seng Fat WONG, H. C. MAK, C. H. KU, Weng Ian HO
University of Macau, Macau

IEEM17-P-0257
Path Location Problem for the Marine Container Terminal with Arbitrary Configuration
Etsuko NISHIMURA
Kobe Univesity, Japan

IEEM17-P-0637
Feasibility Analysis of Renewable Based Hybrid Energy System for the Remote Community in Pakistan
Fahad ALI[1], Yuexiang JIANG[1], Kashifullah KHAN[2]
[1]*Zhejiang University China, China*
[2]*University of Science and Technology of China, China*

IEEM17-P-0397
An Integrated Customer-Manufacturer Optimization Model to Determine the Optimal Product Price and Quality Level Using Theory of Utility
Anindya Rachma DWICAHYANI, Cucuk Nur ROSYIDI, Eko PUJIYANTO
Universitas Sebelas Maret, Indonesia

IEEM17-P-0822
Modelling and Simulation of Agricultural Production System Based on IoT Cultivated Fields Information
Yusaku MATSUMOTO[1], Hironori HIBINO[1], Naoki KUBO[1], Makoto KIMURA[2], Yousuke MIZUKAMI[3]
[1]*Tokyo University of Science, Japan*
[2]*HATAKE Company Inc., Japan*
[3]*AGROPOLIS LLC., Japan*

IEEM17-P-0454
Virtualization Technologies in Product Development: A Cross-Industrial User-Study
Sebastian KREMS[1], Diana REICH[2], Rainer STARK[2]
[1]*BMW Group, Germany*
[2]*Technische Universität Berlin, Germany*

IEEM17-P-0926
Reliability Analysis of Cyber-Physical Systems Considering Cyber-Attacks
Zhihui FANG[1], Huadong MO[2], Yong WANG[1]
[1]*University of Science and Technology of China, China*
[2]*ETH Zurich, China*

Supply Chain Management 3

11/12/2017 15:45 - 17:30
Room: MR332

Chairs: Nihal JAYAMAHA, *Massey University*
Nirmal HUI, *National Institute of Technology Durgapur*

Abstracts: see page 72

IEEM17-P-0812
The Effect of Uncertainty Avoidance on Lean Implementation: A Cross Cultural Empirical Study Involving Toyota
Nihal JAYAMAHA, Nigel GRIGG, Nisansala PALLAWALA
Massey University, New Zealand

IEEM17-P-0429
Inventory Control Model of a 4-Echelon Production-Distribution System
Moumita TEWARY[1], Debabrata DAS[2], Nirmal Baran HUI[1]
[1]*National Institute of Technology Durgapur, India*
[2]*Asansol Engineering College, India*

IEEM17-P-0831
Reference Process for the Continuous Design of Production Networks
Günther SCHUH, Jan-Philipp PROTE, Stefan DANY
RWTH Aachen University, Germany

IEEM17-P-0532
Additive Manufacturing Impact for Supply Chain – Two Cases
Sobolev IVAN, Yong YIN
Doshisha University, Japan

IEEM17-P-0171
Coordination in Supply Chain Finance Under CVaR Criteria
Nina YAN, Ye LIU, Chongqing LIU, Hongyan DAI
Central University of Finance and Economics, China

IEEM17-P-0434
Continuous Improvement of Complex Process Flows by Means of Stream as the "Standardized Cross-Enterprise Value Stream Management Method"
Christof OBERHAUSEN, Meysam MINOUFEKR, Peter PLAPPER
University of Luxembourg, Luxembourg

IEEM17-P-0763
Relationship Between Stringent Customer Environmental Requirements and Environmental Performance in Sustainable Supply Chain
Md Rezaul Hasan SHUMON, Shams RAHMAN, Kamrul AHSAN
RMIT University, Australia

Decision Analysis and Methods 1

11/12/2017 15:45 - 17:30
Room: MR333

Chairs: Ahmed EL-BOURI, *Sultan Qaboos University*
Arnesh TELUKDARIE, *University of Johannesburg*

Abstracts: see page 73

IEEM17-P-0754
Allocation of College Students to Business Majors with the Aid of a Linear Programming Model
Ahmed EL-BOURI, Asma AL-ZAIDI
Sultan Qaboos University, Oman

IEEM17-P-0223
Procedures to Accommodate System Fluctuations that Result in Buffer Compromised Systems Governed by the Theory of Constraints
Jivashan REDDY[1], Arnesh TELUKDARIE[2]
[1]*Aerosud Aviation, South Africa*
[2]*University of Johannesburg, South Africa*

IEEM17-P-0023
Optimization of Decision Support System Based on Three-Stage Threat Evaluation and Resource Management
Afshan NASEEM, Shoab Ahmed KHAN, Asad Waqar MALIK
National University of Sciences and Technology (NUST), Pakistan

IEEM17-P-0747
Objective Measurement for Attractiveness of Sightseeing Spots under Minimization of Maximum Error among Pairwise Comparisons
Takashi HASUIKE[1], Hideki KATAGIRI[2], Hiroshi TSUDA[3]
[1]*Waseda University, Japan*
[2]*Kanagawa University, Japan*
[3]*Doshisha University, Japan*

IEEM17-P-0169
A Further Improved Support Vector Machine Model Along with Particle Swarm Optimization for Face Orientations Recognition Based on Eigeneyes by Using Hybrid Kernel
Yang LIU[1], Yongkui SHI[2], Mingwei XU[1], Liangliang ZHANG[1], Ning YU[1], Yonglu DING[1]
[1]*Shandong University of Science and Technology, China*
[2]*State Key Laboratory Breeding Base for Mine Disaster Prevention and Control, China*

IEEM17-P-0758
Fuzzy AHP Method for Prioritizing Logistics Barriers of Exporting Eggs
Pornwasin SIRISAWAT, Narat HASACHOO, Phattaraporn KALAYA
Mae Fah Luang University, Thailand

IEEM17-P-0749
An Analytical Study on Horizontally Collaborative Transportation Strategies
Long ZHENG, K. G. BAE
University of Louisville, United States

IEEM17-P-0158
Implementation of a Role-Based Decision Support System in an Integrated Petrochemical Enterprise
Eyad BUHULAIGA, Arnesh TELUKDARIE
University of Johannesburg, South Africa

Manufacturing Systems 1

11/12/2017 15:45 - 17:30
Room: MR334

Chairs: Yihai HE, *Beihang University*
Chandima RATNAYAKE, *University of Stavanger*

Abstracts: see page 75

IEEM17-P-0165
Time Dynamic Mission Reliability Modeling of Multi-State Manufacturing Systems Based on Universal Generating Function
Kongjun GAO[1], Changchao GU[2], Yihai HE[2]
[1]*PLA91872, China*
[2]*Beihang University, China*

IEEM17-P-0452
Implementation of Lean Principles for Performance Improvement: Use of VSM+WID for Waste Identification
Jose DINIS-CARVALHO[1], R.M. Chandima RATNAYAKE[2], Luis FERRETE[1]
[1]*University of Minho, Portugal*
[2]*University of Stavanger, Norway*

IEEM17-P-0161
Challenges and Opportunities in Implementing Engineering Systems Thinking in Design, Manufacturing and Process Industries in Zimbabwe
Wilson R. NYEMBA, Charles MBOHWA
University of Johannesburg, South Africa

IEEM17-P-0212
Applying Lessons Learned From Lean Implementation For SMEs – Singapore Context
Laura Xiao Xia XU[1], Feng Yu WANG[2]
[1]*Singapore Institute of Manufacturing Technology, Singapore*
[2]*Singapore Institute of Manufacturing Technology (SIMTech), Singapore*

IEEM17-P-0317
Two-Stage Assembly Flowshop Scheduling Problem with Distinct Due Windows
Feng CHEN[1], Tsui-Ping CHUNG[1], Le WANG[2], Meng QIU[2]
[1]*Jilin University, China*
[2]*FAW-Volkswagen Automotive Co., Ltd., China*

IEEM17-P-0160
Redesign and Control of Backtracking of Process Paths in Manufacturing Plant Layouts for Productivity and Sustainability
Wilson R. NYEMBA[1], Marvin MASWERA[2], Charles MBOHWA[1]
[1]*University of Johannesburg, South Africa*
[2]*University of Zimbabwe, Zimbabwe*

IEEM17-P-0072
Towards Just-in-Time (JIT) Production System Through Enhancing Part Preparation Process
Mohd Norzaimi CHE ANI[1], Shahrul KAMARUDDIN[2], Abdul Azid ISHAK[1]
[1]*Universiti Kuala Lumpur, Malaysia*
[2]*Universiti Teknologi Petronas, Malaysia*

IEEM17-P-0449
Product Design for Mass Individualisation for Industrial Application
Ravi K. SIKHWAL, Peter R N. CHILDS
Imperial College London, United Kingdom

Quality Control and Management 1

11/12/2017 15:45 - 17:30
Room: MR335

Chairs: Leif OLSSON, *Mid Sweden University*
Carman Ka Man LEE, *The Hong Kong Polytechnic University*

Abstracts: see page 77

IEEM17-P-0002
Quantifying Leanness Combining Value Stream Mapping with a Data Envelopment Analysis Based Method - A Case Study at a Swedish Logistics Company
Victoria HJALMARSSON, Leif OLSSON
Mid Sweden University, Sweden

IEEM17-P-0582
An Integration Method of MFCA, Dynamic Programming, and Multiple Criteria Decision Making in Operations Improvement: A Case Study
Chompoonoot KASEMSET[1], Chawis BOONMEE[2]
[1]*Chiang Mai University, Thailand*
[2]*Muroran Institute of Technology, Japan*

IEEM17-P-0154
Quality Attributes of Robotic Vehicles and Their Market Potential
Bjoern FRANK[1], Shane J. SCHVANEVELDT[2]
[1]*Sophia University, Japan*
[2]*Weber State University, United States*

IEEM17-P-0438
Application of Quality Function Deployment for Halal Food Products
Iwan VANANY, Ghoffar Albab MAARIF, Adi SOEPRIJANTO, Bilqis AMALIAH
Institut Teknologi Sepuluh Nopember, Indonesia

IEEM17-P-0432
Implementation of Shainin's DOE : A Case of Plastic Injection Molding Process
Tossapol KIATCHAROENPOL, T. VICHIRAPRASERT
King Mongkut's Institute of Technology Ladkrabang, Thailand

IEEM17-P-0207
Developing a Total Quality Management Model for Healthcare Industry: An Indonesian Hospital Case Study
Jonny JONNY, Kriswanto KRISWANTO
Bina Nusantara University, Indonesia

IEEM17-P-0177
State Space Modeling of Multi-Scale Variation Propagation in Machining Process Using Matrix Model
Kun WANG, Yaxiang YIN, Shichang DU, Lifeng XI, Tangbin XIA
Shanghai Jiao Tong University, China

Service Innovation and Management 1

11/12/2017 15:45 - 17:30
Room: MR309

Chairs: Dinh Son NGUYEN, *University of Science and Technology The University of Danang*

Abstracts: see page 78

IEEM17-P-0914
Developing Community-Based Engagement in Smart Cities: A Design-Computational Thinking Approach
Chien-Sing LEE[1], K. Daniel WONG[2]
[1]*Sunway University, Malaysia*
[2]*Daniel Wireless Software Pte. Ltd, Singapore*

IEEM17-P-0572
Application of Queuing Theory in Service Design
Dinh Son NGUYEN
The University of Danang, Viet Nam

IEEM17-P-0825
Examining the Application of Standards for Information Technology Service Management Practice: An Empirical Study
Gregory CHIN, Younes BENSLIMANE, Zijiang YANG
York University, Canada

IEEM17-P-0493
Library Facility Layout Design for Digital Native Generation
Felecia FELECIA, Siana HALIM, D. WULANDARI
Petra Christian University, Indonesia

IEEM17-P-0588
A Study on Entrepreneurial Education Regarding College Students' Creative Tendency, Entrepreneurship Self-Efficacy and Entrepreneurial Motivation
Feng-Ming SUI[1], Jen-Chia CHANG[2], Hsiao HSI-CHI[3], Sheng-Chu SU[1]
[1]*Hwa Hsia University of Technology, Taiwan*
[2]*National Taipei University of Technology, Taiwan*
[3]*Cheng Shiu University, Taiwan*

IEEM17-P-0722
Performance Assessment System Development Based on Performance Prism in Social Services
Rui ESTRADA, Sergio D. SOUSA, Isabel LOPES
University of Minho, Portugal

IEEM17-P-0442
Establishing Suitable Process Improvement Methodologies for Optimizing Servicing Operations in the Banking Industries
Olasumbo MAKINDE, Thomas MUNYAI, Boitumelo RAMATSETSE
Tshwane University of Technology, South Africa

Reliability and Maintenance Engineering 1

11/12/2017 15:45 - 17:30
Room: MR308

Chairs: David VALIS, *University of Defence*
Gopinath CHATTOPADHYAY, *Federation University*

Abstracts: see page 79

IEEM17-P-0200
Modelling Water Distribution Network Failures and Deterioration
David VALIS[1], Kamila HASILOVA[1], Marie FORBELSKA[2], Katarzyna PIETRUCHA-URBANIK[3]
[1]*University of Defence, Czech Republic*
[2]*Mendel University in Brno, Czech Republic*
[3]*Rzeszów University of Technology, Poland*

IEEM17-P-0670
OEE Improvement of Thermoforming Machines Through Application of TPM at Tibaldi Australasia
Vickram CHUNDHOO[1], Gopinath CHATTOPADHYAY[1], Indra GUNAWAN[2], Yousef IBRAHIM[1]
[1]*Federation University, Australia*
[2]*The University of Adelaide, Australia*

IEEM17-P-0529
Birnbaum Importance Measure of Network Based on C-Spectrum Under Saturated Poisson Distribution
Yongjun DU, Shubin SI, Hengyi GAO, Zhiqiang CAI
Northwestern Polytechnical University, China

IEEM17-P-0468
Reliability Analysis of Rectification on Electromagnetic Compatibility Test
Dan LI, Wei DANG, Li SUN, Ye TIAN, Jiaqi FENG
Chinese Academy of Sciences, China

IEEM17-P-0193
Design and Estimation of Reliability of an Off Grid Solar Photovoltaic (PV) Power System in South East Queensland
Mandeep Singh PAHWA, Anisur RAHMAN
Griffith University, Australia

IEEM17-P-0201
Modelling of a Transport Belt Degradation Using State Space Model
David VALIS[1], Dariusz MAZURKIEWICZ[2], Marie FORBELSKA[3]
[1]*University of Defence, Czech Republic*
[2]*Lublin University of Technology, Poland*
[3]*Mendel University in Brno, Czech Republic*

IEEM17-P-0533
Ant Colony Optimization for Component Assignment Problems in Circular Consecutive-k-out-of-n Systems
Zhiqiang CAI, Wei WANG, Shuai ZHANG, Zhongyu JIANG
Northwestern Polytechnical University, China

IEEM17-P-0331
Justification of Maintenance Management: AHP Approach
Sachin YADAV[1], Rajesh Kumar SINGH[2], Pravin KUMAR[3]
[1]*Guru Gobind Singh Indraprastha University, India*
[2]*Management Development Institute, India*
[3]*Delhi Technological University, India*

Operations Research 4

12/12/2017 09:00 - 10:45
Room: MR327

Chairs: Mangesh GHAROTE, *Tata Consultancy Services*
Li ZHU, *Dalian University of Technology*

Abstracts: see page 81

IEEM17-P-0674
Multi-Objective Stable Matching with Ties
Nitin PHUKE[1], Mangesh GHAROTE[2], Rahul PATIL[3], Sachin LODHA[2]
[1]*College of Engineering, India*
[2]*Tata Consultancy Services, India*
[3]*Indian Institute of Technology, Bombay, India*

IEEM17-P-0363
Key Performance Indicators for Manufacturing Operations Management in the Process Industry
Li ZHU[1], Charlotta JOHNSSON[2], Jacob MEJVIK[2], Martina VARISCO[3], Massimiliano SCHIRALDI[3]
[1]*Dalian University of Technology, China*
[2]*Lund University, Sweden*
[3]*University of Rome Tor Vergata, Italy*

IEEM17-P-0769
Supply Chain Coordination and Revenue-Sharing Contract with Backlogs for a Perishable Product
Renfei LUO, Zhaotong LIAN, Chang Boon LEE
University of Macau, Macau

IEEM17-P-0737
A Capacitated Location-Routing Problem with Customer Satisfaction Under Facility Disruption
Pooya POURREZA, Reza TAVAKKOLI-MOGHADDAM, Soroush AGHAMOHAMADI, Ali BOZORGI-AMIRI, Yaser RAHIMI
University of Tehran, Iran

IEEM17-P-0584
Time-Varying Hyperparameter Strategies for Radial Basis Function Surrogate-Based Global Optimization Algorithm
Peng JIANG[1], Christine SHOEMAKER[2], Xiao LIU[1]
[1]*Shanghai Jiao Tong University, China*
[2]*National University of Singapore, Singapore*

IEEM17-P-0593
A New MILP Formulation for Rebalancing Enhanced Index-Tracking Portfolios
Oliver STRUB
University of Bern, Switzerland

IEEM17-P-0672
Two-Dimensional Lease Contract Model with Coordination for New and Used Equipment
Hennie HUSNIAH[1], Udjianna S. PASARIBU[2], Bermawi P. ISKANDAR[2]
[1]*University of Langlangbuana, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

Technology and Knowledge Management 2

12/12/2017 09:00 - 10:45
Room: MR328

Chairs: Charles MBOHWA, *University of Johannesburg*
Michel ALDANONDO, *Toulouse University*

Abstracts: see page 82

IEEM17-P-0478
Constraints Driven Reverse Logistics Model for Plastic Solid Waste (PSW)
Bupe MWANZA, Arnesh TELUKDARIE, Charles MBOHWA
University of Johannesburg, South Africa

IEEM17-P-0666
Customer Supplier Relation: Towards a Constraint-Based Model for Bids
Delphine GUILLON[1], Abdourahim SYLLA[1], Elise VAREILLES[1], Michel ALDANONDO[1], Eric VILLENEUVE[2], Christophe MERLO[2], Thierry COUDERT[3], Laurent GENESTE[3]
[1]*Université de Toulouse – Mines Albi, France*
[2]*ESTIA – Bidart, France*
[3]*Université de Toulouse – ENI Tarbes, France*

IEEM17-P-0373
Knowledge Sharing in Thai SMEs in Manufacturing Sector
Chayaruk Thanee TIKAKUL, Avril THOMSON
University of Strathclyde, United Kingdom

IEEM17-P-0216
Lean Execution of Engineering Projects: The Potential Application of Case- Based Reasoning to Facilitate Cross-Project Knowledge Transfer
Andika RACHMAN, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

IEEM17-P-0297
Transformation of Working Environments Through Digitalization: Exploration and Systematization of Complexity Drivers
Benedikt Andrew LATOS, Markus HARLACHER, Philipp M. PRZYBYSZ, Susanne MÜTZE-NIEWÖHNER
RWTH Aachen University, Germany

IEEM17-P-0562
Extended CAD-Models – State of Practice Within Three Companies
Tim HEIKKINEN, Joel JOHANSSON, Fredrik ELGH
Jönköping University, Sweden

IEEM17-P-0361
Analysing Service Quality Using Customer Expectations and Perceptions in the South African Telecommunication Industry
Mfanasibili NGWENYA
University of Pretoria, South Africa

Human Factors 3

12/12/2017 09:00 - 10:45
Room: MR329

Chairs: Markus HARTONO, *University of Surabaya*
Nantakrit YODPIJIT, *King Mongkut's University of Technology North Bangkok*

Abstracts: see page 83

IEEM17-P-0535
The Extended Framework of Kansei Engineering, Kano and TRIZ Applied to Logistics Services
Markus HARTONO[1], Amelia SANTOSO[1], Dina Natalia PRAYOGO[2], Ivon IVON[1]
[1]*University of Surabaya, Indonesia*
[2]*University of Indonesia, Indonesia*

IEEM17-P-0920
A Low-Cost Portable 3D Human Motion Analysis System: An Application of Gait Analysis
Nantakrit YODPIJIT[1], Manutchanok JONGPRASITHPORN[2], Kengkaj PONGMIT[1], Teppakorn SITTIWANCHAI[1]
[1]*King Mongkut's University of Technology North Bangkok, Thailand*
[2]*King Mongkut's Institute of Technology Ladkrabang, Thailand*

IEEM17-P-0894
Information Security in Communication Network of Memory Channel Considering Information Importance
Takaaki KAWANAKA[1], Shuichi ROKUGAWA[1], Hiroshi YAMASHITA[2]
[1]*The University of Tokyo, Japan*
[2]*Meiji University, Japan*

IEEM17-P-0516
The Importance of Compliance with the Expectations of the Value of Stakeholder in Order to Achieve Success in the Implementation of Lean Projects
M.A. GÓMEZ GAVITO, Pablo NUÑO DE LA PARRA, Cesar DE LA LUZ DE JESÚS
Universidad Popular Autónoma del Estado de Puebla, Mexico

IEEM17-P-0583
Applying the Purdue Pegboard to Evaluate Precision Assembly Performance
Yu-Cheng TSENG, Kai-Yin CHANG, Pin-Ling LIU, Chien-Chi CHANG
National Tsing Hua University, Taiwan

IEEM17-P-0604
Effects of Search Strategies on Fault Diagnosis Performance
Qiuran LUO, Xuansheng DING, Weiwei QIU, Zhizhong LI
Tsinghua University, China

IEEM17-P-0495
Application-Specific Design of Assistance Systems for Manual Work in Production
Lukas MERKEL, Christoph BERGER, Cedric SCHULTZ, Stefan BRAUNREUTHER, Gunther REINHART
Composite and Processing Technology IGCV, Germany

IEEM17-P-0033
Introducing Process Building Blocks for Planning the Division of Labor in Human Robot Work Systems
Peter KUHLANG[1], Daniel SCHROETER[2], Thomas FINSTERBUSCH[1], Manuela OSTERMEIER[1], Thomas MUEHLBRADT[1]
[1]*Deutsche MTM-Vereinigung e.V., Germany*
[2]*Adam Opel AG, Germany*

Systems Modeling and Simulation 3

12/12/2017 09:00 - 10:45
Room: MR330

Chairs: Amos H.C. NG, *University of Skovde*
Tatsushi NISHI, *Osaka University*

Abstracts: see page 85

IEEM17-P-0281
Improving the Material Flow of a Manufacturing Company via Lean, Simulation and Optimization
Ainhoa GOIENETXEA URIARTE[1], Amos H.C. NG[1], Enrique ZÚÑIGA[1], M. URENDA MORIS[2]
[1]*University of Skövde, Sweden*
[2]*Jönköping University, Sweden*

IEEM17-P-0751
A Multi-Commodity Flow Model for Guide Path Layout Design of AGV Systems
Shuhei AKIYAMA[1], Tatsushi NISHI[1], Toshimitsu HIGASHI[2], Kenji KUMAGAI[2], Michi HASHIZUME[2]
[1]*Osaka University, Japan*
[2]*Murata Machinery, LTD., Japan*

IEEM17-P-0262
Simulation Study on Evolvement Mechanism of Group Events in Large Projects
Ling LI[1], Xue ZHAO[1], Shiruo ZHANG[2]
[1]*Tianjin University, China*
[2]*Missouri University of Science and Technology, United States*

IEEM17-P-0611
A Modelling Approach for Maintenance Resource-Provisioning Policies in a Wind Farm Maintenance System
Winda Nur CAHYO
Islamic University of Indonesia, Indonesia

IEEM17-P-0125
A Review of Modelling Approaches for Conceptual Design of Complex Engineering Systems (CESs)
Shiva ABDOLI, Sami KARA
University of New South Wales, Australia

IEEM17-P-0764
Crowdsourced Delivery for Last-Mile Distribution: An Agent-Based Modelling and Simulation Approach
Ping CHEN, Stanislav CHANKOV
Jacobs University Bremen, Germany

IEEM17-P-0874
Predicting Atmospheric Corrosion Rates of Copper in Taiwan Industrial Zones Using Artificial Neural Network
Chien Ming LO, Ya-Ping CHIU, Min-Der LIN
National Chung Hsing University, Taiwan

Supply Chain Management 4

12/12/2017 09:00 - 10:45
Room: MR332

Chairs: Linda ZHANG, *IESEG School of Management*
Diana FEIBERT, *Technical University of Denmark*

Abstracts: see page 86

IEEM17-P-0292
Application of Interpretive Structural Modelling for Analyzing the Factors of IoT Adoption on Supply Chains in the Chinese Agricultural Industry
Danping LIN[1], Carman Ka Man LEE[2], W.C. TAI[2]
[1]*Shanghai Maritime University, China*
[2]*The Hong Kong Polytechnic University, Hong Kong SAR*

IEEM17-P-0481
An Integrated Process and Digitalization Perspective on the Shipping Supply Chain – A Literature Review
Diana FEIBERT, Mette Sanne HANSEN, Peter JACOBSEN
Technical University of Denmark, Denmark

IEEM17-P-0695
Blockchain Application in Food Supply Information Security
Daniel TSE, Bowen ZHANG, Haoran MU, Shenli CHENG, Yuchen YANG
City University of Hong Kong, Hong Kong SAR

IEEM17-P-0096
A Design Methodology for Biomass Energy Supply Chains Based on Weighted K-Means Algorithm
Hongyan DAI[1], Yali LIU[1], Yining CHANG[1], Songlin CHEN[2]
[1]*Central University of Finance and Economics, China*
[2]*Nanyang Technological University, Singapore*

IEEM17-P-0166
Supply Chain Collaboration – A Case Study of Textile and Apparel Industry
Thi Phuong Dung HO, Arun KUMAR, Nirajan SHIWAKOTI
RMIT University, Australia

IEEM17-P-0898
A Simulation-Based Modeling Approach to Assess the Multi-Echelon Supply Chain Network Design
Inoka MUNASINGHE , Thashika RUPASINGHE, Ruwan WICKRAMARACHCHI
University of Kelaniya, Sri Lanka

IEEM17-P-0869
Toward Sustainable Reverse Logistics Implementation: A Conceptual Framework of the Quattro Bottom Line Approach
Hesti MAHESWARI, Gatot YUDOKO, Akbar ADHIUTAMA
Institut Teknologi Bandung, Indonesia

IEEM17-P-0518
Vendor Managed Inventory on Two Echelon Inventory System with Optimum Accelerated Lead Time and Component Commonality
Yosi Agustina HIDAYAT[1], Tota SIMATUPANG[1], Sebrina SEBRINA[1], Nashir ARIANSYAH[2], Wibisana SEMBADA[1]
[1]*Institut Teknologi Bandung, Indonesia*
[2]*Telkom University, Indonesia*

Decision Analysis and Methods 2

12/12/2017 09:00 - 10:45
Room: MR333

Chairs: Kasin RANSIKARBUM, *Ubonratchathani University*
Alberto BELLINI, *University of Bologna*

Abstracts: see page 88

IEEM17-P-0029
Multi-Criteria Selection Problem of Part Orientation in 3D Fused Deposition Modeling Based on Analytic Hierarchy Process Model: A Case Study
Kasin RANSIKARBUM[1], Namhun KIM[2]
[1]*Ubonratchathani University, Thailand*
[2]*Ulsan National Institute of Science and Technology, South Korea*

IEEM17-P-0659
The Determinants of Asset Mothballing in the Offshore Supply Market
Roar ADLAND, Oda SVÆREN
Norwegian School of Economics, Norway

IEEM17-P-0232
An Extended TODIM Method Under Probabilistic Dual Hesitant Fuzzy Information and its Application on Enterprise Strategic Assessment
Zhiliang REN[1], Zeshui XU[1], Hai WANG[2]
[1]*Southeast University, China*
[2]*Nanjing Audit University, China*

IEEM17-P-0233
Dual Probabilistic Linguistic Term Set and its Application on Multi-Criteria Group Decision Making Problems
Wanying XIE, Zeshui XU, Zhiliang REN
Southeast University, China

IEEM17-P-0596
Modelling the Emergence of Modularity and its Limits, Markov Decision Process and Agent Based Modelling Approach
Imane BOUAMAMA, Tomoatsu SHIBATA
Tohoku University, Japan

IEEM17-P-0697
Towards a Data-Driven Enterprise: Effects on Information, Governance, Infrastructures and Security
Alberto POLZONETTI, Matteo SAGRATELLA
E-Lios, Italy

IEEM17-P-0771
An Artificial Intelligence Based Model for Implementation in the Petroleum Storage Industry to Optimize Maintenance
Tawanda MUSHIRI[1], Robin HUNGWE[2], Charles MBOHWA[1]
[1]*University of Johannesburg, South Africa*
[2]*University of Zimbabwe, Zimbabwe*

Manufacturing Systems 2

12/12/2017 09:00 - 10:45
Room: MR334

Chairs: Ali SIADAT, *Arts et Metiers ParisTech*

Abstracts: see page 89

IEEM17-P-0323
Proposing an Assignment Mathematical Model in Assembly Line Manufacturing System with Considering Human Factors' Role in Product Quality
Erfan ASGARI[1], Lazhar HOMRI[2], Ali SIADAT[1], Zeynab SAZVAR[1], Ali BOZORGI-AMIRI[1]
[1]*University of Tehran, Iran*
[2]*Arts et Métiers ParisTech, France*

IEEM17-P-0466
Rapid Tooling Road to Rapid Manufacturing
Niranjan Kumar SINGH, Sivadasan MAMBETA
National Institute of Foundry and Forge Technology, India

IEEM17-P-0298
Enhancing Smart Maintenance Management Using Fog Computing Technology
Mohammad ASHJAEI, Marcus BENGTSSON
Mälardalen University, Sweden

IEEM17-P-0324
Reflective and Formative Constructs in the Implementation of Sustainable Manufacturing with 'SMEET' Framework
Keshav G. VALASE, D.N. RAUT
Mumbai University, India

IEEM17-P-0551
Development of a Projection-Based Assistance System for Maintaining Injection Molding Tools
Sven HINRICHSEN, Daniel RIEDIGER, Alexander UNRAU
Ostwestfalen-Lippe University of Applied Sciences, Germany

IEEM17-P-0636
Towards Capability-Based Worker Modelling in a Smart Factory
Susanne VERNIM[1], Hendrik WALZEL[2], Alois KNOLL[1], Gunther REINHART[1]
[1]*Technical University of Munich, Germany*
[2]*Fortiss GmbH, Germany*

IEEM17-P-0589
On a New Modelling Approach for Circular Layouts and its Practical Advantages
Philipp HUNGERLAENDER[1], Kerstin MAIER[2], Joerg POECHER[2], Christian TRUDEN[2]
[1]*Massachusetts Institute of Technology, Austria*
[2]*Alpen-Adria Universitaet Klagenfurt, Austria*

IEEM17-P-0614
Automated Generation of Orienting Devices for Vibratory Bowl Feeders
Cosima STOCKER, Melanie HELL, Raven REISCH, Gunther REINHART
Technical University of Munich, Germany

Quality Control and Management 2

12/12/2017 09:00 - 10:45
Room: MR335

Chairs: Leif OLSSON, *Mid Sweden University*
Aries SUSANTY, *Diponegoro University Indonesia*

Abstracts: see page 91

IEEM17-P-0294
Application of Safety Assessment Model to Dog Products
Shu Lun MAK, H. K. LAU
The Open University of Hong Kong, Hong Kong SAR

IEEM17-P-0395
A Critical Review of Product Safety in Industry 4.0 Applications
Chi Ho LI, H. K. LAU
The Open University of Hong Kong, Hong Kong SAR

IEEM17-P-0422
The Application of 6S Methodology as a Lean Improvement Tool in an Ink Manufacturing Company
Nita SUKDEO
University of Johannesburg, South Africa

IEEM17-P-0465
A Six Sigma Approach Applied to the Analysis of Variability of an Industrial Process in the Field of the Food Industry
Fátima CARNEIRO, Americo AZEVEDO
University of Porto, Portugal

IEEM17-P-0525
The Impact and Effectiveness of Participating In External Quality Assurance Programmes in Quality Management and Improvement at a Local Institute Medical Laboratory, South Africa
Sambil Charles MUKWAKUNGU, Charles MBOHWA
University of Johannesburg, South Africa

IEEM17-P-0335
The Influence of Traceability System Practice to Product Recall Capability in Bulk Food Industry: Observation and Interview
Ivan GUNAWAN, Iwan VANANY, Erwin WIDODO
Institut Teknologi Sepuluh Nopember, Indonesia

IEEM17-P-0433
Factors Affecting a South African Construction Company's Suppliers' Performance
Sambil Charles MUKWAKUNGU, Kabelo NKOAGATSE, Charles MBOHWA
University of Johannesburg, South Africa

Service Innovation and Management 2

12/12/2017 09:00 - 10:45
Room: MR309

Chairs: Daniel MO, *Hang Seng Management College*
Huey Yuen NG, *Singapore Institute of Manufacturing Technology (SIMTech), Singapore*

Abstracts: see page 92

IEEM17-P-0268
Design of Mass Customized Paratransit Services
Daniel MO, Yue WANG, Tommy CHEUNG
Hang Seng Management College, Hong Kong SAR

IEEM17-P-0467
Categorization of Business Model Patterns and Mapping of Their Relations with Business Model Building Blocks
Huey Yuen NG
Singapore Institute of Manufacturing Technology (SIMTech), Singapore

IEEM17-P-0180
Modelling the Core Areas of Municipal Performance Towards an 'Ideal' Municipality
Bingwen YAN[1], Ogochukwu Iruoma NZEWI[2]
[1]*Cape Peninsula University of Technology, South Africa*
[2]*University of Fort Hare, South Africa*

IEEM17-P-0806
Improving Project Management Practice: An Engineering and Construction Case Study
Sofia CARVALHO, Anabela TERESO, Gabriela FERNANDES
University of Minho, Portugal

IEEM17-P-0234
Evaluation of the Influencing Factors on General Aviation Tourism Industry of Xi'an Based on AHP and Fuzzy Comprehensive Evaluation Method
Hongru YAN, Huaqi CHAI
Northwestern Polytechnical University, China

IEEM17-P-0680
Creativity in Organization: A Literature Review
Retno INDRIARTININGTIAS[1], Subagyo SUBAGYO[2], Budi HARTONO[2]
[1]*University of Trunojoyo, Indonesia*
[2]*University of Gadjah Mada, Indonesia*

Reliability and Maintenance Engineering 2

12/12/2017 09:00 - 10:45
Room: MR308

Chairs: Masdi MUHAMMAD, *Universiti Teknologi PETRONAS*
Zied HAJEJ, *LGIPM/Lorraine University*

Abstracts: see page 93

IEEM17-P-0534
Intelligent Fault Diagnostic Model for Rotating Machinery
Masdi B. MUHAMMAD, Umair SARWAR, Mohammadreza TAHAN, Zainal Ambri A KARIM
Universiti Teknologi PETRONAS, Malaysia

IEEM17-P-0753
Reliability Analysis for Gap Null Gate by Bivariate T-Distribution
Houbao XU, Mei LI
Beijing Institute of Technology, China

IEEM17-P-0120
Performance-Oriented Preventive Maintenance Policy for Deteriorating Single-Machine Manufacturing Systems
Biao LU, Xiaojun ZHOU
Shanghai Jiao Tong University, China

IEEM17-P-0415
Cost Sustainability of TFR Electric Locomotives Operating on the Natal Corridor
Bheki MAKHANYA[1], Renju MATHEW[2], Hannelie NEL[1], Jan-Harm PRETORIUS[1]
[1]*University of Johannesburg, South Africa*
[2]*Transnet Freight Capital, South Africa*

IEEM17-P-0922
Nonparametric EWMA Chart for Simultaneous Monitoring of Event Frequency and Magnitude
Shuo HUANG[1], Jun YANG[1], Amitava MUKHERJEE[2]
[1]*Beihang University, China*
[2]*Xavier School of Management, India*

IEEM17-P-0908
The Characteristic of Cold Metal Transfer (CMT) and its Application for Cladding
Nelson Edoh IMOUDU[1], Yonas Zewdu AYELE[2], Abbas BARABADI[1]
[1]*UiT The Arctic University of Norway, Norway*
[2]*Østfold University College, Norway*

IEEM17-P-0927
Study on Fault Diagnosis of SVM for Mechanical and Electrical Product Based on Improved Conjugate Transformation
Hui ZHENG, Jun-xia ZHANG
Tianjin University of Science & Technology, China

Operations Research 5

12/12/2017 11:15 - 12:45
Room: MR327

Chairs: Trang NGUYEN, *Viettel Reseach and Development Institute*
Gitae KIM, *Hanbat National University*

Abstracts: see page 94

IEEM17-P-0575
On the Mathematical Program in Theater Anti-Aircraft Distribution Problem
Trang T. NGUYEN, Trung Q. BUI, Bang Q. NGUYEN, Su TRAN LE
Viettel Research and Development Institute, Viet Nam

IEEM17-P-0553
Travel Time Estimation in Vehicle Routing Problem
Gitae KIM
Hanbat National University, South Korea

IEEM17-P-0070
Mixed-Integer Second-Order Cone Programming for Truss Topology Optimization with Self-Weight Load and Limitation on Number of Nodes
Yoshihiro KANNO
Tokyo Institute of Technology, Japan

IEEM17-P-0902
Development of Integrated Tactical Level Planning in Container Terminal
Dina Natalia PRAYOGO, Akhmad HIDAYATNO, Komarudin KOMARUDIN
University of Indonesia, Indonesia

IEEM17-P-0750
Minimizing the Height of Stacked Egg Cartons: A Comparison of Solving 3D Bin Packing Problems and Packers' Experience
Narat HASACHOO, Pornwasin SIRISAWAT, Phattaraporn KALAYA
Mae Fah Luang University, Thailand

IEEM17-P-0828
Using Meta-Heuristic Algorithms and Hybrid of Them to Solve Multi Compartment Vehicle Routing Problem
Masoud RABBANI, Zahra TAHAEI, Hamed FARROKHI-ASL, Niloofar AKBARIAN SARAVI
University of Tehran, Iran

Technology and Knowledge Management 3

12/12/2017 11:15 - 12:45
Room: MR328

Chairs: Ville OJANEN, *Lappeenranta University of Technology*
Charles MBOHWA, *University of Johannesburg*

Abstracts: see page 95

IEEM17-P-0439
The Impact of Digitalization on Product Lifecycle Management: How to Deal with it?
Yan XIN, Ville OJANEN
Lappeenranta University of Technology, Finland

IEEM17-P-0199
How Knowledge Management Impacts Performance: An Empirical Study in Chinese Knowledge-Intensive Enterprises
Yana YUAN, Huaqi CHAI, Liang LIU
Northwestern Polytechnical University, China

IEEM17-P-0469
Factors Influencing Intention to Use of Smartphone Applications in Thailand
Massoud MOSLEHPOUR[1], Khoirul AMRI[1], Paoleena PROMPRASORN[2]
[1]*Asia University, Taiwan*
[2]*SGC, Thailand*

IEEM17-P-0385
Technology Management, R&D Investment, and Small and Medium-Sized Enterprise Growth
SooGeun AHN, Jeewhan YOON, YoungJun KIM
Korea University, South Korea

IEEM17-P-0404
Research on Foreign Capital R&D Ecosystem in China Based on Dissipative Structure Theory
Qilei LIU[1], Peng GUO[1], Yuyan LEI[2], Yuwen FENG[1]
[1]*Northwestern Polytechnical University, China*
[2]*Northwestern University, China*

IEEM17-P-0530
Collaboration Between SMEs and its Stakeholders: Cross-Tabulation Analysis for Indonesian SMEs Using GEM Data
Ceicalia TESAVRITA[1], Cindy Marika Amalia WIBOWO[1], Iwan Inrawan WIRATMADJA[2]
[1]*Universitas Katolik Parahyangan, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

Safety, Security and Risk Management 1

12/12/2017 11:15 - 12:45
Room: MR329

Chairs: Lovelin Auguskani P, *St.Xavier's Catholic College of Engineering*
Om Prakash YADAV, *North Dakota State University*

Abstracts: see page 96

IEEM17-P-0805
Risk Reduction Using Grievance Handling Mechanism in Handloom Industry
Lovelin Auguskani P[1], Sree Devi V[2], Darwin Jose Raju A[1], Jerlin Priya J.M[3], Marsaline Beno M[1]
[1]*St.Xavier's Catholic College of Engineering, India*
[2]*Manonmaniam Sundaranar University, India*
[3]*Annammal College of Nursing, India*

IEEM17-P-0688
Analysis of Risk Sources in New Product Development Process Using Fuzzy Failure Mode Analysis
Avanish Singh CHAUHAN[1], Om Prakash YADAV[2], Ajay Pal Singh RATHORE[1], Gunjan SONI[1]
[1]*Malaviya National Institute of Technology Jaipur, India*
[2]*North Dakota State University, United States*

IEEM17-P-0131
New Product Development Project Risks in Saudi Firms - Preliminary Findings
Abdullah ALRABGHI[1], Muhammad AKRAM[2], Abdulaziz ALHARBI[1], Owais NAGRO[1], Abdullah BUKHARI[1]
[1]*University of Jeddah, Saudi Arabia*
[2]*Cranfield University, United Kingdom*

IEEM17-P-0472
The Uncertainty Importance Analysis for the Fault Tree and its Probability Density Evolution Algorithm
Guijie LI, Chaoyan XIE, Fayuan WEI, Bin LIAO
China Academy of Engineering Physics, China

IEEM17-P-0574
Apply HFACS to Accident Investigation System Interface Design
Ting-Yi LIN, Kang-Hung LIU, Chien-Chi CHANG
National Tsing Hua University, Taiwan

IEEM17-P-0711
Petri-Net Based Safety Analysis of Process Systems
Jianfeng ZHOU
Guangdong University of Technology, China

Systems Modeling and Simulation 4

12/12/2017 11:15 - 12:45
Room: MR330

Chairs: Abdul-Wahid SAIF, *King Fahd University of Petroleum & Minerals*
Tatsushi NISHI, *Osaka University*

Abstracts: see page 97

IEEM17-P-0052
Network-Based Process Control and Improvements with Fuzzy Time Delay Modulator
Abdul-Wahid SAIF, Muneeb A. AKRAM
King Fahd University of Petroleum and Minerals, Saudi Arabia

IEEM17-P-0038
Modeling and Simulation of Cascading Failure on R&D Network Based on Different Node States Under Attack Strategies
Yue SONG, Naiding YANG, Yanlu ZHANG, Jingbei WANG
Northwestern Polytechnical University, China

IEEM17-P-0663
A System Dynamics Case Study of Resilient Response to IP Theft from a Cyber-Attack
Daniel SEPULVEDA[1], Omera KHAN[2]
[1]*Technical University of Denmark, Denmark*
[2]*Aalborg University, Denmark*

IEEM17-P-0411
Throughput Analysis of Random Storage Systems Operated Under the Closest Eligible Location Rule
Anja HESSLER, Christoph SCHWINDT
Clausthal University of Technology, Germany

IEEM17-P-0384
An Optimization Model for Quality Improvement Investment Decisions Considering Learning and Forgetting Curve
Mega Aria PRATAMA, Cucuk Nur ROSYIDI, Eko PUJIYANTO
Universitas Sebelas Maret, Indonesia

IEEM17-P-0538
A Graphical Method for Multi-Signal Flow Graph Modeling and Testability Analysis Based on Visio Control Component
Jinsong YU, Yidong ZHENG, Diyin TANG, Y. YANG
Beihang University, China

Supply Chain Management 5

12/12/2017 11:15 - 12:45
Room: MR332

Chairs: Aries SUSANTY, *Diponegoro University Indonesia*
Allen H. TAI, *The Hong Kong Polytechnic University*

Abstracts: see page 98

IEEM17-P-0381
Performance Measurement of the Relationship Between Farmers-Cooperatives-Industrial Processing Milk in a Dairy Supply Chain: A Balanced Supply Chain Management Scorecard Approach
Aries SUSANTY, Arfan BAKHTIAR, Ratna PURWANINGSIH, Dina Firma DEWANTI
Diponegoro University, Indonesia

IEEM17-P-0491
Optimal Replenishment Policy for Inventory Systems with an Unreliable Supplier
Allen H. TAI
The Hong Kong Polytechnic University, Hong Kong SAR

IEEM17-P-0372
Distribution Center Capacity Analysis in Stochastic Environment: An Application of Value Stream Analysis and Monte Carlo Simulation
Ammar M. AAMER
Sampoerna University, Indonesia

IEEM17-P-0524
A Comprehensive Model for Supply Chain Performance Measurement: Application in the Coal Beneficiation Plant of Steel Manufacturing Company
Md. Asif EQUBAL[1], Azhar EQUBAL[2], Archana KUMARI[3], Rajkumar OHDAR[2]
[1]*Cambridge Institute of Technology, India*
[2]*National Institute of Foundry and Forge Technology, India*
[3]*Marwari College, India*

IEEM17-P-0913
Model Development of Rescue Assignment and Scheduling Problem Using Grasp Metaheuristic
Amelia SANTOSO[1], Dina Natalia PRAYOGO[2], Joniarto PARUNG[1], Hazrul ISWADI[1], D.A. RIZQI[1]
[1]*University of Surabaya, Indonesia*
[2]*University of Indonesia, Indonesia*

IEEM17-P-0346
Last Mile Distribution in Humanitarian Logistics Under Stochastic and Dynamic Consideration
Meilinda Fitriani Nur MAGHFIROH, Shinya HANAOKA
Tokyo Institute of Technology, Japan

IEEM17-P-0844
Multi-Objective Optimization of the Competitive Supply Chain Network Design Based on a Huff Model
Niloofar AKBARIAN SARAVI, Reza TAVAKKOLI-MOGHADDAM, Zahra TAHAEI
University of Tehran, Iran

Decision Analysis and Methods 3

12/12/2017 11:15 - 12:45
Room: MR333

Chairs: Ainul Akmar MOKHTAR, *Universiti Teknologi Petronas*
Alberto BELLINI, *University of Bologna*

Abstracts: see page 99

IEEM17-P-0556
Assessing Performance of Aging Air-Cooled Heat Exchangers Using Inspection and Performance Data
Ainul Akmar MOKHTAR[1], Masdi B. MUHAMMAD[2], Hilmi HUSSIN[1], Mohd Amin ABDUL MAJID[1]
[1]*Universiti Teknologi Petronas, Malaysia*
[2]*Universiti Teknologi PETRONAS, Malaysia*

IEEM17-P-0244
Energy Balance of Waste Management Systems: A Case Study
Alberto BELLINI, Alessandra BONOLI
University of Bologna, Italy

IEEM17-P-0506
Schools location through hybrid multi-criteria methodology to satisfy demand of extended school day program in Colombia
Jonathan CALIXTO, Nicolas TABARQUINO, Pablo MANYOMA
Universidad del Valle, Colombia

IEEM17-P-0507
Effect of Socioeconomic Status on Lung Cancer Survival: A Mediation Analysis Based on Bayesian Network Approach
Kartika Nur ANISA, Shi-Woei LIN
National Taiwan University of Science and Technology, Taiwan

IEEM17-P-0261
Development of Intelligent Building Management System Evaluation and Selection for Smart Factory: An Integrated MCDM Approach
Chih-Hao YANG
University of National Defense, Taiwan

IEEM17-P-0601
OPBI: An Open Pipeline for Biomarker Identification
Sugandima VIDANAGAMACHCHI[1], Mahesan NIRANJAN[2]
[1]*University of Ruhuna, Sri Lanka*
[2]*University of Southampton, United Kingdom*

Manufacturing Systems 3

12/12/2017 11:15 - 12:45
Room: MR334

Chairs: Linda ZHANG, *IESEG School of Management*
Kerbache LAOUCINE, *HEC Paris/Qatar Foundation*

Abstracts: see page 100

IEEM17-P-0019
Interpretive Ranking Process-based Lean Manufacturing Barrier Evaluation
Linda ZHANG[1], Balkrishna Eknath NARKHEDE[2], Anup CHAPLE[2]
[1]*IESEG School of Management, France*
[2]*Veermata Jijabai Technological Institute (VJTI), India*

IEEM17-P-0906
Transiting Toward the Factory of the Future: Optimal Buffer Sizes and Robot Cell Design in Car Body Production
Alain PATCHONG[1], Kerbache LAOUCINE[2]
[1]*MEXENCE Digital & Robotics, France*
[2]*HEC Paris, Qatar*

IEEM17-P-0748
A Random Forest Method for Obsolescence Forecasting
Yosra GRICHI, Yvan BEAUREGARD, Thien-My DAO
École de Technologie Supérieure, Canada

IEEM17-P-0450
Use of Additive Manufacturing for Polymer Tooling: Case Study from Reaction Injection Molding
Audun L. STORSANDEN, Marcus VÅLE, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

IEEM17-P-0015
A Hybrid Backtracking Search Algorithm for Permutation Flow-Shop Scheduling Problem Minimizing Makespan and Energy Consumption
Peng CHEN[1], Long WEN[1], Ran LI[2], Xinyu LI[1]
[1]*Huazhong University of Science and Technology, China*
[2]*Jianghan University, China*

IEEM17-P-0741
Hybrid Simulation Method by Cooperating Between Manufacturing System Simulation and Computational Fluid Dynamics Simulation First Report: Optimization for Energy Consumption per Unit of Production Throughput Considering Compressed Air Feed
Hitoshi NAGASAWA[1], Hironori HIBINO[1], Motonobu HASHIMOTO[2], Norifumi KASE[2]
[1]*Tokyo University of Science, Japan*
[2]*ITOCHU Techno-Solutions Corporation, Japan*

Quality Control and Management 3

12/12/2017 11:15 - 12:45
Room: MR335

Chairs: Yaping LI, *Nanjing Forestry University, Shanghai Jiao Tong University,*
Niranjan Kumar SINGH, *NIFFT, Ranchi,JKD,INDIA*

Abstracts: see page 101

IEEM17-P-0546
Robust Inference Traceability Technology for Product Quality Enhancement
Qi XIU, Keiro MURO
Hitachi, Ltd., Japan

IEEM17-P-0660
An Application of Fractional Factorial Method to Obtain Robust Solutions at a Glove Manufacturing Environment in Sri Lanka
Achinthya PERERA, Pramila GAMAGE
University of Peradeniya, Sri Lanka

IEEM17-P-0784
Spectral Network Approach for Multi-Channel Profile Data Analysis with Applications in Advanced Manufacturing
Chen ZHANG[1], Linmiao ZHANG[2], Nan CHEN[1]
[1]*National University of Singapore, Singapore*
[2]*Micron Technology, Singapore*

IEEM17-P-0364
Quality, Excellence and Culture in the Pursuit of Organizational Agility
Andre CARVALHO[1], Paulo SAMPAIO[2], Eric REBENTISCH[3], Pedro SARAIVA[4]
[1]*MIT Portugal Program / University of Minho, Portugal*
[2]*University of Minho, Portugal*
[3]*Massachusetts Institute of Technology, United States*
[4]*University of Coimbra, Portugal*

IEEM17-P-0691
An Optimization Design of the Exponentially Weighted Moving Average Control Chart
Mona AGHNIAEI, Mohammad SHAMSUZZAMAN, Sadeque HAMDAN
University of Sharjah, United Arab Emirates

IEEM17-P-0801
Optimization of Green Sand Casting Parameters Using Taguchi Method to Improve the Surface Quality of White Cast Iron Grinding Plates – A Case Study
Lakshman SAMARAWEERA, Shiron THALAGALA, Pramila GAMAGE, Manjula NANAYAKKARA
University of Peradeniya, Sri Lanka

Service Innovation and Management 3

12/12/2017 11:15 - 12:45
Room: MR309

Chairs: Satya SHAH, *University of Greenwich UK*
Huey Yuen NG, *Singapore Institute of Manufacturing Technology (SIMTech), Singapore*

Abstracts: see page 102

IEEM17-P-0482
An Overview of Sustainable Practices in Food Processing Supply Chain Environments
Olumide OJO, Satya SHAH, Alec COUTROUBIS
University of Greenwich, United Kingdom

IEEM17-P-0182
How Do Employees Inspire Innovative Work Behavior? Transformational Leadership and Work Motivation Perspectives
Jen-Chia CHANG, Chia-Ying LEE, Pai-Yen WEI, Wei-Cheng HUANG
National Taipei University of Technology, Taiwan

IEEM17-P-0366
Design of an Evaluation Methodology for the Service Design and Development Process from Concurrent Engineering: The Case of the Advertising Sector
Dayni REYES, Rita PEÑABAENA-NIEBLES
Universidad del Norte, Colombia

IEEM17-P-0477
Sustainable Supply and Demand Chain Integration within Global Manufacturing Industries
Elmira NAGHI GANJI, Satya SHAH, Alec COUTROUBIS
University of Greenwich, United Kingdom

IEEM17-P-0878
Product-Service System for Indonesian Industrial Estate Firms: A Conceptual Framework
Christina WIRAWAN, Gatot YUDOKO, Yuliani Dwi LESTARI
Institut Teknologi Bandung, Indonesia

IEEM17-P-0649
Unlocking the Economic Value and Potential of Design for Manufacture and Assembly in a Developing Country for Sustainability
Wilson R. NYEMBA[1], Rodney MUZOROZA[2], Tauyanashe CHIKUKU[2], Charles MBOHWA[1]
[1]*University of Johannesburg, South Africa*
[2]*University of Zimbabwe, Zimbabwe*

IEEM17-P-0423
The Delivery of Service Quality to Increase Customer Repurchase Behaviour and Customer Satisfaction at Fast Food Outlets in Central Johannesburg, South Africa
Save AKILIMALISSIGA, Nita SUKDEO, Andre VERMEULEN
University of Johannesburg, South Africa

Reliability and Maintenance Engineering 3

12/12/2017 11:15 - 12:45
Room: MR308

Chairs: Zied HAJEJ, *LGIPM/ Lorraine University*,
Masdi MUHAMMAD, *Universiti Teknologi PETRONAS*

Abstracts: see page 103

IEEM17-P-0509
A Jointly Integrated Maintenance and Emission Optimization for a Manufacturing and Remanufacturing System
Zied HAJEJ, Nidhal REZG, Salim BOUSLIKHANE
Lorraine University, France

IEEM17-P-0050
A Simple Algorithm to Verify Cycles in MSNs for a Given Demand Level
Shin-Guang CHEN
Tungnan University, Taiwan

IEEM17-P-0305
Cause Analysis of Representative Troubles at Distillation Tower Using Discriminant Analysis
Jun OKITSU[1], Toshiaki MATSUO[1], Hiroki YAMAMOTO[1], Haslinda Bt ZABIRI[2], Lemma Dendena TUFA[2], Marappagounder RAMASAMY[2]
[1]*Hitachi Ltd., Japan*
[2]*Universiti Teknologi PETRONAS, Malaysia*

IEEM17-P-0609
Reliability Modeling of Incomplete Common Cause Failure Systems Subject to Two Common Causes
Jin QIN, Ruoxing GU, Guijie LI
China Academy of Engineering Physics, China

IEEM17-P-0613
Bi-Level Optimization for Maintenance Service Contracts Involving Three Parties Using Genetic Algorithm
Nur F. SA'IDAH, Andi CAKRAVASTIA, Udjianna S. PASARIBU, Bermawi P. ISKANDAR
Bandung Institute of Technology, Indonesia

IEEM17-P-0624
Joint Optimization of Preventive Maintenance and Economic Production Quantity with Considering Demand Adjustment
Xuejuan LIU, Rui PENG, Qunxia LI, Xiaoyang MA
University of Science and Technology Beijing, China

Operations Research 6

12/12/2017 13:45 - 15:30
Room: MR327

Chairs: Philipp BAUMANN, *University of Bern*
Temel ONCAN, *Galatasaray University*

Abstracts: see page 104

IEEM17-P-0608
Optimal Staff Assignment and Routing in Personalized Home Care
Philipp BAUMANN
University of Bern, Switzerland

IEEM17-P-0290
Iterated Exact and Heuristic Algorithms for the Minimum Cost Bipartite Perfect Matching Problem with Conflict Constraints
Temel ÖNCAN[1], I. Kuban ALTıNEL[2]
[1]*Galatasaray University, Turkey*
[2]*Boğaziçi University, Turkey*

IEEM17-P-0231
Green Vehicle Routing Problem with Path Flexibility
Xinglu LIU[1], Mingyao QI[1], Chun CHENG[2]
[1]*Tsinghua University, China*
[2]*Polytechnique Montréal and CIRRELT, Canada*

IEEM17-P-0497
Heuristic Approach of Exact Bin-Packing Model
Amandus JOHANSSON, Manfred AXELSSON, Klas GUSTAVSSON
Mid Sweden University, Sweden

IEEM17-P-0436
Towards Extending Algorithmic Strategy Planning in System Dynamics Modeling
Maximilian MOLL
Bundeswehr University, Germany

IEEM17-P-0620
Dynamic Lot Sizing with Time-Varying Demand and Return Rates for a Product Life Cycle
Hong SUN, Weida CHEN, Zhiliang REN
Southeast University, China

IEEM17-P-0866
Green Vehicle Routing and Scheduling Problem with Optimized Travel Speed
N. NABIL, Hala FAROUK, Khaled EL-KILANY
Arab Academy for Science, Technology, and Maritime Transport, Egypt

Technology and Knowledge Management 4

12/12/2017 13:45 - 15:30
Room: MR328

Chairs: Lena Stephanie FELIX, *Nanyang Technological University*
Ville OJANEN, *Lappeenranta University of Technology*

Abstracts: see page 105

IEEM17-P-0879
Singapore's NEHR: Challenges on the Path to Connected Health
Lena Stephanie FELIX
Nanyang Technological University, Singapore

IEEM17-P-0656
Achieving Strategic Growth in Microenterprises through Information Technology: UK Micro Enterprise Case Study
Satya SHAH, Matthew LONG, Elmira NAGHI GANJI
University of Greenwich, United Kingdom

IEEM17-P-0633
Mechanisms for Effective Tacit Knowledge Transfer in University Laboratory: An Agent-Based Approach
Fadillah RAMADHAN[1], Rayinda Pramudtya SOESANTO[2], Afrin Fauzya RIZANA[2], Amelia KURNIAWATI[2], Iwan Inrawan WIRATMADJA[3]
[1]*Institut Teknologi Nasional, Indonesia*
[2]*Telkom University, Indonesia*
[3]*Bandung Institute of Technology, Indonesia*

IEEM17-P-0905
Research on the Key Factors of Tacit Knowledge Diffusion in Customized Titanium Processing Enterprises Based on ISM Model
Qinglin BAO, Huaqi CHAI, Kang WU
Northwestern Polytechnical University, China

IEEM17-P-0759
Design and Development of a Training Module for Data-Driven Product-Service Design
Anies Faziehan ZAKARIA, S.C. Johnson LIM
Universiti Tun Hussein Onn Malaysia, Malaysia

IEEM17-P-0330
Servitization and the Wider Services Communities: A Bibliometric Study
Alan PILKINGTON[1], Jawwad RAJA[2], Juliana HSUAN[2], Thomas FRANDSEN[2]
[1]*University of Westminster, United Kingdom*
[2]*Copenhagen Business School, Denmark*

Safety, Security and Risk Management 2

12/12/2017 13:45 - 15:30
Room: MR329

Chairs: Nantakrit YODPIJIT, *King Mongkut's University of Technology North Bangkok*
Om Prakash YADAV, *North Dakota State University*

Abstracts: see page 106

IEEM17-P-0924
Environmental Analysis of Biomass Power Plants for Sustainability in Thailand
Manutchanok JONGPRASITHPORN[1], Adisak MARTSRI[2], Supapat PHUANGKAEW[2], Wannapong YEAMMA[2], Nantakrit YODPIJIT[2]
[1]*King Mongkut's Institute of Technology Ladkrabang, Thailand*
[2]*King Mongkut's University of Technology North Bangkok, Thailand*

IEEM17-P-0377
High School Students' Knowledge and Seismic Risk Perception: The Case of Mexico City
Jaime SANTOS-REYES, Tatiana GOUZEVA
Instituto Politécnico Nacional, Mexico

IEEM17-P-0907
Quantitative Risk Analysis of Components Under High Stress
Yonas Zewdu AYELE[1], Abbas BARABADI[2]
[1]*Østfold University College, Norway*
[2]*UiT The Arctic University of Norway, Norway*

IEEM17-P-0694
Awareness of Information Security and its Implications to Legal and Ethical Issues in Our Daily Life
Daniel TSE, Zehan XIE, Zhaolin SONG
City University of Hong Kong, Hong Kong SAR

IEEM17-P-0567
Injury Prediction Based on Safety Climate Questionnaire Score Using Artificial Neural Networks
Yu Cheng CHANG, Szu Yu LEE, Pin-Ling LIU, Chien-Chi CHANG
National Tsing Hua University, Taiwan

IEEM17-P-0700
Procurement and Reserves Polices for Humanitarian Logistics
Lin ZHANG[1], Jun TIAN[1], Richard Y. K. FUNG[2], Chuangyin DANG[2]
[1]*Xi'an Jiaotong University, China*
[2]*City University of Hong Kong, Hong Kong SAR*

Systems Modeling and Simulation 5

12/12/2017 13:45 - 15:30
Room: MR330

Chairs: Amos NG, *University of Skovde*
Stanislav CHANKOV, *Jacobs University Bremen*

Abstracts: see page 107

IEEM17-P-0279
Lean, Simulation and Optimization: A Maturity Model
Ainhoa GOIENETXEA URIARTE[1], Amos H.C. NG[1], M. URENDA MORIS[2], Mats JÄGSTAM[2]
[1]*University of Skövde, Sweden*
[2]*Jönköping University, Sweden*

IEEM17-P-0650
Analysis of Human Arm Motions at Assembly Work as a Basic of Designing Dual Robot Arm System
Bernadus KRISTYANTO, Brilianta NUGRAHA, Anugrah PAMOSOAJI, Kristanto NUGROHO
Universitas Atma Jaya Yogyakarta, Indonesia

IEEM17-P-0399
Integrated Vendor-Buyer Inventory Model Considering Imperfect Quality and Inspection Errors with Controllable Lead Time
Amanda SOFIANA, Cucuk Nur ROSYIDI
Universitas Sebelas Maret, Indonesia

IEEM17-P-0770
Concurrent Scheduling of a Job Shop and Microgrid to Minimize Energy Costs Under Due Date Constraints
Ashley THORNTON[1], Cedric SCHULTZ[2], Sami KARA[1], Gunther REINHART[2]
[1]*University of New South Wales, Australia*
[2]*Composite and Processing Technology IGCV, Germany*

IEEM17-P-0338
Using Gradient Boosting Regressor to Predict Stress Intensity Factor of a Crack Propagating in Small Bore Piping
Arvind KEPRATE, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

IEEM17-P-0044
Mitigation Strategy Against Cascading Failures of the R&D Network
Jingbei WANG, Naiding YANG, Yanlu ZHANG, Yue SONG
Northwestern Polytechnical University, China

IEEM17-P-0410
Design of an Agent-Based Model to Simulate Governance in Inter-Organizational Project Networks
Jaakko KUJALA, Tapio VUORINEN
University of Oulu, Finland

Supply Chain Management 6

12/12/2017 13:45 - 15:30
Room: MR332

Chairs: Ciwei DONG, *Zhongnan University of Economics and Law*
Weihua LIU, *Tianjin University*

Abstracts: see page 108

IEEM17-P-0745
The Coexistence of Printed Book and Electronic Book in a Book Supply Chain
Yanping CHENG[1], Ciwei DONG[2], Renjun LIU[2]
[1]*Central China Normal University, China*
[2]*Zhongnan University of Economics and Law, China*

IEEM17-P-0347
The Choice of Buy-Back Contract in Logistics Service Supply Chain with Demand Updating and Mass Customization Service
Weihua LIU
Tianjin University, China

IEEM17-P-0570
Heterogeneous Vehicle Routing Delivery on Collaborative Distribution Using Genetic Algorithm – The Case of Yogyakarta City
Anna Maria Sri ASIH[1], Bertha Maya SOPHA[1], Yusnia KHAIRUNNISA[1], Hendra Edi GUNAWAN[1], Yuni KARUNIAWATI[2]
[1]*Universitas Gadjah Mada, Indonesia*
[2]*Province of D.I. Yogyakarta, Indonesia*

IEEM17-P-0841
The Joint Decisions of Modularity Level Design and Refund Price in a Two-Tier Supply Chain
Qingying LI, Weijian ZHOU
Donghua University, China

IEEM17-P-0275
Capacity Investments in Logistics Outsourcing
Tarun JAIN[1], Jishnu HAZRA[2]
[1]*Indian Institute of Management Udaipur, India*
[2]*Indian Institute of Management Bangalore, India*

IEEM17-P-0635
Towards an Approach to Assess Supply Chain Quality Management Maturity
Ana FERNANDES[1], Rui OLIVEIRA[1], Catarina CUBO[1], Paulo SAMPAIO[1], Maria do Sameiro CARVALHO[1], Paulo AFONSO[1], J. ROQUE[2], Marcio REBELO[2], Joao BRANDÃO[2]
[1]*University of Minho, Portugal*
[2]*Bosch Car Multimedia, Portugal*

IEEM17-P-0209
Evaluation of Market Entry Strategies of Late Entrant in the Sustainable SCM
Tasuya INABA
Kanagawa Institute of Technology, Japan

Decision Analysis and Methods 4

12/12/2017 13:45 - 15:30
Room: MR333

Chairs: Ainul Akmar MOKHTAR, *Universiti Teknologi Petronas*
Xue-Ming YUAN, *Singapore Institute of Manufacturing Technology*

Abstracts: see page 109

IEEM17-P-0622
Weighted Point Matrix Based Supplier Evaluation Method for the Oil and Gas Industry
Qamarul FADHLI BIN KHAIRIZAN[1], Wee Li LEE[2], Xue-Ming YUAN[1]
[1]*Agency for Science, Technology and Research (A*STAR), Singapore*
[2]*Schlumberger, Singapore*

IEEM17-P-0602
Challenges in Implementing Cleaner Production: Barriers and Strategies in the Indonesian Seafood Processing Industry
Pregiwati PUSPORINI[1], Iwan VANANY[2]
[1]*University of Muhammadiyah Gresik, Indonesia, Indonesia*
[2]*Institut Teknologi Sepuluh Nopember, Indonesia*

IEEM17-P-0817
Project Change Request: A Proposal for Managing Change in Industrialization Projects
Deborah PERROTTA[1], João FARIA[2], Madalena ARAÚJO[1], Anabela TERESO[1], Gabriela FERNANDES[1]
[1]*University of Minho, Portugal*
[2]*Bosch Car Multimedia Portugal, Portugal*

IEEM17-P-0426
A New Method for Aggregating Experts' Probability Judgments
Min YANG[1], Wenyu GUO[1], Fengtian WANG[2]
[1]*Beihang University, China*
[2]*The 304 Research Institute of China Aerospace Science & Industry Corp, China*

IEEM17-P-0626
An Integrated Decision Making Model for Sustainable Supplier Selection Under Uncertain Environment
Xiongyong ZHOU, Zhiduan XU
Xiamen University, China

IEEM17-P-0170
The Prison Construction Decision Analysis for Reducing Capacity Overloads with the Social Cost of Crime Concept
Hsiao-Ling CHANG, Tyrone T. LIN
National Dong Hwa University, Taiwan

IEEM17-P-0248
Assessing the Possible Potential in the Global Energy Consumption: Integrated Artificial Neural Network and Data Envelopment Analysis
Oludolapo OLANREWAJU, Charles MBOHWA
University of Johannesburg, South Africa

Engineering Economy and Cost Analysis

12/12/2017 13:45 - 15:30
Room: MR334

Chairs: Jasmine Siu Lee LAM, *Nanyang Technological University*
Diego MANOTAS-DUQUE, *Universidad del Valle*

Abstracts: see page 110

IEEM17-P-0837
Feasibility of Implementing Energy Management System in Ports
Jasmine Siu Lee LAM, Ming Jun KO, Jing Rong SIM, Yang TEE
Nanyang Technological University, Singapore

IEEM17-P-0492
Financial Risk Measurement in Colombian System of Mining Royalties
Angelica BUSTOS-GONZÁLEZ, Luis Felipe RAMÍREZ-DOMÍNGUEZ, Stephania MOSQUERA-LOPEZ, Diego MANOTAS-DUQUE
Universidad del Valle, Colombia

IEEM17-P-0329
Sustainable Building Policy Management in Kolkata, India
Rohan Singh WILKHO[1], Himadri GUHA[2]
[1]*AFCONS Infrastructure Ltd., India*
[2]*Jadavpur University, India*

IEEM17-P-0503
Decisive Economies and Opportunity Cost of Modular Product Structure Alternatives: An Empirical Case Study
Marc WINDHEIM[1], Erik GREVE[2], Dieter KRAUSE[2]
[1]*Hilti Entwicklungsgesellschaft mbH, Germany*
[2]*Hamburg University of Technology, Germany*

IEEM17-P-0566
Some Thoughts on the Kelly Criterion Associated with a Real Investment Perspective
Gyutai KIM
Chosun University, South Korea

IEEM17-P-0883
Performance Evaluation of Logistics listed Companies Based on Grey Ideal Correlation Entropy
Fumin DENG, Canmian LIU, Xuedong LIANG, Jing XU
Sichuan University, China

IEEM17-P-0470
Product Portfolio Optimization Based on Substitution
Anna MYRODIA, Alexandria Lee MOSELEY, Lars HVAM
Technical University of Denmark, Denmark

Project Management 3

12/12/2017 13:45 - 15:30
Room: MR335

Chairs: Ralph RIEDEL, *Chemnitz University of Technology*

Abstracts: see page 111

IEEM17-P-0181
Post Formation Dynamics and Their Determinants
Xiao-li CHEN, Ralph RIEDEL, Egon MUELLER
Technische Universität Chemnitz, Germany

IEEM17-P-0369
Outcome Prediction of Software Projects for Information Technology Vendors
Tomoyuki KAWAMURA, Tetsuya TOMA, Kenichi TAKANO
Keio University, Japan

IEEM17-P-0541
An Empirical Study on Value Creation of Multi-Product Small-Volume Production Through Industry-Academia Collaboration
Sadayo HIRATA
Shibaura Institute of Technology, Japan

IEEM17-P-0502
Risk Evaluation in Project Management Implementation: The Case of Infrastructural Development Projects
Jan-Harm PRETORIUS, Nokuthula DLUDHLU, Jurie VAN WYNGAARD
University of Johannesburg, South Africa

IEEM17-P-0034
Why CPM is Not Good Enough for Scheduling Projects
Tapan P BAGCHI[1], Kaushik SAHU[2], Bimal K JENA[2]
[1]*Indian Institute of Technology Kharagpur, India*
[2]*KIIT University, India*

IEEM17-P-0185
Transmission of Software-Related Agile Mechanisms of Action Towards Product Development Processes for Technical Products
Günther SCHUH, Michael RIESENER, Jan KANTELBERG, Niklas STEIREIF
RWTH Aachen University, Germany

IEEM17-P-0559
Using Fuzzy Front End Theory on the New Product Development and Innovation
Yueen LI[1], Na LIU[1], Haiyan ZHANG[2], Jintao YU[1], Shen SUN[1]
[1]*Shandong Jianzhu University, China*
[2]*Purdue University, United States*

E-Business and E-Commerce

12/12/2017 13:45 - 15:30
Room: MR309

Chairs: Daniel MO, *Hang Seng Management College*
Michel ALDANONDO, *Toulouse University*

Abstracts: see page 112

IEEM17-P-0435
How Do Flexible Options Affect Customer Decision Making in an Online Configurator System?
Yue WANG[1], Guohua TANG[2], Daniel MO[1]
[1]*Hang Seng Management College, Hong Kong SAR*
[2]*Alibaba Group, China*

IEEM17-P-0653
ETO Bid Solutions Definition and Selection Using Configuration Models and a Multi-Criteria Approach
Abdourahim SYLLA[1], Elise VAREILLES[1], Thierry COUDERT[2], Michel ALDANONDO[1], Laurent GENESTE[2], Yvan BEAUREGARD[3]
[1]*Université de Toulouse – Mines Albi, France*
[2]*Université de Toulouse – ENI Tarbes, France*
[3]*École de Technologie Supérieure, Canada*

IEEM17-P-0293
Assessing the Profitable Conditions of Online Grocery Using Simulation
Ahmed ALZUBAIRI[1], Abdullah ALRABGHI[2]
[1]*King Abdulaziz University, Saudi Arabia*
[2]*University of Jeddah, Saudi Arabia*

IEEM17-P-0527
Application of Revenue Management in Supply Chain of Postal Services
Ahmad TEYMOURI, Amir KHATAIE, Pavel ANDREEV, Craig KUZIEMSKY
University of Ottawa, Canada

IEEM17-P-0683
The Study of Critical Success Factors of Cross-Border E-Commerce Freight Forwarder from China to Thailand
Ting SUN, Woramol Chaowarat WATANABE
Naresuan University, Thailand

IEEM17-P-0349
A User Experience Evaluation for Wendy's Online Delivery Website Geared Towards Improving Customer Experience
Wendy SIA, Rendell TIU, Jazmin TANGSOC
De La Salle University, Philippines

Reliability and Maintenance Engineering 4

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Room: MR308

Chairs: Yaping LI *Nanjing Forestry University, Shanghai Jiao Tong University*,
Yihai HE, *Beihang University*

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Jointly Optimal Design of Perfect Maintenance Policy and CUSUM Control Chart
Yaping LI, Long CHEN, Ershun PAN, Zhen CHEN
Shanghai Jiao Tong University, China

IEEM17-P-0728
Development of a Low-Cost Tool for Semi-Automatic Classification and Counting of Particles in Industrial Oils
Bruno Cesar CAIXETA LEME, Luis Fernando DE ALMEIDA, Jose Walter PARQUET BIZARRIA, Francisco Carlos PARQUET BIZARRIA, Alvaro Manoel SOUZA SOARES, Marcos Alessandro CRUZ RAMOS
University of Taubate, Brazil

IEEM17-P-0243
Intelligent Fault Diagnosis of Rotating Machinery Using Locally Connected Restricted Boltzmann Machine in Big Data Era
Saibo XING, Yaguo LEI, Feng JIA, Jing LIN
Xi'an Jiaotong University, China

IEEM17-P-0540
Memetic Algorithm to Optimize Level of Repair and Spare Part Decisions for Fleet System
Ayush JAIN[1], Ganesh K. RAO[1], Manish RAWAT[1], Bhupesh Kumar LAD[2]
[1]*Manipal University, India*
[2]*Indian Institute of Technology Indore, India*

IEEM17-P-0217
Optimal Scheduling of Imperfect and Perfect Inspections for Systems Subject to Continuous Degradation
Jingyuan SHEN, Lirong CUI
Beijing Institute of Technology, China

IEEM17-P-0259
Reliability Assessment of NAND SSD Based on Acceleration Degradation Test
Peng LI, Kai LIU, Wei DANG, Tianji ZOU
Chinese Academy of Sciences, China

IEEM17-P-0386
Reliability Analysis for Single-Unit System of Warship Equipment with One Repairman Having Vacations Based on Phase-Type Distribution
Tong CHEN[1], Bingqing WANG[2], Dongliang YIN[1]
[1]*Naval University of Engineering, China*
[2]*Huazhong University of Science and Technology, China*

Poster

12/12/2017 16:00 - 18:00
Room: Nicoll 1-2

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On Economizing Local Foods Networks in Developing Countries
Per ENGELSETH[1], Yuanita HANDAYATI[2], Maria WIDYARINI[3]
[1]*Molde University College, Norway*
[2]*Institut Teknologi Bandung, Indonesia*
[3]*Parahyangan Catholic University, Indonesia*

p.114 IEEM17-P-0197
Tax Policy and Sourcing Strategy – A Social Welfare Perspective
Huafan MA[1], Ziping WANG[2]
[1]*Wenzhou-Kean University, United States*
[2]*Morgan State University, United States*

p.114 IEEM17-P-0461
On the Circular Supply Chain's Impact on Revenue Growth for Manufacturers of Assembled Industrial Products – A Conceptual Development Approach
Samuel B. LARSEN, Torben KNUDBY, Jacques VAN WONTERGHEM, Peter JACOBSEN
Technical University of Denmark, Denmark

p.114 IEEM17-P-0630
Pricing Decisions of Seller and Speculative Strategic Customers
M. LI, J. J. LU, Yongquan LAN, Z. W. MIAO
Xiamen University, China

p.114 IEEM17-P-0686
Strategic Organizing of Piping Supplies for Ship Construction
Per ENGELSETH, Bich LE
Molde University College, Norway

p.114 IEEM17-P-0712
A Multi-Channel Sale System Under Financially Constraint
Xin LI, Yan CHEN
Macau University of Science and Technology, China

p.114 IEEM17-P-0786
Optimal Multi-Period Multi-Product Supplier Selection and Order Allocation: Balancing Supplier Development and Supplier Switching
Lixin CUI[1], Lu BAI[1], Zhipeng CUI[2]
[1]*Central University of Finance and Economics, China*
[2]*Tianjin University, China*

p.115 IEEM17-P-0862
Multi-Objective Optimization of Costs and Pollutants in Order to Manage the sustainable Supply Chain of Bio-Fuels
Elaheh JAFARNEJAD[1], Jamal ALIABADI[2]
[1]*Islamic Azad University South Tehran Branch, Iran*
[2]*Iran University of Science and Technology, Iran*

p.115 IEEM17-P-0289
Excess Inventories Redeployment Strategy for Spare Parts Service Logistics Management
Daniel MO, Danny HO, Nicole CHAN
Hang Seng Management College, Hong Kong SAR

p.115 IEEM17-P-0508
Status and Future of Manufacturing Execution Systems
Emrah ARICA[1], Daryl John POWELL[2]
[1]*SINTEF Technology and Society, Norway*
[2]*Kongsberg Maritime AS, Norway*

p.115 IEEM17-P-0632
A GA-Based Method for Sales Order Allocation in a MTS/ MTO Supply Chain
Chin Sheng TAN, Zhong Jin NG, Chi XU
*Agency for Science, Technology and Research (A*STAR), Singapore*

p.115 IEEM17-P-0016
Using DEA Model Without Input and with Negative Input to Develop Composite Indicators
William CHUNG
City University of Hong Kong, Hong Kong SAR

p.115 IEEM17-P-0077
Feasibility Analysis of Grid Tied PV System Based on Net-Metering Incentive for a Developing Country: A Case Study of Pakistan
Ayesha ZAHIR, Shoab Ahmed KHAN, Afshan NASEEM
National University of Sciences and Technology (NUST), Pakistan

p.115 IEEM17-P-0249
Assessing the Possible Potential in the Global Energy Consumption: Integrated Artificial Neural Network and Data Envelopment Analysis
Oludolapo OLANREWAJU, Charles MBOHWA
University of Johannesburg, South Africa

p.115 IEEM17-P-0250
The Selection of Enterprise Technology Innovation Mode (TIM) Based on Grey-AHP Method
Hongjie ZHANG, Yuming ZHU, Xiaoyu SONG
Northwestern Polytechnical University, China

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Nested Bilevel Genetic Algorithms for Game-Theoretic Optimization of Product Line Design Considering Competition
Xiaojie LIU[1], Gang DU[1], Roger J. JIAO[2], Yi XIA[1]
[1]*Tianjin University, China*
[2]*Georgia Institute of Technology, United States*

p.116 IEEM17-P-0462
A Two-Staged Task Assignment Algorithm for Worker Recommendation in a Crowdsourcing Environment
Rong CHEN[1], Shifei CHEN[2], Xiaoyao ZHANG[1]
[1]*Dalian Maritime University, China*
[2]*Sichuan University, China*

p.116 IEEM17-P-0521
Simulation-Driven Manufacturing Planning for Product-Production Variety Coordination
Xuejian GONG[1], Jonas LANDAHL [2], Hans JOHANNESSON[2], Roger J. JIAO[1]
[1]*Georgia Institute of Technology, United States*
[2]*Chalmers University of Technology, Sweden*

p.116 IEEM17-P-0872
Statistical Analysis of Oil Insulation Breakdown Voltage
Himanshu GUPTA, Supriyo DAS
National Institute of Technology Meghalaya, India

p.116 IEEM17-P-0910
Robust Model Predictive Control for Energy Management of Isolated Microgrids
Mengyan ZHAI, Yajie LIU, Tao ZHANG, Yan ZHANG
National University of Defense Technology, China

p.116 IEEM17-P-0088
Resource Recovery from Municipal Waste and Bio Solids (Digestate) Through Vermicomposting: A Waste Management Initiative
Mercy MANYUCHI, Charles MBOHWA, Edison MUZENDA
University of Johannesburg, South Africa

p.116 IEEM17-P-0431
Industry 4.0 Interface for Dynamic Reconfiguration of an Open Lab Size Automated Production System to Allow Remote Community Experiments
Safa BOUGOUFFA, Kilian MESSMER, Suhyun CHA, Emanuel TRUNZER, Birgit VOGEL-HEUSER
Technical University of Munich, Germany

p.117 IEEM17-P-0489
Integrated Value Stream Mapping and Simulation for Cash-to-Cash Cycle Time Improvement of a Machining Facility
Weidong LIN[1], Engsuan CHAN[2], Lifeng KWAN[3]
[1]*Singapore Institute of Technology, Singapore*
[2]*Temasek Polytechnic, Singapore*
[3]*CKE Manufacturing Pte Ltd, Singapore*

p.117 IEEM17-P-0667
Manufacturing Industry in Cloud Computing Era: Case Study
Yuqiuge HAO, Petri HELO
University of Vaasa, Finland

p.117 IEEM17-P-0300
A Fuzzy Approach for Fatigue and Creep Analysis in a Fire and Tube Boiler
Tawanda MUSHIRI[1], Alimon Z. SHOKO[2], Charles MBOHWA[1]
[1]*University of Johannesburg, South Africa*
[2]*University of Zimbabwe, Zimbabwe*

p.117 IEEM17-P-0304
The Advantage of the Arduino Sensing System on Parking Guidance Information Systems
K. Y. HUANG[1], Shann-Bin CHANG[2], P. R. TSAI[1]
[1]*Ling Tung University, Taiwan*
[2]*Chaoyang University of Technology, Taiwan*

p.117 IEEM17-P-0681
An Intelligent Optimization Approach for Waste Collection with Dynamic Disposal Trips
Qu WEI, Qi LIU, Zhaoxia GUO
Sichuan University, China

p.117 IEEM17-P-0191
A Sequential Multi-Objective Robust Optimization Approach Under Interval Uncertainty Based on Support Vector Machines
Tingli XIE, Qi ZHOU, Jiexiang HU, Leshi SHU, Ping JIANG
Huazhong University of Science & Technology, China

p.117 IEEM17-P-0240
Reliability-Oriented Quality Risk Modeling and Monitoring Approach in Manufacturing Process
Jiaming CUI, Yihai HE, Chunling ZHU, Fengdi LIU
Beihang University, China

p.117 IEEM17-P-0340
Test Stand for the Investigation of Driven Rollers
Benjamin KÜSTER[1], Malte STONIS[1], Ludger OVERMEYER[2]
[1]*Institut für Integrierte Produktion Hannover, Germany*
[2]*Leibniz Universität Hannover, Germany*

p.118 IEEM17-P-0358
Multi-Criteria Classification for Prioritization of Preventive Maintenance Tasks to Support Maintenance Scheduling
Isabel LOPES[1], P. SENRA[1], Bruna NETO[2], R. COSTA[2], Miguel SOUSA[1], Tiago CABO[3], J.A. OLIVEIRA[1]
[1]*University of Minho, Portugal*
[2]*Bosch Car Multimedia Portugal, Portugal*
[3] *University of Porto, Portugal*

p.118 IEEM17-P-0374
A Method for Function Modules Clustering Based on the Function Analysis and the Law of System Completeness
Yujuan DU, Ping JIANG, Shenghui SUN, Runhua TAN
Hebei University of Technology, China

p.118 IEEM17-P-0382
Analysis of Multi-State Warm Standby System Reliability Model with Repair Priority
Tao HU, Dongliang YIN, Tong CHEN
Naval University of Engineering, China

p.118 IEEM17-P-0408
Reliability Model Analysis on Parallel System Having Multiple Vacations of One Repairman
Wei WANG[1], Dongliang YIN[1], Bingqing WANG[2]
[1]*Naval University of Engineering, China*
[2]*Huazhong University of Science and Technology, China*

p.118 IEEM17-P-0413
The Reliability Analysis of Multi-State Cold Standby System Based on Phase-Type Distribution
Fang LI, Tong CHEN, Peng DI
Naval University of Engineering, China

p.118 IEEM17-P-0537
A Maintenance Evaluation Method for Complex Systems with Standby Structure Based on Goal Oriented Method
Xiaojian YI[1], Lei CHEN[2], Jian SHI[3], Peng HOU[4], Yuehua LAI[4]
[1]*China North Vehicle Research Institute, China*
[2]*Shanghai Nuclear Engineering Research & Design Institute, China*
[3]*Chinese Academy of Sciences, China*
[4]*Beijing Institute of Technology, China*

Abstracts

Session	Operations Research 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR327
Chairs	Kaushik NAG, *American University of the Middle East*, Sudhir YADAV, *Pandit Deendayal Petroleum University*

IEEM17-P-0808

Evaluating Erlang C and Erlang A Models for Staff Optimization: A Case Study in an Airline Call Center

Kaushik NAG, Magdy HELAL
American University of the Middle East, Kuwait

Call centers can easily be modeled as queuing systems where the calls arrive, wait in a virtual queue and are serviced by operators. The simplest representation of a call center is the M/M/N queue or the Erlang C model which in this study is tested on an airline call center. A further extension of the Erlang C model is the M/M/N+M queue or the Erlang A model which takes call abandonment into consideration, has also been evaluated and compared with the Erlang C and the simulation results. With the current system having a high number of abandoned calls, low number of agents and high utilization level, Erlang C estimates are markedly different to that of the real system and is pessimistically biased by a great extent. Erlang A predictions, on the other hand, although optimistically biased is a bit more accurate. The optimum staffing requirements for each model has been predicted.

IEEM17-P-0068

Analyzing the Effectiveness of Lean Manufacturing Practices in Indian Small and Medium Sized Businesses

Saumyaranjan SAHOO, Sudhir YADAV
Pandit Deendayal Petroleum University, India

This research article aims to examine the relationship between lean manufacturing practices and operational performance of small and medium sized manufacturing enterprises, operating in India. Using a survey questionnaire, responses were collected from 121 manufacturing firms in India. Bivariate correlation and linear regression analyses were employed to investigate the effects of lean manufacturing methods on operational performance. Overall, the results from Indian manufacturing perspective indicate that lean strategy implementation is important predictor of operational performance. By testing the effect of lean manufacturing practices on operational performance of small-medium sized manufacturing businesses, this study shows strong foundation on lean manufacturing practices as an effective way of improving operational performance.

IEEM17-P-0370

Robustness Through Possible Crew Swaps in Airline Operations

Ian Frederic ILAGAN, Charlle SY
De La Salle University, Philippines

Delays in airline transportation resulting from poor planning of resources, such as crew, are commonplace. Common practices that deal with disruptions, such as purposeful cancellation of flights or assignment of emergency crew, have several drawbacks. Disruption management in terms of robustness, while increasing planned costs, are capable of creating flight schedules resistant to delays. This paper proposes an approach that incorporates delay propagation costs of flights in planning, and finds swap opportunities for crew assigned to each flight in case of disruptions. The crew swaps should lessen the need to assign emergency crew to specific flights, which is seen as costlier. A scenario is presented comparing the solutions obtained through the traditional crew pairing model and the proposed crew swap model. A solution is obtained with a comparatively higher planned cost, but with significantly lower delays.

IEEM17-P-0210

A Mixed Integer Programming Optimization of Bundling and Pricing Strategies for Multiple Product Components with Inventory Allocation Considerations

Paul Siegfried BARRIOS, Dennis CRUZ
De La Salle University, Philippines

Bundling has been practiced in different industries because of the numerous opportunities that it can provide both to the company and to the customers. However, the implementation of bundling entails the need for retailers to face several challenges in coming up with decisions that will successfully actualize the benefits. This is why literature has witnessed a spurt in the articles dedicated to the study of bundling. This study proposes a mixed integer programming model that maximizes profit by simultaneously optimizing the bundling and the pricing strategies, along with the inventory allocation decisions, of a firm having multiple product components. Results showed that the bundling decisions are dependent on the customer's preference and the profit margin of the bundles which are influenced by different factors including cost, inventory, and valuation. Increasing valuation can increase profit but can also threaten the profit margin of other bundles unlike cost reduction which will always lead to higher profits. Finally, inventory reduction limits the profit of the firm while making mixed bundling selling strategy or pure components selling strategy more profitable to adopt.

IEEM17-P-0211

A Tool for Selecting Optimal Emergency Response Unit Locations Using an Integrated AHP-MILP Approach

Jayne Lois SAN JUAN, Christine FERNANDEZ, Bryanne LIM, Erika LIM, Richard LI
De La Salle University, Philippines

The location of emergency response units (ERUs) is crucial to their operational success. This paper proposes the use of both qualitative and quantitative techniques to consider possible trade-offs between the two in determining optimal locations through an integrated Analytical Hierarchical Process and Mixed Integer Linear Programming approach with consideration of multiple routes with changing velocities and multiple ERU locations in a district. Neither objective is optimized at the other's expense through the maximization of the least efficiency value generated. A case application showed the model's validity by prioritizing the ERU locations that had the highest preference ratings. Scenario analysis revealed that varying ERU capacity does not change the optimal solution but affects the percent of population served, while changing the number of ERUs required per district and the preference ratings of the potential locations does, as the model adjusts to meet the new requirements and considers changed priorities.

IEEM17-P-0241

Positive Behaviour Changes Through Learn-Practice-Implement Leadership Behavioural Standards

Bin MA, Roland LIM, Ming Hon TOH, Huey Yuen NG
Singapore Institute of Manufacturing Technology (SIMTech), Singapore

Productivity has been identified by the Singapore government as a key pillar to supports the economic growth. However, improving the labour productivity can prove to be challenging, especially when the local workforce is shrinking. To address this challenge, local companies have to embark on a lean manpower transformation journey. From our experience with more than 200 local companies, it is the company's productivity leadership and leaders behaviours that determine the fate of its lean transformation. In this paper, we present the Leadership Behavioural Standards (LBS), a practical method that focuses on people development to help companies to improve their productivity leadership through leaders' positive behaviour changes. This method is developed based on the lean management philosophy, behavioural science and scientific psychology.

IEEM17-P-0639

Joint Decision Making About Price and Duration of Discount Airfares

Yanli FANG, Yan CHEN, Xin LI
Macau University of Science and Technology, China

Dynamic pricing is a common mechanism used in the market to enhance revenue generation from different segments of customers. In this paper, we study a joint decision making problem, faced by an airline, about the optimal price and duration of the discounted airfares to maximize its revenue. Customers have heterogeneous valuations about the air ticket. Furthermore, customers' valuations increase over the sales horizon as customers learn more about their travel schedule. In this study, the interaction between the airline and customers is modeled as a Stackelberg game, where airline acts as the leader and customers act as followers. The optimal joint decision is derived to maximize airline's total expected revenue. At last, a numerical example is conducted to illustrate the strategic pricing decision of the airline.

Session	Engineering Education and Training 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR328
Chairs	Margaret MORGAN, *Ulster University*, Miwa NISHINAKA, *The Graduate University for Advanced Studies*

IEEM17-P-0229

Engaging with Industry to Improve Student Learning on Undergraduate Engineering Programmes

Margaret MORGAN, Pearse O'GORMAN
Ulster University, United Kingdom

It is widely accepted that students' learning is closely linked to their levels of engagement. Whilst there is no single, universally accepted definition of 'a fully engaged student' there is a general consensus that active participation by the student leads to higher levels of student learning. Engineering programmes typically provide many opportunities for their students' active participation, yet many students simply drop-out or discontinue their studies before graduation. This paper describes how staff in the School of Engineering at Ulster University have used an active participation approach in a second year module in industrial engineering using a series of industrial student visits. Students' participation during the visits and their perceptions of industry before and after the visits are described. Practical suggestions on how site visits to manufacturing companies might be incorporated into the undergraduate engineering curriculum are provided.

IEEM17-P-0345

Analysis of the Stakeholders of Engineering Education System to Improve the Creativity of Engineering Education

Rufaidah Y. ALMAIAN
Kuwait University, Kuwait

Improving the creativity of engineering education is the responsibility of many stakeholders. In this paper, the major stakeholders involved in the engineering education systems including, students, faculty members and lecturers, and engineering institutions are studied. The aim is to identify what these stakeholders are required to develop or change in order to satisfy the needs of the global engineering education. In addition, the paper summarizes the barriers toward creativity with respect to each stakeholder. The paper also discusses how the understanding of the different learning styles for students can help to provide a better learning experience for the students. The paper depends mainly on a preliminary research from the literature to summarize the engineering education requirements, and barriers.

IEEM17-P-0523

Towards the Best Method of Cross Cultural Training for IT Engineering Graduates from Eastern Indonesia Region: Ready to be Global Engineers

Agung PRABOWO[1], Sulistyowati [1], Ika WINDIARTI[2]
[1]*STMIK Palangkaraya, Indonesia*
[2]*Tridharma University, Indonesia*

Indonesian IT engineering graduates are nowadays expected to work in multicultural work team. Generally, Indonesian IT engineering students are only focused on their technical skill. In fact, they need a balance of technical and non-technical cross cultural skill. To conduct cross cultural training in order to prepare them to be ready on international assignments, the best methods need to be selected concerned to some factors. The purpose of this paper is to analyze the best and applicable cross cultural training methods to be given for Eastern Indonesian IT engineering graduates. This study reports part of the results of a web-based survey of Indonesian expatriate engineers addressing their knowledge, experience and perceptions of working in multicultural working team. The output of this paper is a recommendation of the best cross cultural training methods for Eastern Indonesian IT engineering graduates as their additional valuable skill to be ready in international employment.

IEEM17-P-0845

Development of Needham Model Based e-Module for Electromagnetic Field & Wave

M.F. LEE, N.A. ZAINAL
Universiti Tun Hussein Onn Malaysia, Malaysia

This paper aims to discuss the design and development of Needham Model Based e-Module for Electromagnetic Field and Waves (EMT) course. This course is tough and students are facing problem to understand the extremely abstract concept in EMT. Without the strong support of the fundamental theories, students cannot perform in the practical class. This study was using ADDIE model as research methodology, but this paper will only discuss the three phases of ADDIE, namely analyze, design and development phases. The e-module was design and development using Needham Model which consist of five stages that are orientation, generation of idea restructuring of idea, application of idea, and reflection. The e-module was assessed by three experts from the area of EMT, Multimedia and pedagogy. The results of the assessment from 3 experts showed that the Needham Model-based e-module is in line with the subject content, the multimedia selection is suitable and the learning approach is good. The experts also accept the e-module at the high level of usability in teaching EMT. As a conclusion, the e-module is recommended to students enroll in EMT course.

IEEM17-P-0007

Industrial IoT Business Workshop on Smart Connected Application Development for Operational Technology (OT) System Integrator

Satoshi GOTO, Osamu YOSHIE, Shigeru FUJIMURA
Waseda University, Japan

Today, many of manufacturing system integrators are pursuing new business solution on information technology (IT) embedding Internet of Things (IoT) functionalities. However, how about conventional type of system integrators? Although their customers already require new innovative IoT solutions, such integrators tend to still provide traditional operational technology (OT) solutions that the customers are less interested in. This is a cause of lack of knowledge of IT technology that OT engineers have never experienced. This paper introduces a preliminary study for a method development on pragmatic workshop combining with business model definition and IoT technology training for such OT system integrators. This workshop method particularly focuses on convergence of OT and IT; defining a new business value chain and experiencing of commercial IoT technology as hands-on session. This paper is mainly discussed a real case study as a preliminary trial in an industrial city in Far East region.

IEEM17-P-0295

How to Improve Employee Education - Methodological Approach to Structure Specialist and Interdisciplinary Requirements

Barbara Theresia WULFKEN[1], Egon MUELLER[2]
[1]*Volkswagen Sachsen GmbH, Germany*
[2]*Technische Universität Chemnitz, Germany*

The automobile industry and automotive supplier industry is confronted with large changes in connection with industry 4.0 and the increased focus on electric mobility. Changes involve not only modifications in the production line, but also an extended demand to employees. The following article describes a methodology on how requirements can be structured to ensure employee selection and education in the context of technological and organizational changes as needed.

Session	Intelligent Systems
Date	11/12/2017
Time	11:15 - 12:45
Room	MR329
Chairs	Arnesh TELUKDARIE, *University of Johannesburg*, Abdul-Wahid SAIF, *King Fahd University of Petroleum & Minerals*

IEEM17-P-0184

Implementation of Industry 4.0 Technologies in the Mining Industry: A Case Study

Michael N. SISHI, Arnesh TELUKDARIE
University of Johannesburg, South Africa

In modern mining, it is imperative to have a real-time flow of information between enterprise level systems (ERP, CRM, SCM) and shop floor systems. The gaps that exist between the two spheres make it difficult for managers to have timely information for optimum decision making. A mining company needs instantaneous visibility on production, quality, cycle times, machine status, and other important operational variables in order to achieve optimum and effective operations. With the implementation of Industry 4.0 technologies fragmented shop floor systems and the enterprise level systems communicate seamlessly in delivering optimum operations. The research demonstrates Industry 4.0 technologies as the mechanisms for integrating business systems and processes. The methods researched are deployed in a uranium mining company to integrate all shop floor systems with SAP ERP. The results introduce a semi-smart Mine with real-time visibility of overall mining status.

IEEM17-P-0264

Application of the Agile Energy Model to the Procure to Pay Process

Megashnee MUNSAMY[1], Arnesh TELUKDARIE[2]
[1]*Mangosuthu University of Technology, South Africa*
[2]*University of Johannesburg, South Africa*

Multinational Manufacturing Corporations (MMC's), which account for a fair percentage of the manufacturing industry encounter challenges with energy quantification and optimisation. Traditional energy models, which have long been used for energy system evaluations have limited application at MMC's due to model characteristics of high level of expertise, data and time intensive, long time horizons and large spatial detail. The Agile Energy Model utilises business processes for energy evaluation and optimisation. The features of the Agile Energy Model supporting application at MMC's are generic, reproducible, ease of use, minimum user input data and time requirements and transparency of the evaluation process. It enables the energy quantification of non-traditional activities of finance, HR, ICT and sales and marketing. The methodology of application of the Agile Energy Model is demonstrated with the established procure to pay process.

IEEM17-P-0641

Usage Frequency of Product Configuration Systems Relative to Integrations and Fields of Application

Sara SHAFIEE[1], Katrin KRISTJANSDOTTIR[1], Lars HVAM[1], Loris BATTISTELLO[2], Enrico SANDRIN[2]
[1]*Technical University of Denmark, Denmark*
[2]*University of Padova, Italy*

Product Configuration Systems (PCS) are automatic solutions that can support and facilitate the sales and engineering processes. PCSs have recently attracted increased attention both from the researches and practitioners. There are variety of challenges reported in the literature as consequences of using PCS, which reduces the usage frequency of the system. To address those challenges, IT integrations can be an effective solution to reduce the number of manual tasks and complexity inside PCSs and make PCSs more user friendly. However, the influence of integrating PCS to different IT systems on usage frequency has not been addressed in the literature. This paper aims to study the relationship of PCS usage frequency in terms of (1) different application area of the PCSs, and (2) integrations to different IT systems. The research method adopted in the paper is survey-based conducted in one company where the unit of analysis is operating PCS.

IEEM17-P-0278

Chatbots and Conversational Agents: A Bibliometric Analysis

Hio Nam IO, Chang Boon LEE
University of Macau, Macau

Chatbots are replacing some of the jobs that are traditionally performed by human workers, such as online customer service agents and educators. From the initial stage of rule-based chatbots to the era of rapid development in artificial intelligence (AI), the performance of chatbots keeps improving. Chatbots can nowadays "chat" like a human being and they can learn from experience. The purpose of this research is to examine the past research on chatbots (also known as conversational agents) using the quantitative bibliometric analysis. The contribution of this research is to help researchers to identify research gaps for the future research agenda in chatbots. The results of the analysis found a potential research opportunity in chatbots due to the emergence of the deep learning technology. This new technology may change the direction of future research in chatbots. Several recommendations for future research are provided based on the results obtained from our analysis.

IEEM17-P-0760

Evaluation of Knowledge Acquisition from Document Clustering Based on Information Retrieval Scales

Shu OCHIKUBO, Kano KOMIYA, Fumiaki SAITOH, Syohei ISHIZU
Aoyama Gakuin University, Japan

Twitter is becoming one of the most important social sensors for observing the reputation and trends of events and things in the real world. Also the impression and reputation of enterprises on the public, information available on Twitter is effective in influencing opinions. In this study, we attempted to classify companies using tweets that included hash tags that corresponded to each company from language resources related to the companies accumulated on Twitter. However, there are differences in the number of tweets by companies, which may affect the performance of clustering. Therefore, by comparing TF-IDF which is a conventional method and BM25 considered in document length, it is confirmed whether difference in performance of companies clustering occurs. The collected tweets were weighted by information retrieval scale, and clustering result was evaluated by entropy. As a result, the peripheral method of BM 25 was shown to be effective in document clustering.

IEEM17-P-0777

Extraction of Customer Satisfaction Topics Regarding Product Delivery Using Non-Negative Matrix Factorization

Tokuhiro KUJIRAOKA, Fumiaki SAITOH, Syohei ISHIZU
Aoyama Gakuin University, Japan

The purpose of this research is to extract knowledge about textual data of customer satisfaction from the customer's voices with regard to delivery of e-commerce products. With the recent development of e-commerce, new distribution formats such as O2O and Omni-Channel are penetrating society. Since customer reviews are free-form descriptions, comments about delivery services and comments about the personal experience of individual customers are mixed in with product evaluation data. In this study, we focus on the topic extraction function of nonnegative matrix factorization and extract topics from mixed review data. We propose a method of decomposing review data and extracting topics to identify delivery-related expressions. Furthermore, by using a random forest with the above topic as the features, we were able to detect those factors affecting overall satisfaction.

IEEM17-P-0515

A Framework for Knowledge-Intensive Design Decision Support in Model Based Realization of Complex Engineered Systems

Ru WANG[1], Guoxin WANG[1], Yan YAN[1], Shuting CHEN[1], Janet K. ALLEN[2], Farrokh MISTREE[2]
[1]*Beijing Institute of Technology, China*
[2]*The University of Oklahoma, United States*

Industry is experiencing the challenges of "data-driven" that bring a digital transformation in the industry. In order to facilitate competitiveness in the trend of the digital manufacturing, a method of knowledge-intensive design decision support in the model based realization of complex engineered systems is suggested for manufacturing enterprises to support decision-centric meta-design in robust design, ontology-based knowledge management, and rapid design decision using modular process templates. A concept of DGS - Design Guidance System, as well as the associated operation scenarios, are also identified to increase the efficiency and effectiveness of a designer using platform PDSIDES for the decision-making.

Session	Supply Chain Management 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR332
Chairs	Teng-Sheng SU, *Chaoyang University of Technology*, Cagatay IRIS, *Nanyang Technological University*

IEEM17-P-0485

Integrated Supporting Cooperation Model with Fuzzy Approach for Staff Scheduling Problem in Service Supply Chain

Teng-Sheng SU, Su-Chuan LIU
Chaoyang University of Technology, Taiwan

In the past few years, the multinational chain has risen widely. Facing up to the manpower shortage issue in the market, how to design an integrated efficient and responsive supply chain model to optimize personnel planning and staffing operations, and fulfill diverse requirements of product and service for satisfying customers has become one factor in the modern labor-intensive service industry system. In this study, we propose a framework that satisfying the supporting cooperation among members based on the service skill with the fuzzy clustering and objective function with the penalty evaluation to solve the human resource planning problem within multinational supply chain system. Unlike traditional staff scheduling that merely focuses on reducing the cost, the supporting cooperative framework provides proper integrated platforms for personnel flow in global logistics in respect of the customer service and partnership empathy to achieve the goal of the sustainable operation.

IEEM17-P-0430

Models for Continuous Berth Allocation and Quay Crane Assignment: Computational Comparison

Cagatay IRIS, Jasmine Siu Lee LAM
Nanyang Technological University, Singapore

This paper reviews the state-of-the-art models for the continuous and dynamic berth allocation and quay crane assignment problem. This problem arises at the seaside of the container terminals, and it is mostly studied at the operational level. The problem aims at determining a berthing position in a kth-meter partitioned continuous berth, a berthing start and end time, and a quay crane assignment for each vessel calling the terminal. The quay crane assignment includes the number of quay cranes allocated to each vessel at each time period. The state-of-the-art models are run with same settings and benchmark. The results indicate that set-partitioning model and an enhanced compact model outperform the remainder.

IEEM17-P-0299

Determining Quality Refining Rice Mill Location with Disruption Risks

Wichitsawat SUKSAWAT NA AYUDHYA
King Mongkut's Institute of Technology, Thailand

The events of disaster caused the disruptions in supply networks. In 2011, Thailand also witnessed one of the worst floods in 50 years. This event reminds decision makers to consider all uncertainties when they decide to determine their facility locations of quality refining rice. Facility locations for quality refining rice play an important role for the logistic system cost especially for transportation cost. With these quality refining rice facilities, Thai's rice can capture niche market in today's fierce competition. This paper presents scenario planning models to address the uncertainty of travel distances and rice productions. The results show that only Bangkok, Chachoengsao, and Samut Prakan are common solutions from scenario planning models.

IEEM17-P-0351

Performance Analysis of Riceberry Rice Supply Chain in Thailand

Wassanai WATTANUTCHARIYA, Thammasak KUAITES
Chiang Mai University, Thailand

This research aimed to evaluate the performance of the Riceberry rice supply chain in Thailand – from producer to rice mill to end seller – using data collected from site visits and interviews. To evaluate the supply chain, we used the Logistic Performance Index based on Inventory Holding Cost per Sales, Transportation Cost per Sales, Average Inventory Day, Forecast Accuracy Rate, Rate of Return Goods, Warehousing Cost per Sales, Average Order Cycle Time, Average Delivery Cycle Time, and Transportation DIFOT Rate. The key factors that enhanced the performance and sales volume of the supply chain were market expansion, product processing, transportation plan, warehouse management, and customer demand forecasting. These factors can reflect the sales volume of Riceberry rice. A good transportation plan and better warehouse management can reduce the total cost and enhance the performance of the supply chain, while the accuracy of customer demand forecasting can also increase customer satisfaction.

IEEM17-P-0543

Framework of Supply Chain Simulation Using SCOR Model in Newspaper Industry

Arinda Soraya PUTRI, Wahyudi SUTOPO, Muhammad HISJAM
Universitas Sebelas Maret, Indonesia

This paper aims to review several possible methods in measuring supply chain performance of newspaper industry. In order to formulate the method, the whole business process in newspaper supply chain needs to be mapped properly. A particular brand of newspaper industry in Indonesia has been chosen as a case study hence a simulation can be conducted. Mapping of business process in newspaper industry involving supplier, manufacturer and distributor is elaborated in this article. The study result shows that SCOR simulation is the most suitable method in measuring supply chain performance in this case. Future research possibly can be a validation test of indicators used in the newspaper industry simulation method.

IEEM17-P-0253

Pricing Policy in Green Supply Chain Management with a Risk-Averse Retailer

Bo LI, Yushan JIANG, Xiaolong QU
Tianjin University, China

Green Supply Chain Management (GSCM) integrates environmental concept into supply chain management, such as, the design of green product. However, manufacturers require high investment to perform R&D green innovation, and the retailers may bear the risk of the consumers' acceptance in the market. Combining the manufacturer's investment of an environmental-friendly green product with the retailer's risk aversion, this paper investigates the optimal decisions of a green supply chain with a risk-neutral manufacturer and a risk-averse retailer. Through Stackelberg game model, we use conditional value-at-risk (CVaR) criterion to evaluate the risk-averse behavior of the retailer under stochastic demand. The results show the great impacts of the retailer's risk-averse behavior on the green degree, the wholesale price, the retail price and the order quantity of green products relative to certain key thresholds.

IEEM17-P-0271

Developing Innovative Supply Chain Using Crowdsourcing: A Conceptual Model

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The advancement in information technology has revolutionised the supply chains across the globe. It has enabled organisations to be more efficient and integrated, while continually improving by incorporating latest trends and technologies. Among the recent trends, crowdsourcing is contributing toward improved operations and innovation by seeking the involvement of users, customers and thinkers into generating new ideas and incorporating those into current or future processes. However, the application of crowdsourcing in the supply chain is very limited. Considering its potential benefits, this paper proposes a conceptual model to develop an innovative supply chain by incorporating crowdsourcing. This paper presents an innovative approach which enables researchers and practitioners to study the benefits of crowdsourcing on the supply chain. Identification of the conceptual relationship between crowdsourcing and the supply chain author hopes will contribute towards the development of new theoretical approaches in this field.

Session	Information Processing and Engineering 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR333
Chairs	Urs BUEHLMANN, *Virginia Tech*, SC Johnson LIM, *Universiti Tun Hussein Onn Malaysia*

IEEM17-P-0339

Estimating Component Yield for CLT Production

Urs BUEHLMANN[1], R. Edward THOMAS[2]
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The emergence of cross-laminated timber (CLT) for building construction in North America may provide an additional and possibly more valuable product market for hardwood logs. Using the RaySaw sawing and ROMI rough mill simulators and a digital databank of laser-scanned low-grade yellow-poplar (Liriodendron tulipifera) logs, we examine the yield-recovery potential for components used in the production of CLT. Results include a sawing yield of 65% and a rough-mill yield of 78%, for a total material yield of approximately 50%. This study confirmed the usability of yellow poplar as a material for the production of CLT and allows to estimate the impact on our forest resource of increased use of yellow poplar CLT.

IEEM17-P-0619

Meshes Optimization in Freeform and 3D Printing for Product Design

Chung-Chuan WANG[1], Chung-Shing WANG[2], Ching-Hu YANG[2], Kai-Jai YANG[2], Teng-Ruey CHANG[3]
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[2]*Tunghai University, Taiwan*
[3]*Nan Kai University of Technology, Taiwan*

Meshes optimization plays an important role in freeform surface reconstruction and 3D printing for product design. The purpose of this study applied the "Winner-take-all" method of Self-Organizing Maps (SOM) to classify the meshes in product model. SOM is to find the optimized feature points for the data points in model and reduce the points efficiently in the whole surface reconstruction process. An implicit surface based on radial basis function (RBF) kernel calculation reconstructed the meshes. Three case studies has been implemented to achieve an effective points data reduction and an error deviation acceptable process.

IEEM17-P-0266

Analysis and Mode Establishment of Information Integration Activities - A Case Study Perspective

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Influencing by the factors of sudden change of demand, unknown strategy, advancing technology and insufficient experience, enterprise's information systems are lead to diversification and difficult integration. Although quite a few scholars thus proposed information integration frameworks, theories and suggestions, the lack consideration on internal operations, project operation mechanism and no complete information integration activity structure has resulted in too conceptual and principle outcome, leaving enterprise's failure in getting the expected benefits. In this respect, this study (1) selects "the Key Success Factors of Information Integration Activity Structure" the literatures and qualitative interview methods to specifically emerge the implementation structure and items/factors of information integration project activities; (2) based on case study interview to explain the gains and losses of the information integration activities procedures for a famous vegetarian group in Taiwan; (3) follows the CREATER model, analyzes each activity procedure items/factors on the "structure table" to emerge possible problems and solutions; (4) dialysis the "project activity mode" of "organization operation surface" and the "importance difference" of "solution surface"; (5) elaborates the management implications and contributions of the research results. It's believed that the results of this study can effectively combine practical application with academic value. It also helps enterprises to enhance the possibilities of success on information integration activities.

IEEM17-P-0668

Adaptation of a Product Maturity Model to Highly Iterative Product Development

Günther SCHUH, Jan-Philipp PROTE, Stefan DANY, Marco MOLITOR, Luca PAGANO
RWTH Aachen University, Germany

Fast changing market conditions and shortening of product life cycle put pressure on producing companies. The resulting increase of complexity requires a new way to organize the entire product development process. One option to handle this is the highly iterative product development approach. Fast changing customer requirements lead to a continuous adaption of the products. Therefore, a frequent assessment of the product maturity level is necessary. In order to adapt a product maturity model to the highly iterative product development, this paper aims to present an approach how product maturity models need to be structured.

IEEM17-P-0455

Validation of an Optical System for Measuring the Absolute Angular Position

Tobias SCHNEIDER[1], B. EILERT[1], Malte STONIS[1], Ludger OVERMEYER[2]
[1]*Institut für Integrierte Produktion Hannover, Germany*
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The measurement of the absolute rotational angle and torque via sensors forms the basis for many industrial sectors. Until now, combined sensors have not been available, so that a lot of installation space is occupied by sensor setups. In addition, the sensor setups get expensive quickly. Therefore, an optical and non-contact measurement method to detect the absolute angle of rotation and torque was developed. This paper presents the validation methodology, the setup of the test bench and the validation results. With an angular resolution of 0.001 degree and an accuracy of more than 0.05 percent, the results are promising. However, for industrial application further investigations on determining torque and miniaturizing the optical setup are required.

IEEM17-P-0407

Integration of an Automated Load Management in a Manufacturing Execution System

Cedric SCHULTZ, Christina BAYER, Martin ROESCH, Stefan BRAUNREUTHER, Gunther REINHART
Composite and Processing Technology IGCV, Germany

Today, many nations strive for further decoupling of economic growth and CO2 emissions by increasing their use of renewable energies. Because wind and solar power supply is volatile and puts strain on the electric grid, industrial consumers' Demand Side Management (DSM) becomes crucial for balancing energy supply and demand. As DSM measures directly influence a production system's performance, energy-related factors have to be weighed carefully against other production targets within a company's production control. This paper presents methods for integrating load management into production control in order to minimize energy costs for companies. In order to promote the application of load management in production, these methods are implemented in a commercial Manufacturing Execution System.

Session	Production Planning and Control 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR334
Chairs	Gopinath CHATTOPADHYAY, *Federation University*, Nidhal REZG, *University of Lorraine*

IEEM17-P-0269

Data Analysis on Applying Real Time Tracking in Production Control of Construction

Jianyu ZHAO, Hylton OLIVIERI, Olli SEPPÄNEN, Antti PELTOKORPI, Behnam BADIHI, Pontus LUNDSTRÖM
Aalto University, Finland

The interest in production control has increased over recent years, especially among lean construction practitioners. Despite of advanced planning and control methods, the data of on-site processes are still typically collected manually. At the same time, technology has been developed to the point where it is possible to remotely locate people, equipment and products in supply chains. Therefore, how to obtain and manage data in construction based on real time tracking is critical to change production control to a more real-time and less laborious process. The availability of real-time, location-based data, opens possibilities to revolutionize production control. This paper proposes a prototype of an intelligent system for real time production control on construction site, defining the types of the tracking data, and investigating the utility of them. The prototype combines Bluetooth and WIFI network as connection methods, and locates resources and their movements in real-time, which can be used as a reference to explore proper solution on construction projects and potentially improve production efficiency, sustainability and management of workers.

IEEM17-P-0168

Job Scheduling Integrated with Imperfect Preventive Maintenance Considering Time-Varying Operating Condition

Jiawen HU, Zuhua JIANG
Shanghai Jiao Tong university, China

The integrated problem of preventive maintenance and job scheduling has drawn much attention during the past several decades. However, few researches have taken both the operating condition (OC) of jobs and imperfect maintenance (IM) into account. The OC of jobs can impact the degradation speed of machines; hence, the expected completion time of jobs. This research considers a single machine non-preemptive earliness-tardiness job scheduling problem, takes the sum of the earliness-tardiness penalty cost and maintenance cost as the objective, proposes an integrated model of job scheduling and PM considering both OC and IM. A small-scale example conducted by a total enumeration method is presented to reveal the necessity of considering the OC and IM.

IEEM17-P-0528

A Genetic Algorithm for Unrelated Parallel Machine Scheduling Minimizing Makespan Cost and Electricity Cost Under Time-of-Use (TOU) Tariffs with Job Delay Mechanism

Bobby KURNIAWAN, Alfian Akbar GOZALI, Wei WENG, Shigeru FUJIMURA
Waseda University, Japan

Unrelated parallel machine scheduling under time-of-use electricity price is addressed in this paper. In this setting, price of electricity can be different among various periods of the day. The objective is to minimize total cost consisting of makespan cost and electricity cost. Genetic algorithm (GA) is used to solve the unrelated parallel machine scheduling under time varying tariffs. Chromosome decoding, inspired by greedy total cost, is proposed to transform individual into feasible schedule. Furthermore, generated schedule from the individual is improved by job delay mechanism that shifts jobs to other periods to avoid high electricity cost. Finally, numerical experiment is conducted to implement the approach. Preliminary result shows that our proposed approach is effective and efficient to solve the corresponding problem.

IEEM17-P-0719

Group Production Scheduling Model with Due Window and Maintenance

Wen-Zhu LIAO, Min JIANG, Xiu-Fang ZHANG
Chongqing University, China

A group production scheduling model considering preventive maintenance (PM) and due window is proposed so as to satisfy dual requirements of production cost and delivery date. In this integrated model, learning and forgetting effects between jobs and groups are involved, and an early/tardy delivery penalty membership function is introduced. With the objective of minimizing the total of early/tardy delivery penalty cost and maintenance cost, genetic algorithm is used to obtain the optimal job production and maintenance sequence. Finally, a case study is given to show the effectiveness and reliability of this proposed model.

IEEM17-P-0123

Product Variety Management Using Data-Mining Methods – Reducing Planning Complexity by Applying Clustering Analysis on Product Portfolios

Jan HOCHDÖRFFER, Clemens LAULE, Gisela LANZA
Karlsruhe Institute of Technology (KIT), Germany

In decision making problems regarding production network design, product variety oriented planning of network structures and capacities is indispensable. Due to increasing product variety, related planning tasks have become more complex to account for the significantly varying production requirements of product variants. To create a consolidated and expressive decision basis, a methodology to apply cluster analysis on product portfolios is developed in this paper. The introduced clustering method is able to handle production process-related binary data and production capacity-related metric data simultaneously. By applying this method, the product portfolio is partitioned into clusters so that variants within a cluster have similar requirements regarding production capabilities and capacities. The developed method is applied to two data sets resulting in more efficient and more accurate problem solving in comparison to established clustering methods.

IEEM17-P-0132

Age-Differentiated Analysis of the Influence of the Duration of Breaks on Learning Sensorimotor Tasks

Francoise KUHLENBÄUMER, Simone POLIS, Philipp M. PRZYBYSZ, Susanne MÜTZE-NIEWÖHNER
RWTH Aachen University, Germany

In this paper, the influence of the duration of breaks on the learning time of sensorimotor tasks is investigated. For this purpose, a laboratory study with 48 participants in two age groups was conducted. The experimental task was the repeated assembly of a gear. After each trial participants had a break. Depending on the experimental condition the breaks were 2, 4, 8 or 16 minutes long. To evaluate the performance, execution times and assembly errors were measured in each trial. The results show significant learning effects and a significant difference between the execution times of both age groups. No significant difference was found between these groups concerning assembly errors. The duration of breaks did not influence performance.

IEEM17-P-0471

In Lean Manufacturing, if the Customer is a King, then the Frontline Worker is a "Knight": A Case Study

Pulek KHOLOPANE, Kehinde SOBIYI
University of Johannesburg, South Africa

Worldwide, Lean manufacturing has been widely declared a success. In the industry, Lean manufacturing had been faced with lots of criticism which includes poor integration of human resource capital most especially in the shop floor level regarding the front-line worker. This paper examines the importance of the involvement of a frontline worker in Lean manufacturing resulting from the longitudinal field of study. Although in manufacturing, the focus is the customer however, quality of the product begins with the frontline worker. It proves that the frontline worker has control on the outcome of the product and that what the customer gets at the end of the day depends on the skills and motivation of the frontline worker. A South African multinational mining company is used as a case study. At the company, the effect of frontline workers at the shop-floor level and their effectiveness and contribution to overall plant productivity are examined.

Session	Project Management 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR335
Chairs	Budi HARTONO, *Universitas Gadjah Mada*, Zhe ZHANG, *Nanjing University of Science and Technology*

IEEM17-P-0473

Effective Knowledge Management Strategy and Firm's Size: Evidence from Indonesia Construction Firms

Budi HARTONO[1], Sinta SULISTYO[2], Kah-Hin CHAI[3], Nurul INDARTI[2]
[1]*University of Gadjah Mada, Indonesia*
[2]*Universitas Gadjah Mada, Indonesia*
[3]*National University of Singapore, Singapore*

The objective of this study is to provide both theoretical propositions and empirical evaluations to the association between knowledge management strategy (KMS) and organizational performance within a project-based organization setting. Of particular interest, firm's size is included within the analysis as a possible moderating variable. Primary data is inquired by means of a cross-sectional survey within a specific context of Indonesia construction firms. Out of 262 invited firms, 106 provide usable data (40.5 % response rate). The result shows that empirical data partially supports the hypotheses. It is found that in general, a positive relationship is observable between implementation level of 'codification' strategy and organizational performance. An unexpected, significantly negative association between 'personalization' strategy and performance is also observable. Further evidence also shows that for larger construction firms, management of knowledge which focuses on the codification strategy yields superior performance. Inconclusive results for smaller size organization suggest that more follow-up studies are required.

IEEM17-P-0356

Context-Oriented Strategy for Modularization of Engineering Design Processes: An Automotive Case Study

Christoph HOLLAUER, Gregor PAVLITZEK, Markus MÖRTL, Udo LINDEMANN
Technical University of Munich, Germany

Project planning is a necessary but repetitive and time-consuming activity. Organizational reference process models are often only used as marginal input for project planning, which is mostly conducted manually by experts. Process Tailoring has been introduced in software engineering as a means to methodically instantiate project plans from reference models. However, corresponding approaches focus largely on the software-implementation of model transformations, less on the structured acquisition and derivation of tailoring-relevant knowledge. In this paper, we present a methodology for mapping a processes application context and deriving a process module architecture that satisfies variability-related requirements. The design approach is applied in an industrial case study at an original equipment manufacturer in the automotive industry.

IEEM17-P-0726

Applicability of Earned Value Management for Deadline Energy Constrained Applications

Shunichiro SUENAGA, Kenji TEI, Shinichi HONIDEN
National Institute of Informatics, Japan

Earned Value Management (EVM) is a progress management method in project management. EVM is used as metrics to analyze execution statuses of projects that need to be accomplished within deadlines and limited budgets. By replacing budgets used in project management with energy used in applications, we can apply EVM as metrics to analyze execution statuses of Deadline Energy Constrained (DEC) applications that execute tasks within deadlines and limited energy. DEC applications are often seen in applications that need to consume energy within limits, for example, Wireless Sensor Networks (WSNs), Electric Cars (ECs), and Unmanned Aerial Vehicle (UAV). In this paper, we introduce new possibilities of applying EVM by showing that EVM can be used to analyze execution statuses of and make changes to DEC applications.

IEEM17-P-0732

Implementation and Assessment of a Predictive Analytics Model for Development Project Management

Günther SCHUH, Michael RIESENER, Christian DÖLLE
RWTH Aachen University, Germany

In order to strengthen their competitive position, companies in high wage countries strive towards shortened innovation cycles while decreasing development costs. To achieve this, development projects need to be managed in a lean and efficient way. Existing approaches targeting the development project management mainly focus the target dimensions time, cost and quality on the superior project level. Corrective steering measures however need to be implemented on an activity level. Thus, a concept has been developed that applies predictive analytics techniques to predict deviations in the activities of development projects based on deviation indicators. In the presented paper, a methodology for the evaluation of suitable input parameters is presented. A predictive analytics model based on this concept is then implemented and validated. Therefore, a data set was acquired, which is used to train a neural network. To validate the applicability of the model, the accuracy of the predicted deviations is assessed against the actual deviations.

IEEM17-P-0814

Challenges of Agile Development Implementation in Mechatronic Development Processes

Kristin GOEVERT[1], Attila GÖKDEMIR[1], Christoph PEITZ[2], Udo LINDEMANN[1]
[1]*Technical University of Munich, Germany*
[2]*OSRAM GmbH, Germany*

This paper gives an overview of the challenges in the implementation of agile development in mechatronic development processes. For this purpose, 31 situations, 13 challenges, and three problem areas are identified in an innovative company department. This department operates like a start-up surrounded by a business group structure. First improvements to solve challenges are implemented in the department.

IEEM17-P-0797

Conflict Management in Outsourced Engineering Projects in South Africa

Bulali MDONTSANE, Hannelie NEL, Annlizé MARNEWICK
University of Johannesburg, South Africa

The aim of this study was to investigate conflict management in engineering projects in South Africa. Improved management of project failure is possible if the relationship between conflict management and project success is known. Organizations turn to project management to unlock opportunities and fulfil strategic objectives. This study provides a framework to address and manage conflict in outsourced engineering projects for the benefit of organizations and engineering professionals who are involved in projects. The constructs of conflict management and project success were delineated and analyzed with structural equation modeling in SPSS. The statistical analysis confirmed that effective conflict management positively impacts project success.

Session	Big Data and Analytics 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR309
Chairs	Feng YANG, *Agency for Science Technology and Research (A*STAR), Singapore*, Shen REN, *Agency for Science Technology and Research (A*STAR), Singapore*

IEEM17-P-0550

Feature Importance-Guided Multi-Regression Ensemble with Application to Remaining Useful Life Prediction

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[1]*Agency for Science Technology and Research (A*STAR), Singapore*
[2]*PSB Academy, Singapore*

Ensemble methods have been applied to many problems, with the three typical steps of the ensemble process, namely, ensemble generation, ensemble pruning and ensemble integration, being widely studied. This paper proposes the use of multi-model ensemble in generating the final predictions of the Remaining Useful Life (RUL), where the primary focus are in ensemble generation (to produce multiple base models) and ensemble integration (to design weighting methods for the base models). Upon generating the multiple base models, each base model is then weighted by incorporating the importance information of the features that are used. Six weighting methods were implemented and experiments were conducted on real data from eight induction motors. Results comparison with the commonly used equal weighting method showed the benefits of such ensemble methods incorporating feature importance information.

IEEM17-P-0336

Status Quo and Future Potential of Manufacturing Data Analytics – An Empirical Study

Sebastian GROGGERT[1], Marian WENKING[2], Robert H. SCHMITT[1], Thomas FRIEDLI[2]
[1]*RWTH Aachen University, Germany*
[2]*University of St. Gallen, Switzerland*

Digitization is continuously increasing throughout all sections of manufacturing. Therefore, more data than ever before is accumulated along the value chain. The shop-floor data contains essential information for process optimizations. The correct exploitation of this data is expected to boost companies' competitiveness by supporting business-decision making. In an empirical study, 100 manufacturing companies - mostly located in Germany and Switzerland - were asked how they are handling this data, what problems they encounter and how they are dealing with them. Thus, the data analytics process was divided into four steps. The study shows that especially data processing and data exploitation are still challenging for most companies. Additionally, this study revealed that the current business performance impact of data analytics in manufacturing is not satisfactory for most companies due to problems across the data analytics process.

IEEM17-P-0104

Monitoring of an Aluminum Melting Furnace by Means of a 3D Light-Field Camera

Sara MOHAMMADIFARD[1], Jan LANGNER[1], Malte STONIS[1], Hubertus SEMRAU[2], Sven-Olaf SAUKE[2], Hossein LARKI HARCHEGANI[3], Bernd-Arno BEHRENS[3]
[1]*Institut für Integrierte Produktion Hannover, Germany*
[2]*ZPF GmbH, Germany*
[3]*Leibniz Universität Hannover, Germany*

The melting process in an aluminum melting furnace cannot be monitored by contact sensors, since the furnace is not accessible due to the high temperatures (more than 700 °C). Therefore, monitoring the melting process by means of optical sensors is investigated for the first time in this research project. This article deals with an innovative optical measuring system that is able to monitor the melting bridge despite the red-hot furnace walls. For this purpose, a light-field camera is installed on top an aluminum melting furnace in order to monitor the process and to control a targeted heat input into the melting furnace using a rotatable burner. The light-field camera used can capture a 3D point cloud with only one image. To achieve this, a separate field of lenses is placed between the image sensor and the main lens, projecting a virtual intermediate image onto the actual image sensor for further data processing. In addition, a self-developed image analysis program serves to monitor the height variation of the aluminum block and any melting rest on the melting bridge of the furnace [1].

IEEM17-P-0577

Large-Scale Clustering Using Mathematical Programming

Mario GNÄGI, Philipp BAUMANN
University of Bern, Switzerland

Cluster analysis is a fundamental task in exploratory data analysis with a wide range of applications. Several clustering approaches based on mathematical programming have been proposed in the literature and were successfully used for small- and medium-scale data sets. However, mathematical programming based clustering models are rarely used for large-scale data sets due to their extensive running time. In this paper, we propose a general scaling approach for existing mathematical programming–based clustering models that is based on the idea of replacing identical or nearly-identical objects by a small set of representatives. Our computational results indicate that the proposed scaling approach substantially reduces running time with a minor loss in clustering accuracy.

IEEM17-P-0842

Association Rules and Collaborative Filtering on Sparse Data of a Leading Online Retailer

Yongzhong WU, Mianmian HUANG, Yuxin LU
South China University of Technology, China

Personalized recommender systems are important for online shopping retailers to recommend items to potential customers. However, data sparsity is a key problem leading to poor recommendations. In this paper, we established two recommender models, i.e., the one based on association rules and the one based on collaborative filtering (CF), and tested them on a large set of sparse data obtained from a Chinese leading online shopping retailer. For the first model, only a limited number of reliable association rules were obtained due to data sparsity. For the second model, although collaborative filtering did not work well on the entire dataset, it performed significantly better when limiting the data to those associated with popular items. As retailers' majority of revenues coming from popular items, restricting the dataset to those associated with popular items can improve the effectiveness and maintain the usefulness at the same time.

IEEM17-P-0027

A Comparison Between MODWT-SVM-DE Hybrid Model and ARIMA Model in Forecasting Primary Energy Consumptions

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The future demand of primary energy plays an important role in a reliable supply system, which is used as a guideline for a proper policy. The useful information of demand can be obtained from suitable forecasting models. In this paper, the forecasting performances of ARIMA model and hybrid model of MODWT-SVM-DE model are investigated and compared based on three criteria; MAE, MAPE, and sMAPE. The empirical results indicated that the MODWT-SVM-DE model provides more accurate forecasts than ARIMA model at significance level $\alpha = 0.10$. However, the ARIMA model as a simplified model is capable to provide the accurate result that is not relatively different than that of the MODWT-SVM-DE model in given data sets.

Session	Healthcare Systems and Management 1
Date	11/12/2017
Time	11:15 - 12:45
Room	MR308
Chairs	Xiuzhu GU, *Tokyo Institute of Technology*, Hamid ALLAOUI, *University of Artois*

IEEM17-P-0174

Developing an Error Taxonomy System for Patient Handoff Events

Xiuzhu GU, Tsuyoshi SEKI, Kenji ITOH
Tokyo Institute of Technology, Japan

This paper develops an error taxonomy system for a framework of analyzing patient handoff events. The taxonomy was composed of four sections: event outline, outcome severity, background factors and prevention mechanisms. Each section included one or more dimensions, each of which had multiple categories. Applying the taxonomy to patient handoff incidents collected from five general hospitals in Japan, we identified several important characteristics of handoff failures. Two handoff types that most frequently failed were inter-department handoffs and nurse-to-nurse shift handoffs in the wards. And the failures were mainly due to insufficient or inaccurate information transfer about medication and patient conditions other than vital signs. Regarding inter-department handoffs, transfer failure of patients, medicines, materials and equipment was also frequently occurred. Staff human factors, organizational factors and busy work situations were three major contributing factors behind patient handoff incidents. Reliability of the taxonomy system was confirmed by inter-rater reliability.

IEEM17-P-0665

Scheduling Patients in Emergency Department: A Case Study

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Emergency Department (ED) is the center of the hospital management's efforts. It constitutes a complex system with limited resources and random demands, which affect ED patients' waiting time. This paper aims to find the optimal patients' scheduling in case of an ED in Tunisia. We propose a mixed integer linear programming (MILP) that minimizes patients' waiting time. We consider simultaneously four categories of patients. To solve this model, we use the solver ILOG CPLEX Optimization Studio. The program has been applied to a real case study. Numerical results show that patients' waiting time decreased by using the proposed approach compared to the current configuration.

IEEM17-P-0796

Simulation Analysis to Improve Outpatient Turnaround Times in Specialty Clinics

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[3]*Georgia Institute of Technology, United States*

This paper describes a case study undertaken at an outpatient specialty clinic of a hospital. In order to improve patient turnaround times in the outpatient clinic, the hospital management considers implementing changes in patient appointment scheduling, adopting a new patient registration system, and adopting a new billing system. Using computer simulation, the study first models the outpatient care process in the clinic and assesses patient turnaround times in the process. Then, it evaluates the effects of implementing the changes being considered by the hospital management on patient turnaround times in the process. The results of the study would be helpful to those considering improving patient turnaround times in the outpatient care process or other similar processes in hospital clinics.

IEEM17-P-0839

Applying Lean Principles to Health Economics Transactional Flow Process to Improve the Healthcare Delivery

Ibrahim ALRASHED, Parminder Singh KANG
De Montfort University, United Kingdom

Defects reduction and end-to-end process improvement are key to successful delivery of key services such as healthcare. This research paper investigates the implication of Lean management for healthcare service improvement. Transactional flow process is one of the key processes within the Saudi Arabian healthcare system. Transactional flow process in health economics needs to be defects free to insure an accurate healthcare delivery. This paper identifies and investigates two transactional flows within the health economics department. The anticipated outcome of this research paper is identification of two value streams and critical analysis of the Lean tools to improve the overall performance.

IEEM17-P-0586

Does Policy of Delayed Retirement Affect Individual Health

Yan ZENG, Qifan JIA, Jie ZHOU
Chinese Academy of Sciences, China

In order to study how the policy of delayed retirement, -a very important reform for healthcare system and social security system in China-influences individual health, we got data from a sample of 703 people to investigate the relationship among policy acceptability and individual wellbeing and the moderating role of individual-relevance of policy. Results showed that the demographic variables and some individual social attitudes had important effects on individual wellbeing. More importantly, after controlling the demographic characters and some social attitudes, policy acceptability of delayed retirement still affected individual wellbeing significantly. In addition, individual-relevance of policy moderated the relation between policy acceptability and individual wellbeing. When people think the policy of delayed retirement was highly individual-relevant, policy acceptability would positively predict individual wellbeing. The present research has some implications for improving individual physical and psychological health by promoting policy acceptability in healthcare system management.

IEEM17-P-0698

An Integer Programming Model for Radiographer Scheduling Considering Skills and Training

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[2]*Osaka University Hospital, Japan*

Radiographers/radiology technicians, who operate medical image diagnostic apparatuses used for examination and treatment of patients in hospitals, are limited human resources. Appropriately allocating radiographers working on a variety of medical image diagnostic apparatuses considering their skills lead to providing high-quality services to patients and providing a good working environment to staff. On the other hand, staff training is also an important issue from the long-term perspective of hospital administration. We construct a new integer programming model of radiographer scheduling considering skills and training of radiographers, confirm correctness of the model, and measure the required time for optimization.

Session	Operations Research 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR327
Chairs	Norbert TRAUTMANN, *University of Bern*, Nur Aini MASRUROH, *Gadjah Mada University*

IEEM17-P-0615

An Assignment-Based Continuous-Time MILP Model for the Resource-Constrained Project Scheduling Problem

Tom RIHM, Norbert TRAUTMANN
University of Bern, Switzerland

The widely studied resource-constrained project scheduling problem consists of determining the start times for a set of precedence-related project activities requiring time and scarce resources during execution such that the total project duration is minimized. In the literature, in addition to a large variety of specific solution approaches, various mixed-integer linear programming (MILP) models have been proposed for this problem. We present a novel MILP model that is based on explicit assignment and sequencing variables; we enhance the performance of the model by eliminating some symmetric solutions from the search space and by modifying the sequencing constraints for pairs of activities that cannot be processed in parallel. Our computational results for four standard test sets from the literature indicate that this novel model outperforms two state-of-the-art models, particularly when resources are very scarce.

IEEM17-P-0288

A Robust Optimisation Approach to the Aircraft Sequencing and Scheduling Problem with Runway Configuration Planning

Kam Hung NG, Carman Ka Man LEE, Felix CHAN
The Hong Kong Polytechnic University, Hong Kong SAR

Unanticipated delays cause significant reduction of airport capacity management, decrease in customer satisfaction, and poor on-time performance. Safety in runway configuration planning is a top priority in aviation management, and air traffic control adopts the risk analysis in handing flight schedules under uncertainty. The degree of conservatism in handling airborne delays and airport traffic should be increased, as any accident due to improper runway usage causes dramatic loss, delay propagation and disruption to the airport management and subsequence activities. In this paper, the robust aircraft sequencing and scheduling problem with runway configuration planning using the min-max regret approach is proposed. The adoption of the mid-point scenario heuristic as an initial solution is able to reduce the computational burden in the computational experiment compared to the solution by using lower bound scenario by solving instances of moderate size (10 – 30 flights) in a two-runways system.

IEEM17-P-0409

A Cut-Off Grade Optimization Model in the Open Pit Mining Considering Reclamation and Valuable Waste Materials

Benazir IMAM ARIF MUTTAQIN, Cucuk Nur ROSYIDI, Eko PUJIYANTO
Universitas Sebelas Maret, Indonesia

Cut-off grade is one of the decision variables that must be determined correctly by the open pit mining company in order to generate the maximum total profit. This study develops a cut-off grade determination model by using analytical solution approach by considering cost and revenue components such as mining cost, waste removal/rehabilitation cost, processing cost, reclamation cost, marketing/selling stage cost, fixed cost and income/revenue from selling the valuable wasted materials. To illustrate the application of the model, this study also presents the numerical example for the iron ore mining case along with the sensitivity analysis of the sales price. The sensitivity analysis result shows that the optimal cut-off grade and profit obtained by the company are sensitive to the sales price. Using the model in this study, it is expected that the company can make right decision of the cut-off grade value in a mining location easily and quickly.

IEEM17-P-0499

Comparison of PSO and DE for Truck Scheduling in Multi-Door Cross Docking Terminals

Warisa WISITTIPANICH, Piya HENGMEECHAI
Chiang Mai University, Thailand

This paper presents an application of the modified version of Differential Evolution, call 2-Stage DE (2S-DE), for solving the transshipment of multiple product types in a multi-door cross docking system when a storage is allowed to be temporarily hold at the shipping dock. The objective is to find the truck schedule that minimizes the makespan. The performances of the proposed 2S-DE are evaluated and compared with the original DE and the GLNPSO previously published in literature. Using a set of generated instances, the experimental results show that all algorithms are able to find optimal solutions in small-size problems easily. However, when the problem becomes more complex, 2S-DE is superior to the GLNPSO and the original DE since it statistically shows outstanding results in terms of solution quality and convergence behavior.

IEEM17-P-0836

Worst Case Scenario Lemma for Γ-Robust Combinatorial Optimization Problems Under Max-Min Criterion

Jiabao ZHANG[1], Wei WU[2], Mutsunori YAGIURA[1]
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[2]*Seikei University, Japan*

Robust optimization motivated by practical applications deals with optimization problems in which some input parameters are uncertain. In this paper, we consider Γ-robust combinatorial optimization problems under max-min criterion. For this type of problems, we propose and prove a general lemma that we call the worst case scenario lemma; it specifies a worst case scenario for a given solution. Based on the worst case scenario lemma, we propose an exact dynamic programming algorithm for the Γ-robust knapsack problem under max-min criterion.

IEEM17-P-0393

Multi-Skilled Manpower Scheduling with Part-Time Consideration: Case Study

Ping Chong CHUA, Hendra Teja WIRAWAN, Tay Jin CHUA
Singapore Institute of Manufacturing Technology, Singapore

Service sectors such as F&B will require the use of precious manpower resources in order to fulfil customer demands. Given the tight labor resource in recent years, equipping current workers with multiple skills is one of the common approaches. Using the mathematical programming model to incorporate various multi-skilled workers and obtaining the optimal solution is highly intractable, especially with the increase in the number and permutations of skill sets. In this paper, a heuristic catering to the allocation of multi-skilled full-time and part-time workers is proposed. The heuristic is able to generate a solution approximately of an average of 10% deviation from the branch and bound solution with a significant reduction in computation time, based on the industry data from a restaurant in the F&B sector.

Session	Engineering Education and Training 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR328
Chairs	Miwa NISHINAKA, *The Graduate University for Advanced Studies*, Margaret MORGAN, *Ulster University*

IEEM17-P-0350

Visualization of the Influence by Conceptual Leadership Promoting High Quality Output

Miwa NISHINAKA[1], Kunio SHIRAHADA[2], Youji KOHDA[2]
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[2]*Japan Advanced Institute of Science and Technology, Japan*

This paper presents theoretical implications regarding conceptual leadership in group work that provides the team concept as a centrality of discussion. Work of conceptual leadership is regarded as one of the influence. Experimental workshops were conducted with teams composed of members assigned to follow different communication network structures to simulate various types of interactions. We obtained both qualitative and quantitative data, including records of the conversations during the group work, for analysis. As a result of the analysis, we visualized the influence of a conceptual leadership function that appeared autonomously in a successful team. The conceptual leadership served as the centrality of discussion as a team concept, and influences on the output. The results are useful for building and operating a team in situations where high-quality discussion is required, such as a meeting of project leaders or workshops in higher education.

IEEM17-P-0581

Emotional Intelligence and Information Technology Professionals

Chang Boon LEE, Wing Han Brenda CHAN, Chi Ming LEE
University of Macau, Macau

Emotional Intelligence (EI) has garnered much popularity among researchers and practitioners as EI is widely believed to be associated with positive outcomes such as job satisfaction and good work performance. The intuitive explanation for the association is that EI creates good human relations and so EI results in positive outcomes. This research focuses on EI among information technology (IT) professionals and validates a model on EI and work outcomes. IT professionals are highly achievement-oriented and therefore the key hypotheses of this research posit that EI is positively related to personal accomplishment and job satisfaction, and that personal accomplishment is positively related to job satisfaction. Data were collected among IT professionals to test the hypotheses. The results show that personal accomplishment mediates the relationship between EI and job satisfaction. Further analysis of the results also indicate that personal accomplishment mediates two dimensions of EI – regulation of emotion and use of emotion – and job satisfaction. This study provided implications for the results obtained.

IEEM17-P-0121

Factors Influencing Research in an Engineering Faculty

Nicoline REYNECKE, Annlizé MARNEWICK, Jan-Harm PRETORIUS
University of Johannesburg, South Africa

In the last few years, universities have been changing from traditional teaching universities into research ones to accommodate the rapid advances in knowledge and technology. Research and knowledge cannot be left without some form of management to direct the performance and outcome of researchers. Identifying the factors that influence research output and then finding ways to manage these factors through the use of support systems and managerial approaches can lead to an increase in research outputs. According to staff members surveyed, the factors that have the most impact on research are working with top-quality colleagues and linking some form of monetary or non-monetary rewards with doing research. Staff members also indicated that having free time during working hours to do research would be beneficial, along with knowing how resources are allocated and attending time management workshops.

IEEM17-P-0192

Vocational Pedagogy Among Technical Vocational Education and Training Teachers

Jailani MD. YUNOS[1], Siti Nur Kamariah RUBANI[1], Faizal AMIN NUR YUNUS[1], Maizam ALIAS[1], Syahril ST[2], Marina IBRAHIM[1], Lee MING FOONG[1], Tee TZE KIONG[1], Sri SUMARWATI[1], Dedy Irfan D[2], Junita SULAIMAN[1]
[1]*University Tun Hussein Onn Malaysia, Malaysia*
[2]*University National Padang, Indonesia*

This concept paper discusses selected factors that affect vocational pedagogy among Technical Vocational Education and Training (TVET) teachers. In the process of teaching and learning, teachers have a very important role. To understand the scope of the vocational pedagogy teachers, all components of vocational pedagogy in the Note for the UNESCO-UNEVOC e-Forum have been used in the study as the basic theory. Documents analysis is used in this research such as scientific journals, previous studies and scientific books. Therefore, this concept paper will elaborate on the selected factors that affect vocational pedagogy i.e., teaching and learning strategies, pedagogical decisions and the padagogy wheel.

IEEM17-P-0018

Group Technology Application to Investigate Learning/Teaching Style of Engineering Students

Abdelhakim ABDELHADI
Prince Sultan Univesity, Saudi Arabia

This study aims at classifying engineering students at classroom level into clusters according to their learning style preferences using Felder and Silverman Learning Style Index in conjunction with group technology concept. Based on that, the right teaching methodology can be used to maximize the benefit of the teaching goal intended. Group Technology is a methodology that identifies and exploits the common similarities among attributes of a set of objects and clusters them into cells.

IEEM17-P-0394

Entering the Testing and Certification Industry: A Review of Job and Competency Requirements

Fanny TANG[1], Anne O'GRADY[2], Andrew CLAPHAM[2]
[1]*The Open University of Hong Kong, Hong Kong SAR*
[2]*Nottingham Trent University, United Kingdom*

As the world transitions, we are pulled in different directions by the challenges of globalization. Dynamic and ever-changing technologies, global supply chains, product safety, and traceability are some of the main issues that concern society. Testing and certification (T&C) play a vital role in guaranteeing quality and credibility when dealing with these global challenges. In view of the importance of testing and certification, manpower demand and employment opportunities to support the testing and certification industry are discussed by studying the statistics published by the Census and Statistics Department of the HKSAR Government. This paper studies four main areas: testing and certification industry job requirements, competency, employability skills, and the skills gap.

Session	Human Factors 1
Date	11/12/2017
Time	13:45 - 15:15
Room	MR329
Chairs	Bertha Maya SOPHA, *Gadjah Mada University*, Seng Fat WONG, *University of Macau*

IEEM17-P-0203

Knowledge Engineering: Exploring Evacuation Behavior During Volcanic Disaster

Bertha Maya SOPHA[1], Anna Maria Sri ASIH[1], Dini Graita ILMIA[2], Hari Agung YUNIARTO[2]
[1]*Universitas Gadjah Mada, Indonesia*
[2]*Gadjah Mada University, Indonesia*

Efficient evacuation is one of the most important factors to reduce casualties in disaster. However, evacuating is not an easy task because it involves heterogeneous human behaviors, which take into account not only socio-demographic but also psychological aspects. Despite the importance of human behaviors affecting the effectiveness of evaluation plan, studies on evacuation decision-making is little explored. The present study therefore seeks evacuation behaviors of volcanic disaster and their underlying attributes. Knowledge Engineering (KE) was applied both to obtain attributes of decision-making and to formulate decision-making behavior during volcanic disaster. Results reveals that the evacuation behaviors can be categorized into four behaviors, i.e., adaptive, non-adaptive, altruistic, and leader-following. Vulnerability, perception of danger, previous disaster experiences, disaster training, ownership of livestock/valuables, traditional belief, trust on cultural/community leader, and social concern are all underlying behavioral attributes in which each evacuation behavior is associated to different attributes. Future potential researches are also discussed.

IEEM17-P-0884

Multi-Control and function Design of Ergonomic Electric Wheelchair for Reducing Pressure Ulcer Problem

Seng Fat WONG, Bin LIN, Z. C. LUO
University of Macau, Macau

Barrier-free facility is very important for handicapped daily life. Nevertheless, a good wheelchair design is helpfully supporting them. Unfortunately, sitting posture made handicapped perplexing, because the pressure ulcer problem occurs in their lower portion of body by traditional wheelchair. Since the major of the elders and the mobility patients are lower portion of body muscle or joint problems generated the travel inconvenience, therefore, it is necessary to design and study an innovative wheelchair that can aid the elders with mobility disability daily travelling a convenient transportation with multifunctional, easy-control method and superior user experience contributing to their lives. This investigation is going to discuss the possibility and feasibility of the smart wheelchair by Human Factors Engineering Technology to provide a comfortable and safety circumstance to the users, which can reduce the pressure ulcer problem by changing sitting posture with muscle signal control (EMG) and brain wave control (EEG).

IEEM17-P-0896

Ergonomic Assessment and Design Improvement of Shopping Carts for the Satisfaction of Buyers in Grocery Stores and Supermarkets

Rene ESTEMBER, Mara Hiyasmin BERDAN
Mapua University, Philippines

Buyers are dependent on the use of shopping carts when buying their grocery items. At present, studies have yet to focus mainly on the effects of shopping carts to the satisfaction level of buyers in different grocery stores and supermarkets in the Philippines. This paper aimed to assess the existing design of the shopping carts, determine significant factors affecting the satisfaction level of the buyers, and design and improve shopping carts based on the significant features. Various ergonomic and statistical tools were used to determine significant factors with respect to ergonomics, usability, safety and sanitation, and aesthetics satisfaction of buyers. These significant factors were used as basis in proposing an improved design of the shopping cart that contributed to the satisfaction level of buyers in the grocery stores and supermarkets.

IEEM17-P-0406

Research on Low Cost Virtual Assembly Training Platform Based on Somatosensory Technology

Shengqian JIANG, Peng LIU, Dawei GAO, Yang XU, Xian MENG, Zhaoyi LIU, Zhuo HUANG, Ruolan XU
Jilin University, China

This paper presents a method to design a virtual assembly training platform basing on the analysis of the model of virtual assembly system with somatosensory interaction and the Kinect V2 interaction technology. And in this platform, Unity 3D is used as the interaction engine, MAYA and CATIA are used to build scenes, and Kinect V2 is used to capture the coordinate of the user's spine point. This coordinate is the basic point to unify the virtual location and real location. Besides, we will find the prospect of the virtual assembly training platform by testing the effect of the virtual assembly and the actual assembly of scissors.

IEEM17-P-0571

A Short Review of Mental Models of Operators in Main Control Rooms of Nuclear Power Plants

Yingzhi ZHANG, Zhizhong LI
Tsinghua University, China

Definition, classification and measurement of team mental model are reviewed in this paper. This study also provides a practical method to analyze operators' mental models in main control rooms of nuclear power plants, including the definition and the measurement method.

IEEM17-P-0296

An Identification of Dimensions Able to Attract the Potential Workforce for I.T. Industry in India

Bhartrihari PANDIYA, Vijayshri TEWARI, Richa SINGH DUBEY
Indian Institute of Information Technology, Allahabad, India

The objective of this paper is to review the present literature in the emerging area of employer branding and to list the antecedents capable of alluring the prospective employees by their future employers. A scale of employer branding is developed to evaluate the employer attractiveness in the I.T. sector. The approach involves reviewing conceptual and empirical research papers from academic journals and other available literature. The review provides the insight as to which antecedents are important for the employees and to what extent. The various facets of job components discussed by the various researchers were identified and analyzed. The relative worth will be studied and their response can be an eye opener to the changing demands of the next generation of the employees. The uniqueness of the review is that it provides the base for a new scale in employer branding in the I.T. sector in the Indian context.

IEEM17-P-0915

Design Thinking and Semiotics to Increase Socio-Cognitive-Affective Engagement: An Inclusive Design Human Factors Case Study

Chien-Sing LEE[1], K. Daniel WONG[2]
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[2]*Daniel Wireless Software Pte. Ltd, Singapore*

Successful aging with and into disability is a challenge in various countries due to an increasing aging population. Prior research indicate that brain training may stimulate but significant improvement may take time. To sustain improvement, this exploratory study suggests adopting a technology-assisted affective socio-cognitive approach to arrest cognitive and social decline holistically. WHO's International Classification of Functioning, Disability and Health (ICF) supports the holistic dimensions to adaptive, and engaging sustenance of quality of life. We scope our study to the participation aspect; extending context and various context-aware interactions. This study reports on the use of semiotics for inclusive design to increase cognitive engagement with youth and some seniors with Mild Cognitive Impairment (MCI), forming the bases for design thinking-based technology-assisted scaffolds/ affordances.

Session	Systems Modeling and Simulation 1
Date	11/12/2017
Time	13:45 - 15:15
Room	MR330
Chairs	Dinh Son NGUYEN, *University of Science and Technology, The University of Danang*, Karthik SANKARANARAYANAN, *University of Ontario Institute of Technology*

IEEM17-P-0809

Topology Optimization as an Innovative Design Method for Additive Manufacturing

Dinh Son NGUYEN[1], Frédéric VIGNAT[2]
[1]*The University of Danang, Viet Nam*
[2]*University of Grenoble Aples, France*

Additive Manufacturing (AM), popularly called 3D Printing, enables the manufacture of nearly any complex geometries by adding layer by layer of material. Advances in AM technologies are the ability to fabricate products without the need for process planning, the removal of tooling compared with the conventional manufacturing technologies. AM opens opportunities for product designers so they can freely create any complicated geometries of their products without thinking about manufacturability constraints. However, it is necessary to have a method to design a product for additive manufacturing technologies. Thus, a novel approach as an innovative design tool using topology optimization is presented in the paper. It is to help designer create an optimal structure of product with the least amount of material used, but still ensure the mechanical properties of product.

IEEM17-P-0084

Neural Network Analysis of Behavioral Agent-Based Service Channel Data

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[2]*TradeRev, Canada*

When developing an agent-based model for service channel design, the individual decision-making process of the agents is a vital part of the simulation. Additionally, due to the nature of agent-based models and the communication networks that exist between agents, the micro/macro-dynamics are heavily linked. To better understand this link, we propose the use of integrated neural networks trained in a supervised learning environment. Training these networks on data collected from human based experiments, and implementing these neural networks into the model will capture the irrational behavior not captured by traditional models, while improving on traditional agent-based decision-making processes.

IEEM17-P-0505

Agent Based Simulation of a Payment System for Resilience Assessments

Aron LARSSON[1], Osama IBRAHIM[2], Leif OLSSON[1], Joeri VAN LAERE[3]
[1]*Mid Sweden University, Sweden*
[2]*Stockholm University, Sweden*
[3]*University of Skövde, Sweden*

We provide an agent based simulation model of the Swedish payment system. The simulation model is to be used to analyze the consequences of loss of functionality, or disruptions of the payment system for the food and fuel supply chains as well as the bank sector. We propose a gaming simulation approach, using a computer based role playing game, to explore the collaborative responses from the key actors, in order to evoke and facilitate collective resilience.

IEEM17-P-0417

A Hybrid Regression Technique for House Prices Prediction

Sifei LU[1], Zengxiang LI[2], Zhen QIN[1], Xulei YANG[1], Rick Siow Mong GOH[1]
[1]*Agency for Science Technology and Research (A*STAR), Singapore*
[2]*Agency for Technology and Research (A*STAR), Singapore*

Usually, House price index represents the summarized price changes of residential housing. While for a single family house price prediction, it needs more accurate method based on location, house type, size, build year, local amenities, and some other factors which could affect house demand and supply. With limited dataset and data features, a practical and composite data pre-processing, creative feature engineering method is examined in this paper. The paper also proposes a hybrid Lasso and Gradient boosting regression model to predict individual house price. The proposed approach has recently been deployed as the key kernel for Kaggle Challenge "House Prices: Advanced Regression Techniques". The performance is promising as our latest score was ranked top 1% out of all competition teams and individuals.

IEEM17-P-0440

Modeling of Power Profiles of Milling Machines for the Use in Factory Models to Optimize Energy Efficiency

Matthias MEISSNER, Andreas WIRTZ, Johanna MYRZIK
TU Dortmund University, Germany

The analysis of the interdependencies of production processes in factory systems in relation to their energy efficiency requires a modeling of the different processes. Consequently, it is required to know the power consumption of the different production processes and to abstract these for the simulation model. Various existing modeling methods are thus presented and analyzed by means of milling processes. Futhermore, a comparison between three methods, which work with the arithmetic mean value, a ramp function and the approximation by a polynomial is presented. As an indicator of the quality of the methods the deviation between the measured and modeled energy consumption is used.

IEEM17-P-0448

A System Model to Improve the Productivity of a South African Steel Industry

Thomas MUNYAI[1], Charles MBOHWA[2], Olasumbo MAKINDE[1], Boitumelo RAMATSETSE[1]
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[2]*University of Johannesburg, South Africa*

South African steel manufacturers are now under pressure to stay functional within the competitive business environment, since the productivity in this industry over the past couple of years has been dwindling. However, productivity measurement and monitoring, which plays an important role in driving steel productivity improvement has not been explored. The present research work therefore developed a system model capable of measuring and monitoring the productivity of these industries. This was achieved by modelling and simulating the South African Steel Industry using the real life manufacturing operating conditions of this industry. Simulation results of the virtual South African Steel Industry showed that the saw master and milling machines, with a total number of 241 and 304 unprocessed workpiece at their respective stations are the bottlenecked machines. Hand sawing machine and relatively cheap milling machine were recommended to support the existing steel production process in order to alleviate the bottlenecks.

Session	Supply Chain Management 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR332
Chairs	Ravi KANT, *Sardar Vallabhbhai National Institute of Technology*, Akram EL-TANNIR, *Beirut Arab University*

IEEM17-P-0237

Examining the Solutions to Overcome the SCKFBs Using Fuzzy AHP and Fuzzy TOPSIS Method

Vishal BHOSALE, Ravi KANT
Sardar Vallabhbhai National Institute of Technology, India

The aim of this paper is to determining the best solution to overcome Supply Chain Knowledge Flow Barriers (SCKFBs) in an Indian case organization by using an Analytic Hierarchy Process (AHP) and the Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) method in fuzzy environment. The weights of the SCKFBs identified using fuzzy AHP method and ranking of the solutions determined by fuzzy TOPSIS method. The uniqueness of the study comes through the application of the AHP and TOPSIS method under fuzzy environment to find the solutions for SCKFBs in order to make knowledge flow implementation becomes simpler in the organization.

IEEM17-P-0032

Mitigating the Bullwhip Effect in Supply Chains Using Variance Reduction Techniques

A. A. EL-TANNIR
Beirut Arab University, Lebanon

This paper proposes a new strategy that can be unilaterally applied by the supplier in order to mitigate the bullwhip effect in its supply chain, especially where information sharing, vendor managed inventory (VMI), and other collaboration methods fail. This strategy is similar to the use of control variates in simulation analysis. It is shown in this paper that this control method can reduce the variance of individual retailer orders, and thus diminishes the aggregated impact of the bullwhip effect on the supplier. Surprisingly, this strategy also happens to enhance the service level to the retailer as well.

IEEM17-P-0595

Factors Influencing Attitude Toward Behavior in Using Mass Transit System in Bangkok: A Case Study in Car Users

Panisara VANICHKITPISAN, Chivalai TEMIYASATHIT
King Mongkut's Institute of Technology Ladkrabang, Thailand

Bangkok Mass Transit system (BTS) is launched in 2000 with the aim to solve congestion problem by reduce number of cars on streets. Due to BTS characteristics of rapid and punctuality, it is believe that BTS gain the popularity as a major mode of transportation in Bangkok. The ridership records report that the number of riderships are significantly increased from approximately 55 millions in 2000 to 220 million in 2014, whereas the number of registered cars in Bangkok also increased. This poses a question on the effectiveness of BTS which lead to our investigation on factors affecting attitude toward behavior in using mass transit system in Bangkok. Theory of planned behavior (TPB) are employed to categorize factorseffect- behavior as attitude, perceived behavior control, and habit. Attitudes toward behavior were attained through various literatures, then they were categorized according to the Marketing Mixed (4Ps) framework. Questionnaires were designed according to best-worst scaling framework [1]–[9]. There are 95 car users response to our survey. Survey data were analyzed with Best-Worst scoring system. The result shows that car users consider speed of travel (A1) and distance between station and ridership's origin/destination (D1) as the most influencing factors affect attitude toward the use of BTS.

IEEM17-P-0802

Determining Medical Aid Distribution Route Using Multi-Objective Optimization

Sinta SULISTYO, Rizka RATNASARI
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The distribution of medical aid during disasters should be executed optimally and equally to the victims. The focus of the medical aid distribution cannot be only one objective but should be several objectives that might be conflicting. This research creates a distribution route for Merapi eruption case using multiple-objectives; to minimize travel distance, travel time, and considering priorities for the shelters with higher demand. The results are compared with the single objective model which minimizes travel distance as the objective. The travel distance generated for Cluster 1 is 55.9 km, Cluster 2 is 47.1 km, Cluster 3 is 35.9 km, Cluster 4 is 52.8 km, and Cluster 5 is 79.8 km. In comparison to the single objective model, the 12,03% distance increment is statistically not significant whereas the 21,16% demand fulfillment level increment is statistically significant. Hence, multi-objectives model works better than the single-objective model.

IEEM17-P-0887

Distribution Planning for Single-Manufacturer Single-Distributor Multi-Retailer Supply Chain

Pachara CHATAVITHEE, Kullapapruk PIEWTHONGNGAM
Khon Kaen University, Thailand

This study addresses a multi-item, two-stage, lot-sizing problem. The large lot size of transportation from manufacturer to the distribution center (DC) is considered to achieve economy of scale of transportation while for smaller lot size from DC to retailer is utilized for efficiency and responsiveness purpose. Cost minimization, in this study, is a trade-off between transportation cost and inventory holding cost. The developed mathematical model and heuristic algorithm consists of 2 layers which are 1) distribution from a manufacturer to a DC and 2) distribution from a DC to a group of retailers. Furthermore, outsourcing transportation has been considered in order to satisfy some parts of customer demand that do not achieve economy of scale of transportation. Comparison between results of the mathematical model and developed heuristic algorithm demonstrates that the heuristic algorithm results in 2.45% of average deviation from the theoretical bound on the objective and much less computation time than the mathematical model.

IEEM17-P-0904

Towards a Collaborative Supply Chain Balanced Score Card Framework to Analyse Collaborative Value-Added

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For years, academics have been widely focused on the collaboration as an effective factor of performance in Supply Chains. However, the quantification of the added value brought by the collaboration is extremely challenging. In fact, some studies have been dedicated on unilateral analysis, some others on bilateral investigations. Moreover, almost of these works lacked in a mutual consensus, and did not arrange on a common set of attributes in their analysis of collaboration. For this purpose, this research paper proposes a new framework that is able to carry out a Collaborative Value-Added analysis. This solution is based on a set of attributes that have been identified from the related literature. The methodology we set out, can measure the value-added to assess the collaboration between two partners. Furthermore, upon the initial aforementioned outline, we present an extended framework based on the Balanced ScoreCard.

IEEM17-P-0673

Development of Fuzzy Logic and Genetic Fuzzy Commodity Price Prediction Systems – An Industrial Case Study

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Supply Chain Managers in major automobile or construction industries often rely on the forecasted commodity prices to negotiate with suppliers where products are produced via respective commodity. For example, the natural rubber price is a key factor affecting cost in buying tires in automobile industries. This industrial case study proposes two commodity pricing prediction systems, Fuzzy Logic and Genetic Fuzzy Systems. By reviewing five main factors for this predictive model: (1) historical quarterly NR price; (2) the prices for crude oil; (3) China GDP growth rate; (4) synthetic rubber price index; (5) world natural rubber consumption/production ratio, the Genetic Fuzzy system outperforms the Fuzzy Logic system.

Session	Information Processing and Engineering 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR333
Chairs	SC Johnson LIM, *Universiti Tun Hussein Onn Malaysia*, Urs BUEHLMANN, *Virginia Tech*

IEEM17-P-0517

Research Evolution in Design Engineering Education: A Visual Approach Using Thematic Network

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Bibliometric analysis is a useful approach to identify key authors, research themes, and evolution of a research field. Previously, there exist a number of related studies on field development of engineering education and design engineering using various analytical approaches. Nevertheless, bibliometric analysis of the design engineering education (DEE) field, an emerging cross-disciplinary research sub-field under the field of engineering education, is still absent. In this study, we suggest a methodology to analyze the research themes and its evolution in the DEE field. A case study that illustrate our methodology is performed using DEE's bibliometric data downloaded from the SCOPUS database. Upon data pre-processing steps, research evolution of the DEE field is presented visually using strategic mapping and thematic evolution network over the years 2010-2015 with discovered insights discussed. We summarize our findings with some discussion on future works.

IEEM17-P-0909

A Cloud-Based Dynamic Random Software Testing Strategy

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Cloud testing has emerged as a new technology in corporate world and organization, which generates virtual machines for application demands, and employs resource allocation strategies to dispatch the test tasks. Traditional resource allocation strategies usually concern on static assignment, which lacks dynamic adjustment functions. Dynamic Random Testing (DRT) strategy employs feedback mechanism to guide the selection of test cases, which is shown to be effective and has great potential in theoretical as well as practical terms. Therefore, planting the idea of DRT into cloud testing can allocate the test tasks in a dynamic way. In this paper, a cloud-based dynamic random testing strategy is proposed to enhance the testing process and promote the testing efficiency, in which the virtual resource allocation is in accordance with the testing results. A framework of cloud-based DRT strategy is constructed and contrast experiments are conducted on the Cloudsim platform. The experimental results show that the proposed cloud-based DRT strategy has better performance than the traditional testing strategies.

IEEM17-P-0222

The Effective Route Selection for East-West Economic Corridor in the Greater Mekong Subregion: Machine Vision Approach

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Due to the economic cooperation of the six countries in the Greater Mekong Subregion Economic Cooperation Program (GMS Program), the improvement of transport linkages between GMS countries has become a priority, especially for the cross-border section. For effective transport, it is necessary to consider the quality of the route pavement. It heavily affects travel time and cost. Previously, there have been difficulties of adequate qualitative survey methods for classifying data like route quality. In this research, a machine vision method is introduced to classify the pavement quality of East-West Economic Corridor routes in Thailand, and alternative route which promotion is being considered. The methodology proposed classifying pavement quality using the provided images. Classification results indicate that all routes in Thailand's section contain more than 90% of pavement and there are still non-pavement parts, especially at the border area. However, the proposed method presents an interesting application using open data, in terms of condition or state of pavements and determination of maintenance needs, the real-time data is needed.

IEEM17-P-0401

Analyzing the Impact of Investor Sentiment in Social Media to Stock Return: Survival Analysis Approach

Aldila RIZKIANA, Hasrini SARI, Pamoedji HARDJOMIJOJO, Budhi PRIHARTONO, Titah YUDHISTIRA
Bandung Institute of Technology, Indonesia

In the era of information technology, stock related information can be easily found on the internet, especially on social media. Thus, data in social media hold an important information to predict the movement of stock price. In addition, the research about the time of stock fulfillment, that is the time until stock gives the expected return, is very rare. For this reason, in this research, we will use Survival Analysis to model time aspect of trading strategies using investor sentiment as the predictor. The result shows that investor sentiment in Stockbit can be used as the predictor of return in Survival Analysis Model we developed and can be used as an alternative method to make stock buying and selling process. We also find Cumulative Twitter Investor Sentiment Hazard (CTIS) ratio of less than one indicates that an increase of CTIS will reduce the hazard.

IEEM17-P-0302

Business Process Modelling Tool Selection: A Review

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The interest in business process modelling has increased in the last decade. Numerous business process modelling tools for developing business processes exist. These tools serve a wide range of business functions and applications. There exist limitations in effectively selecting the appropriate business process modelling tool relative to corporate functions and applications. This research explores this specific limitation and serves as a guide to mitigate this specific limitation relative to prioritizing and selecting a business process modelling tool. This investigation explores the limitations in the currently designed business process modelling tool based on local, regional and global modelling of corporate processes. Results prove essential prioritization constituents relative to selecting a more enhanced business process modelling tool for enterprise professionals. The applicability of the proposed prioritization approach is demonstrated.

IEEM17-P-0834

Implementing Industry 4.0 - A Technological Readiness Perspective

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This paper identifies the relative importance of key enabling factors for implementing industry 4.0 from a technological readiness perspective. The research involves the identification of enabling factors, their categorization into technological readiness dimensions, followed by the determination of the relative importance of both technological readiness dimensions and key objective measures. The results show a strong relationship between technological readiness and design principles of Industry 4.0. The findings suggest that process-related objectives are more important than economic-related and environmental-related objectives when implementing industry 4.0. The results also show that "the knowledge of humans in technology and how to leverage it" and "improving the ability of machines and devices in connecting to the internet" are the most important factors for achieving all objective measures. Practitioners can use the apparent relationship between process related objectives and key technological dimensions for setting appropriate strategies and policies when moving towards Industry 4.0.

Session	Production Planning and Control 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR334
Chairs	Nidhal REZG, *University of Lorraine*, Rui PENG, *University of Science and Technology Beijing*

IEEM17-P-0325

Critical Success Factors for Instrumentation and Control Projects Within the Power Industry in South Africa

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Instrumentation and control projects entail an upgrade or refurbishment of a portion of the current process control system. The changes introduced present integration challenges to people, the plant and operating guidelines and procedures. The successful implementation of these time sensitive projects depends on factors such as change management effectiveness, stakeholder investment and competency of the project team. Project success factors identified across the lifecycle of the project enables the organization to filter down on challenges and risks contained within each project phase. The research identifies critical success factors specific to instrumentation and control projects within the South African power industry. The framework is developed through the descriptive analysis of feedback received from key stakeholders within the organization.

IEEM17-P-0490

A Benders Decomposition-Based Heuristic Algorithm Framework for Unrelated Parallel Machine Scheduling Problem with Weighted Maximum Earliness and Tardiness

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Problems about parallel machines are researched a lot and have a wide application. An unrelated parallel machine scheduling problem is discussed in this paper: there're m unrelated parallel machines that have different processing speeds and opening costs. N jobs are assigned to the machines, meeting distinct due windows. The objective is to minimize the total cost including the machine opening cost and the cost related to maximum earliness and tardiness. The scheduling progress takes both machine utilization and customer satisfaction into consideration. The proposed method in this paper is a benders decomposition-based heuristic algorithm that can solve mixed-integer linear programming problem efficiently. The algorithm is based on a partition of the problem, which is suitable to solve our problem. The algorithm framework is established to solve large-scale problems.

IEEM17-P-0236

Parallel Machines Scheduling Problem with Maintenance Using Greedy Algorithm

Wen-Zhu LIAO, Xiaoxia YANG
Chongqing University, China

This paper aims to deal with parallel machine scheduling problem considering machine reliability. The objective is to minimize the maximum completion time with different deteriorating machine. Firstly, machine preventive maintenance policy is determined by considering machine reliability. Then greedy algorithm with water injection model is proposed to pre-distribute the jobs to balance the machine capacity. Finally, the computational results indicate that this optimization model for parallel machines scheduling problem is reliable and effective.

IEEM17-P-0496

Service Time Effects of Distancing from the Customer, A Case Study from the Swedish Emergency Call Center

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Distancing contact centers from the customer is a highlighted strategic measure in call center industry, argued to reach higher efficiency and reduce operational costs. There is however a lack of empirical evidence about the side-effects of distancing, and academia has requested a mapping of the hidden costs accompanied with moving the operator from its customer. This study examines the relationship between service time and distance, by a designed quasi-distance scale between the customer and the operator. The result indicates a distance dependency, but the main effect is not due to the distance but rather due to characteristics of the office and caller origin independently. The study also stipulate a framework how big data can be converted into valuable information to call center managers, and provide insights of areas where further training and technological improvements should be focused.

IEEM17-P-0484

Package Designs that Enhance Firm Performance in the Japanese Food Industry

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Food industry researchers have pointed out that product packaging has a major influence on consumer decision-making. Some cases have been reported that significant impacts on sales were caused solely by changes in packaging. The present study includes an empirical analysis of the relationship between package design and firm performance in the Japanese food industry, using data on design rights. It became clear through the multiple regression analysis that the number of design rights related to packaging is significantly linked to high operating profits and operating profit ratios. It was also revealed that these values decrease when the number of design rights possessed by a firm exceeds a certain number, indicating that an inverted U-shaped relationship exists between design rights and firm performance.

IEEM17-P-0631

The Link Between the Use of Advanced Planning and Scheduling (APS) Modules and Factory Context

Jesper KRISTENSEN, Jesper ASMUSSEN, Brian Vejrum WÆHRENS
Aalborg University, Denmark

Through a study of four embedded action research cases within a global OEM, it is investigated how the frequency of use and contribution of an Advanced Planning and Scheduling (APS) module are affected by factory context. The performance contribution of the APS module is found to be high at factories characterized by low planning maturity, but lower for factories with medium planning maturity. For low planning maturity, the APS module is used for improving the configuration of the manufacturing system, whereas high planning maturity is required to capture performance benefits from optimization and scenario planning. Further, it is found that planning complexity at the factory increases both the frequency of use and the contribution of using APS modules. On the basis of the findings, three propositions are formulated on the link between factory context and the use of APS module.

Session	Project Management 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR335
Chairs	Zhe ZHANG, *Nanjing University of Science and Technology*, Egon MULLER, *Chemnitz University of Technology*

IEEM17-P-0746

A Bi-Level Model with Rough Coefficients for Multi-Mode Resource-Constrained Scheduling Problems

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A bi-level multi-mode resource-constrained project scheduling problems (MRCPSP) model with rough coefficients is presented in this paper. In this model, bi-level organization structure and subjective uncertainty decision-making environment are considered simultaneously. In order to solve the proposed model, an adaptive particle swarm optimization algorithm (APSO) is designed to find the optimal scheduling plan. Finally, the bi-level mathematical model and APSO are applied to a numerical example, and the results prove that both of them are effective for solving MRCPSP.

IEEM17-P-0022

An Integrated Approach for Automatic Execution of BIM-based Assemblies Using Light-Framed Constructions

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This research suggests that the construction operation logic of industrialization is simulated by setting the family hierarchy to establish a BIM-based process simulation model for light-framed prefabs. Besides, Revit API technology and c# advanced programming language technology are used as means of implementation to develop an interface program of Revit Software for data statistics.

IEEM17-P-0287

Towards an Integrated Controlling Tool Based on a Time-Varying Project Risk Management Concept

Zoltan SEBESTYÉN, Tamas TÓTH
Budapest University of Technology and Economics, Hungary

This article focuses on risk decreasing and disappearing with time, based on value-based risk monitoring. In a project, in order to maintain a value-based risk management process, a continuous valuation method is necessary which is able to capture the value of the project deliverable (e.g., building) in its current state. The objective of this paper is twofold. On the one hand a continuous, integrated monitoring and reassessment tool for risk management processes is briefly introduced. This extension of the original concepts defines the project goal by the owner's minimum requirements to be achieved, then objectively identifies risk factors with measurable financial variables. On the other hand, based on this framework of an automatized risk management process that delivers a more effective practical tool to reduce project risks, we seek future directions for research to develop and integrate risk management. This time the emphasis is more on the future possibilities than the promotion of the new concept.

IEEM17-P-0291

Agile-Waterfall Hybrid Product Development in the Manufacturing Industry – Introducing Guidelines for Implementation of Parallel Use of the Two Models

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Agile development methods received a lot of attention throughout research and industry in recent years. Hybrid agile-waterfall models become increasingly prominent, mostly building one process model by combining elements of the two systems. We propose that there is reason to use the two of them parallel within the same product development project. Based on this assumption we present potential challenges faced in designing and managing such a project. We introduce a framework to categorize these, and suggest matching approaches to overcome them aimed for use by practitioners in the field.

IEEM17-P-0245

Exploring Risks Causing Schedule Overrun in Upstream Natural Gas Projects-A Critical Review and Implications for Future Research

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Schedule overruns in oil and gas projects are a serious concern worldwide because of the detrimental effects of delays, severe cost increases, and reduced return on investments that these slips cause. Despite the increasing occurrence of delays in natural gas projects globally, limited research exists concerning delays in oil and gas projects, and no attention has been paid to the upstream project phases though industry reports have been highlighting those phases as a significant part of the problem. Towards making scholarly literature reflect this emerging truth, this paper critically reviews existing literature to provide comprehensive understanding of risks causing delays in upstream gas projects. Findings are: (1) literature is still inconclusive about impact of nontechnical risks on schedule performance; (2) project performance is influenced by numerous exogenous risks; and (3) absence of sophisticated tools to analyze different dimensions of project delays. This paper accordingly makes a contribution by providing research-driven suggestions for areas requiring further investigation.

IEEM17-P-0341

An Approach for Managing Project-Communicated Content

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Project documentation is a crucial but effort-consuming communicated task in business related projects. To prepare, to write, and to maintain project documents is often considered a tiring and tedious work, especially during times of fleet project with the emphasized regarding short period and limited human forces. However, the context among most Project-communicated content and engineering management is highly interrelated. Based on the context among project-communicated content in projects especially for information development projects, this paper applied the concept of single sourcing and presents an effective approach utilizing object oriented method to clarify project-communicated content. This paper also implemented a prototype environment, OFPDE, with a case study and discussed results to illustrate the approach. The results were usable and applicable for managing project-communicated content.

Session	Big Data and Analytics 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR309
Chairs	Satya SHAH, *University of Greenwich UK*, Shen REN, *Agency for Science Technology and Research (A*STAR), Singapore*

IEEM17-P-0580

Is Big Data for Everyone? The Challenges of Big Data Adoption in SMEs

Satya SHAH, Cristina BARDON SORIANO, Alec COUTROUBIS
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The aim of this paper is to present an investigative study on the concept of Big Data and its challenges towards implementation in manufacturing SMEs. Big Data aims to facilitate the collaborative approach in SMEs through the creation of real time data visualization to address key challenges to many of the market variations for every sector SMEs. Although, earlier research studies have highlighted the importance of Big Data from technological perspectives, this study focuses towards SMEs due to its feasibility and flexibility within the market space. This research aims to investigate the use of case study approach for the re-use, adoption and understanding of strategic future direction from the findings. The findings and early analysis from this paper could be referred by researchers when addressing the use of big data analytics within manufacturing SMEs. Finally, the paper provides a key strategic point towards the exploration of Big Data within SMEs.

IEEM17-P-0891

Spatial-Temporal Traffic Speed Bands Data Analysis and Prediction

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The development of Intelligent Transportation System (ITS) requires insightful information and predictions from spatial-temporal traffic data. In order to improve commuters' experiences by forecasting and proactively taking actions on city traffic, in this paper, we analysed temporal and spatial patterns of low-resolution traffic speed bands and predicted future traffic status based on SVM learning models. Real speed bands data of Singapore were used for analysis and prediction. The performance of machine learning models were evaluated by speed bands data of road segments in Central Business Districts (CBD) and Tampines area at Singapore. The results demonstrated that multiple kernel learning (MKL) combining both temporal and spatial patterns showed better performance in predicting next 5 minutes and 1 hour traffic conditions in both CBD and rural areas (Tampines). In short-term prediction (next 5 minutes), SVM learning using temporal pattern showed better performance in both CBD and Tampines than using spatial patterns. However, the long-term prediction (next 1 hour) of CBD area has lower accuracy than rural area (Tampines). In general, we can achieve up to 88% prediction accuracy of traffic speed band at entire Singapore.

IEEM17-P-0194

A New Data-Driven Intelligent Fault Diagnosis by Using Convolutional Neural Network

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Along with the boosting of big data in manufacturing, applying the data-driven analysis method to support the intelligent fault diagnosis becomes a new trend. Recently, deep learning emerged as a potential artificial intelligence technique. It can obtain the features of raw data automatically, which provides a new way to reduce the expert's bias as more as possible and to mine the inherent relationships hidden in data. Convolutional neural network (CNN) is a promoting kind of deep learning. A new intelligent fault diagnosis method based on CNN is proposed in this paper. Firstly, a transformation from signals to images is investigated to deal with the raw signal data in a simple way. Then these images are trained by CNN. The proposed method is tested on the motor bearing dataset from Case Western Reserve University. The results show that the proposed method achieves as high as 99.51% of the prediction accuracy. The good performance of proposed method is also proved by comparing it with other deep learning methods and traditional methods.

IEEM17-P-0228

Data Analytics in Product Development: Implications from Expert Interviews

Julian WILBERG, Fabian SCHÄFER, Peter KANDLBINDER, Christoph HOLLAUER, Mayada OMER, Udo LINDEMANN
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An increasing number of technical products are being equipped with connectivity components, which enables the collection of use phase data. Such data helps to better design products or understand customer needs. Available studies only take a cross-industry perspective on data analytics. Due to longer development and product life cycles, engineering companies work under special circumstances. The authors therefore conducted expert interviews to better understand the needs and current practices in engineering companies. Experts highlighted the potential of data analytics for instance in requirements engineering. Experts also mentioned the various problems that occur when identifying and implementing use cases. Besides support for technical issues, experts raised the need for additional support during the initial planning phase.

IEEM17-P-0871

Investigate Human Behavior During Ramadan Through Network Structure: Evidence from Twitter

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This paper studies online behavior during the holy month of Ramadan as reflected in tweeting patterns on the popular social media platform Twitter. In the first study of its kind using Twitter data from the United Arab Emirates (UAE), interaction networks before, during and after Ramadan are extracted and analyzed. We examine the network structure via the field decomposition of Weakly Connected Components (WCC), degree distribution, degree mixing, clustering distribution, clustering mixing and diameter statistics. A number of interesting structural features were detected which were subjected to further analysis. Some of these are common to the entire dataset while others were unique to specific periods (either during Ramadan, or in the two adjacent months). While preliminary in nature, these results were extremely promising and strongly motivate subsequent research efforts on this topic.

IEEM17-P-0885

Predictive Modeling of Aircraft Systems Failure Using Term Frequency-Inverse Document Frequency and Random Forest

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For modern aircraft maintenance systems, corrective maintenance is executed by maintenance technicians on ground using the real-time condition monitoring data during the flight. In this paper, a predictive model is proposed to predict faults with high priority in advance by exploring the historical data of aircraft maintenance systems, and preventive maintenance can be carried out based on the prediction results of the model. Prediction of faults with different priorities in this paper are formulated as a binary classification problem. First, counts of different faults occur in past flights are used as raw data, from which term frequency-inverse document frequency is applied to do feature extraction. Next, classification of different faults is modeled by the random forest algorithm and receiver operating characteristics curve is adopted as the performance metrics. For the training dataset, the proposed method achieves true positive rate 100% and false positive rate 0.13%, while for the testing dataset, the proposed method achieves true positive rate 66.67% and false positive rate 0.13%.

Session	Healthcare Systems and Management 2
Date	11/12/2017
Time	13:45 - 15:15
Room	MR308
Chairs	Carlotta PATRONE, *E.O. Ospedali Galliera*, Hamid ALLAOUI, *University of Artois*

IEEM17-P-0565

Managing and Evaluating Different Projects in a Hospital Trough the Analytic Hierarchy Process: Methodology and Test Case

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[2]*University of Genoa, Italy*

Nowadays hospitals work in the context with decreasing resources over time, and unfortunately not all the projects can be implemented. For this reasons healthcare area needs tool to decide on which project invest. The current paper has been developed in one of the major hospital in Genoa (Italy): Galliera. The Galliera hospital has a board of directors who need to know the sustainability of the projects. The aim of this paper is to implement a method to measure in a quantitative way the projects sustainability, with an innovative application of the Analytic Hierarchical Process (AHP). This method allows to compare the quantitative and qualitative items of the projects at the same time. These projects are extremely heterogeneous. The authors involved also all the employees having a strategic position in the hospital determining in this way the success of the work as the results show.

IEEM17-P-0594

Teachers' Mental Health: Perceived Social Justice and Life Satisfaction

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Teachers play an important role in the development and progress of technology and knowledge. However, in today's China, primary and secondary school teachers are living a hard life with high pressure but low payment, which results in a sense of unfair and less satisfaction of life. This study was aimed to explore the effect of teachers' perception of social justice on life satisfaction. 450 primary and secondary school teachers from China were measured with life satisfaction scales, social justice scales, income satisfaction scale, job satisfaction scale, pressure condition scale, and major life event scale. Results showed that demographic variables and individual attitudes had important effects on life satisfaction. More importantly, after controlling them, perceived social justice still had a positive effect on life satisfaction, among which distributive justice played a more important role than procedural justice. The suggestions on teachers' condition and the implications on education reform to improve teachers' mental health are discussed.

IEEM17-P-0870

Applying Bayesian Network for Noncommunicable Diseases Risk Analysis: Implementing National Health Examination Survey in Thailand

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We propose using a Bayesian network to capture and understand the dependency risk factors affecting the prevalence of chronic diseases. By applying a Bayesian network model, we can visualize inter-dependencies between risks and their effects on the Noncommunicable disease (NCD) prevalence. By using a Bayesian network to model the prevalence of diabetes, we can define the top three risks as family history of diabetes, obesity, and age. Furthermore, the risk classification results can help to determine the managing strategy. For the Thai population, problems arising from family history of diabetes and obesity can be met by employing a transfer strategy. Age (especially ages of 35–59) and the risk incurred by low intake of fruits and vegetables should use a reduction or mitigation strategy. Finally, those at risk as a result of their area of residence (in urban areas) and socio-economic factors within the 4th quantile and low level of physical activity should apply a retain strategy.

IEEM17-P-0303

Exploring the Internet Resource for Senior Citizens in Taiwan

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Aging is a trend of global population structure. Taiwan's seniors aged above 65 will become more than 20% to super-aged society in 2025. In recent years, the ICT also developed rapidly. The elders use computers and mobile device to Internet is also getting higher and higher. However, the needs of the elders have their particularity, whether the current Internet resources can meet the needs of the elders is an important issue. This study based on the traditional Chinese website resources in Taiwan, used search engines and keywords to find the website and social media fan pages resources for elders. Three conclusions were provided for government, private organizations and social media.

IEEM17-P-0858

Transformation of Health Care System Using Internet of Things in Villages

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The intention of this paper is to make obvious that how the concept of IoT can be used in transforming the health care services. The IoT refers to the physical devices that are interconnected with each other. In the case of Health care services, the medical gadgets like thermometer, ECG, weight scale, etc., are interrelated using certain sensors. It can be used to sense, detect and predict the health condition of the patient. The sensors or actuators attached to the patient will spot out the changes taking place in their body. These details are collected and sent to the databases after undergoing certain stages of processing. The information which gets stored in the database or end systems can be retrieved and utilized whenever it is necessary. Based on those particulars, diagnosis can be performed in an efficient way and as a result the Doctor will be able to provide the appropriate treatment. This method of transformation of the health care services using the Internet of Things can be extended to the next level by implementing it in the rural areas where even the basic medical facilities are denied. In this paper, the details about IoT, its perspectives, its role in the Health Care services, its way of implementation, applications and the challenges faced are explored in a depth. The advancements in IoT based health care systems and the ideas for taking it to the next level, in such a way that, the humanity gets benefitted are also being discussed in this paper.

IEEM17-P-0715

A Deeper Look at the Causes of Hospital Readmissions

Zhongyuan YU, William B. ROUSE
Stevens Institute of Technology, United States

The US Centers for Medicare and Medicaid Services (CMS) penalizes hospitals that readmit patients within 30 days for several diagnoses. Hospitals argue that readmissions are driven by the nature of populations served. Traditional statistical analyses support this assertion. In this article, we show that a deeper analysis, using clustering, provides a richer and more nuanced explanation of readmissions. Specifically, while patient population is a significant factor, the effectiveness of care and patient satisfaction are also contributors. Hospitals that invest in improving effectiveness and satisfaction should be able to lower readmission rates.

Session	Operations Research 3
Date	11/12/2017
Time	15:45 - 17:30
Room	MR327
Chairs	Nur Aini MASRUROH, *Gadjah Mada University*, Wei WU, *Seikei University*

IEEM17-P-0597

Optimal Pricing Considering Customer Categories: Case on Car Rental Industries

Nur Aini MASRUROH, Vivian Prislyane TJAKRA, Ririh Rahma RATINGHAYU
Gadjah Mada University, Indonesia

Segmentation of the customer provides an opportunity to offer more than one class with the different price. However, the most occurring problem is the loss of demand for lower class due to its high demand but limited capacity, while the utility of the higher class is low due to its high price. Thus, setting the right price becomes critical. This paper proposed optimal pricing models considering the customer segments. Car rental business is used as a case study. The capacity of car rental business is dynamic since the number of cars available might dynamically change due to the dynamic return time of the customers. Two scenarios are proposed, without substitution and with substitution. Since the models are non-linear programming with constraints, KKT procedure is applied to get the optimal solution. Results from the case study show that the proposed model enables to increase revenue significantly. Furthermore, substitution scenario has the opportunity to obtain higher revenue.

IEEM17-P-0840

A Comparison of Integer Programming Formulations and Variable-Fixing Method for the Nurse Scheduling Problem

Masaya HASEBE[1], Takamasa YAMAZAKI[1], Masakazu RYUMAE[1], Wei WU[1], Koji NONOBE[2], Atsuko IKEGAMI[1]
[1]*Seikei University, Japan*
[2]*Hosei University, Japan*

The nurse scheduling problem (NSP) aims to optimize a schedule of work periods (shifts) for nurses so that the schedule simultaneously balances the workload among nurses and maintains the skill level of the nurse team in each shift. In this paper, we present several mixed integer programming models for the NSP and compare them through computational experiments. The results are given for a typical benchmark instance with 25 nurses. In practical use, some constraints cannot be easily modeled, and so on-site schedulers often require either a flexible schedule or multiple good solutions so that they can adjust the final shift schedule. To satisfy this need, we propose a variable fixing method to list the common features among all the optimal solutions and to generate solutions that are optimal with respect to divergence.

IEEM17-P-0522

Optimization of Product Bundling Strategy Decisions and Inventory Allocation with the Integration of the Degree of Contingency and Dead Stock Levels in a Multiple Time Period Setting

Edward John FRANCO, Mikhaela Carissa SANTOS, Denise Ericka SUYOM, Dennis CRUZ
De La Salle University, Philippines

This paper considers a multiple integer non-linear programming model that aims to optimize the three types of bundling strategies while considering the selection of components for the bundles that integrates the degree of contingency and the dead stock component of the product. The proposed model is validated through different scenarios with varying incremental input parameters in order to determine the effects of the variables to the objective function and the sensitive points in the model. The results were able to show that an increasing degree of contingency is able to affect the pure component variable while the interaction of degree of contingency and the reservation price of a mixed individual appears to have a significant effect on the number of pure bundles. In addition, the dead stock level and degree of contingency have produced adverse effects to bundling optimization. These results have shown that integrating component selection, dead stock level and bundling strategies gave the model the flexibility to change through its varying parameters improving its profitability.

IEEM17-P-0768

Agent Scheduling of Call Center Using Decomposition Technique

Netnawee UM-IN, Wipawee THARMMAPHORNPHILAS
Chulalongkorn University, Thailand

This research studies an agent scheduling of a call center where the number of agents and skills are predetermined and varied during each period. Agents must be assigned into work shifts in order to minimize labor related cost and also satisfy working constraints such as worker availability, work duration and break requirements. We decompose this problem into two parts which are solved sequentially. First is to determine the minimum number of required agents for each shift across a month that covers the predetermined number of agents in each period. The outcomes from the first part are used as input for the second part which is to assign agents into work shifts. Mixed integer programming models are proposed to find solutions for both parts.

IEEM17-P-0767

A Mathematical Model for Double Layer Precast Production Scheduling

Nuntiya IAMSUMANG, Wipawee THARMMAPHORNPHILAS
Chulalongkorn University, Thailand

This paper involves a precast production with double layer in identical parallel molds. The precast production consists of 5 processes to be produced sequentially. Each process requires a specific resource that must be shared among molds except the curing process which does not require any resources. There are 5 concrete formulas for considering that do not effect on the precast quality. Nevertheless, each formula results in different costs and different processing time. The more expensive formula requires the shorter processing time. We propose an MIP model to select formulas and schedule all jobs to finish within due date.

IEEM17-P-0065

A New Two-Stage Stochastic Model for Reverse Logistics Network Design Under Government Subsidy and Low-Carbon Emission Requirement

Hao YU, Wei Deng SOLVANG
UiT - The Arctic University of Norway, Norway

Nowadays, increasing number of companies incorporates the reverse logistics decisions into their supply chain design in order to cope with the enforced international and national legislation and improve the resource efficiency and public image. This paper investigates a new stochastic optimization model for designing a single-period multi-product multi-level reverse logistics system under government subsidy and low-carbon emission requirement. In order to resolve the stochastic optimization problem, a modified multi-criteria scenario-based approach is proposed to maximize the profit generation while simultaneously improve the stability of the decision-making under uncertainty. The model and solution method are tested with several numerical experiments, and managerial insights are obtained with respect to the carbon emission requirement, governmental subsidy, economy of scale, and system flexibility.

IEEM17-P-0318

Supply Chain Network Reconfiguration in New Products Launching Phase

Hamed JAHANI, Babak ABBASI, Farzad ALAVIFARD
RMIT University, Australia

This paper examines the impact of new products launch on the optimal supply chain network (SCN).We formulate a stochastic mixed integer nonlinear model that considers product demand and price uncertainties in the markets to optimally reconfigure the SCN. In addition, the correlation between demand and price is considered in the proposed model. The integration of network redesign and new products development (NPD) process is intended to propose a framework to define target markets for each new product respecting demand and maximisation of the profit of the company. A numerical case study is used to illustrate the applicability of the proposed mathematical model.

IEEM17-P-0795

An Optimal Scheduling Policy for Satellite Constellation Deployment

Sunil SINDHU, Goutam SEN
Indian Institute of Technology Kharagpur, India

Satellite constellations are increasingly making their presence in the space due to their use in telecommunication, navigation, earth observation, scientific data collection and many other services. The size of the constellation is also growing with the requirement of high quality data and extensive coverage. The problem of scheduling satellite launches for a moderate-sized constellation deployment with various operational and resource constraints are considered in this paper. We develop an optimal launch strategy, via mathematical programming approach, to minimize the constellation deployment cost. The work in this paper is based on the European Space Agency (ESA) challenge problem [1] published in 2015 accompanied by real data.

Session	Technology and Knowledge Management 1
Date	11/12/2017
Time	15:45 - 17:30
Room	MR328
Chairs	Ville ISOHERRANEN, *University of Oulu*, Yongrae CHO, *Science and Technology Policy Institute*

IEEM17-P-0813

A Framework for Lean Knowledge Dissemination: Enhancing Innovation Excellence

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Lean manufacturing concepts are currently not only limited to high-volume production; they are also becoming increasingly common in low-volume, high-variety production environments, as well as in knowledge work (e.g. innovation, product development, engineering analysis and evaluation, etc.). The ad hoc application of Lean concepts to specific local situations results in the existing body of knowledge on customized Lean being fragmented and scattered across academic and management literature, as well as among individual practitioners and academics. This creates significantly high variability among industrial applications, educational programs and teaching materials. Hence, it is necessary to have comprehensive frameworks to unify the body of knowledge related to Lean knowledge dissemination at different phases of industrial applications to drive excellence in innovation operations. This article is intended to provide a brief review of the bodies of knowledge within innovation and proposes a unified knowledge framework of the bodies of Lean knowledge across the innovation-related disciplines.

IEEM17-P-0851

The Effects of Cooperative Activities with Competitors on the Performances of Innovation and Management

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[2]*Korea Institute of Science & Technology Evaluation and Planning, South Korea*

This study intends to verify whether the coopetition strategies, cooperation with competitors, affect business performances. More specifically, in order to scrutinize the cooperation as a part of innovation mechanism, this study analyzed mediating effect of product and process innovation between the cooperative activities and management performance. In this context, we applied the structural equation analysis by integrating regression model and logistic regression model. The former verified cooperation's effect on management performance, while the latter studied cooperation's effect on innovation performance. The results of analyses showed that the cooperation with competitors, comparing with other types of cooperation, enhanced the innovation performance such as process innovation. Additionally, the analysis demonstrated that such cooperation positively related to the management performance. These results indicate the significance of strategic openness even to the competitors as business environment changes dramatically. Such cooperation would provide the windows of opportunity for sustainable growth through the field-based innovation.

IEEM17-P-0162

Perceived Distance as a Reflection of an Organizational Culture of Learning from Failure

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In collaboration with the Sangikyo Corporation, the present authors investigated the manner in which an organizational policy of learning from failure can be effective in a working system. Sangikyo employees completed a web-based questionnaire assessing how perceived distance, which was used to analyze the cognitive behaviors of employees in the working system, contributes to Self-reflection. In terms of the Self-reflection cluster in the plot analysis, we found that employees made continuous efforts to accumulate experience in the extant field of operation, which involved the company's current organizational culture, rather than taking on challenges to develop new business. Thus, the organizational culture makes experience a core value in cases where learning from failure is working well. Additionally, the further development of the working system is discussed to address outstanding issues.

IEEM17-P-0073

Relationship Among Knowledge Sharing, Open Innovation and Green Poduction: A Multiple Stakeholders Perspective in Batik Tulis Industries

Augustina Asih RUMANTI[1], T.M.A. Ari SAMADHI[2], Iwan Inrawan WIRATMADJA[2], Indryati SUNARYO[2]
[1]*Telkom University, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

The arising necessity for competitiveness inevitably requires Small and Medium Enterprises (SME) to innovate. In the face of obstacles, Small and Medium Enterprise (SME) owners should be able to innovate to improve competitiveness. Innovation process that was done was not separated from human resources within the organization. Innovation process is not separable from the human resources in an organization. The existence of new knowledge is an absolute condition for innovation to happen, and as the continuation, the process of knowledge sharing will be highly important. Therefore the process of knowledge sharing must be well-managed to achieve an optimal result of innovation. This research produces a conceptual model picturing relation between sources of knowledge sharing, open innovation and green production.

IEEM17-P-0062

From Potential to Realized Technological Capability: The Case of Indonesian Vessel Component Industry

Dian PRIHADYANTI, Budi TRIYONO, Dudi HIDAYAT
Indonesian Institute of Sciences, Indonesia

In a supply chain, a supplier has a great role in determining its customer's performance. A firm's innovation is highly influenced by its technological capability (TC). This article analyses TC in Indonesian vessel component firms. Based on the analysis, it can be concluded that the firms possess a TC that has not been utilized to obtain optimum result in an innovation. This lead to a new categorization of TC based on its utilization in innovation process. Two types of TC are proposed – the potential and the realized TC. Using a modified fishbone diagram, there are some interlinked and interrelated factors which inhibit the potential TC to be developed as realized TC. To enable the conversion of potential TC to a realized TC, support from Indonesian government is indispensable.

IEEM17-P-0731

The Influence of Information Technology Infrastructure and Leadership Style on Knowledge Management Implementation

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[1]*State Islamic University of Sultan Syarif Kasim, Indonesia*
[2]*Brawijaya University, Indonesia*

This study addresses the issues leadership style (path goal theory), information technology infrastructure, and knowledge management implementation in State Islamic University of Sultan Syarif Kasim Riau. This article purpose to analyze and examine how leaders and the infrastructure of technology information may support for knowledge management implementation. While most studies relating to aspects of knowledge management are concerned with the industry, the university have not received much attention, especially in Indonesia. We validated our measures and tested our research model using 160 respondents. We conclude that leadership style and information technology are key factors that influence knowledge management implementation. Finally, recommendations and implications are discussed to help university guide their efforts to knowledge management strategy.

IEEM17-P-0603

Research on the Development of General Aviation Industry Chain in Shaanxi Province Based on the Model of GEMD

Qinglin BAO, Huaqi CHAI, Kang WU
Northwestern Polytechnical University, China

It is important to put emphasis on demand for development of the general aviation industry chain, because demand has a profound impact on the industry development. The traditional GEM model has advantage in comparison with diamond model. However, the original factor pairs' in GEM model does not contain demand. So in order to measure the development of general aviation industry chain in Shaanxi province, China, we upgraded the GEM model to a new GEMD model. Combined with the characters of the general aviation industry chain in Shaanxi province, this paper innovative expands one factor pair's-"demand". By adding the government demand and social demand, it could be more specific to measure the development of general aviation industry chain. The study shows that the results based on GEMD are comprehensive and objective. The results are demonstrated to be practical.

IEEM17-P-0224

Creating an Ability to Respond to Changing Requirements by Systematic Modelling of Design Assets and Processes

Samuel ANDRÉ, Fredrik ELGH
Jönköping University, Sweden

System suppliers, e.g. original equipment suppliers, are important for the success of many products. They design a unique solution, often in close collaboration with other companies, based on different product concepts and/or core technologies. The solution can then be manufactured in different quantities depending on the client's need. High level of customization is required as the interfaces are not standardized, the performance is not negotiable, requirements are not initially fixed and the specific system interacts with, is affected by, or affects other systems that are simultaneously developed. A system supplier commonly designs and manufactures solutions for different OEMs and must support many models and variants in their product portfolios. Efficiency, short lead-time, continuous technology development, and adaptability are essential for the competitive edge. A product platform approach has been a success for many companies to enable variety at low cost, however, it is not applicable for system suppliers. This work describes the result from a case study where a platform approach enabling a new way of structuring, publishing and managing design assets and processes was introduced at a company with the purpose to improve the ability to respond to changing requirements in the quotation process and the subsequent product development activities.

Session	Human Factors 2
Date	11/12/2017
Time	15:45 - 17:30
Room	MR329
Chairs	Tarun VERMA, *Indian Institute of Technology, Varanasi*, Bertha Maya SOPHA, *Gadjah Mada University*

IEEM17-P-0617

Injury Analysis of Mine Workers: A Case Study

Vivek THIRUMALA, Tarun VERMA, Suprakash GUPTA
Indian Institute of Technology (Banaras Hindu University), India

Stress is an important aspect that governs the performance and safety of the worker. The presence of high mental and physical stresses may cause inefficient performance and also unsafe operations. There is a dearth of literature studying the impact of worker stress on worker performance and injuries. In this study, worker injury characteristics have been studied based on the worker individual stress factors like age, Body mass index (BMI), sleep hours, chronic disease, daughter's marriage, child's education, family dependency and workplace factors like type of work and perception of maximum injury shift. The results reveal that workers involving in different tasks experience injuries differently. Old age workers are facing comparatively more injuries than younger's. Workers taking insufficient sleep are more prone to injuries especially scraping and puncture type injuries.

IEEM17-P-0788

Reflective Learning in Engineering Education: A Case Study of Shell Eco-Marathon

Sune VON SOLMS, Hannelie NEL
University of Johannesburg, South Africa

Globally, universities are reinventing STEM education where traditional classroom methods are substituted or supplemented with practical learning methods such as problem-based learning and project-based learning. Another method, not often employed in STEM, is learning through reflection. This paper presents a case study where a group of engineering students participated in an international competition, the Shell Eco-Marathon, and partook in reflective learning before and after the event. The results indicate that students who learn through reflection value the inclusion of project-based learning in their curricula, which emphasizes the importance of this study for the future of engineering education.

IEEM17-P-0558

Implementation of High Performance Work Practices (HPWP) in R&D Organizations: Empirical Evidence from Malaysia

Arnifa ASMAWI, Kok-Wai CHEW
Multimedia University, Malaysia

Augmenting Malaysia's innovation and R&D capabilities is a major national priority. At present, the level of R&D and innovation in Malaysia is not encouraging. Hence, there is a critical need to enhance the quality of R&D workforce. Studies have suggested high performance work practices (HPWP) as an HR strategy to nurture creative talents in R&D organizations. This paper describes the existing implementation of HPWP in Malaysian R&D organizations. It is reassuring to know that HPWP is already being implemented by these R&D organizations although the patterns of implementation are slightly different from one to another. By learning how HPWP works, organizations are able make effective decisions to develop exceptional R&D workforce.

IEEM17-P-0903

Workplace Diversity and its Outcomes in the Arctic Area

Maryam BARABADI, Abbas BARABADI
UiT The Arctic University of Norway, Norway

Globalization, migration, technological development along with other aspects of developments have made workgroup diversity and its effects on individual/team/organization outcomes an important challenge in many countries. Some studies concluded that workplace diversity can be a resource for creation and innovation; on the contrary, some studies identified it as a source of conflict, while others reported a no significant direct relationship between workplace diversity and performance. In order to clarify such contradictory conclusions, some researchers propose the use of moderating factors. The moderating factors (moderators) are variables which can affect the relation between independent and dependent variables. For example, here task complexity as a moderator can affect the relation between dissimilarity between team members (independent variable) and team performance as dependent variables. The aim of this paper is to identify the moderating factors in workplace diversity and team or organization outcomes. Moreover, it tries to show how this moderator will affect the individual/team/organization outcomes. The selected method for the study is a systemic literature review.

IEEM17-P-0576

Integration of a Digital Twin as Human Representation in a Scheduling Procedure of a Cyber-Physical Production System

Iris GRAESSLER, Alexander POEHLER
Paderborn University, Germany

Cyber-physical production systems comprise the idea of connected, self-controlling devices. Through communication among the devices holistic information about the production system shall be gathered and for example used for production planning and control. Often the integration of human personnel in this kind of automated planning, control and execution of production processes is combined with an assumption of tasks by the computer system and thereby degradation of employees. The interconnection and negotiation among the devices open up possibilities for a new kind of integration of human employees interacting in such a technically autonomously working environment. This paper presents an approach, where a digital twin is developed, which assumes the communication and coordination tasks of the employee with the production system and acts as a representative. Thereby employees on the shop floor are able to take part in computational decision-making. The digital twin uses a database which emulates user behavior.

IEEM17-P-0460

Design of an Assistant System for Industrial Maintenance Tasks and Implementation of a Prototype Using Augmented Reality

Ruben SCHLAGOWSKI[1], Claudia MEITINGER[1], Lukas MERKEL[2]
[1]*University of Applied Sciences, Germany*
[2]*Composite and Processing Technology IGCV, Germany*

As the complexity of work tasks rises for maintenance workers in modern production facilities, new technologies will be required to support and integrate the service worker of tomorrow. This paper gives an insight into an ongoing research project examining the potential of smart glasses used as a component of assistant systems for workers performing maintenance tasks in an industry 4.0 context. A human centered design process is used to identify the needs of workers and to specify requirements for the assistant system being developed. Thereby, the maintenance of a CNC lathe is used as an example and assistant functions were developed for one specific maintenance task. The architecture of the assistant system proposed in this paper is based on an analysis of the work system including the tasks of the maintenance worker. Finally, the implementation of a first prototype, using state-of-the-art augmented reality smart glasses, is described.

IEEM17-P-0459

A Soft Approach Towards Gaining Employability in IT Professionals

Richa SINGH DUBEY, Vijayshri TEWARI, Bhartrihari PANDIYA
Indian Institute of Information Technology, Allahabad, India

IT industry is a knowledge based industry where human capital is considered as vital factor that enable organisation to gain competitive advantage and calls for necessity to develop workforce through enhanced employability .Thus employability links with the individual performance and satisfaction, organisation's growth and economic well being of the nation. Though there are many factors that affect employability, in this paper we are discussing influence of soft skills on employability in IT professionals.

Session	Systems Modeling and Simulation 2
Date	11/12/2017
Time	15:45 - 17:30
Room	MR330
Chairs	Seng Fat WONG, *University of Macau*, Karthik SANKARANARAYANAN, *University of Ontario Institute of Technology*

IEEM17-P-0775

Developing Advanced Traffic Violation Detection System with RFID Technology for Smart City

Seng Fat WONG, H. C. MAK, C. H. KU, Weng Ian HO
University of Macau, Macau

This study aims to develop a system to instantly detect traffic condition by using computer vision with RFID technology for obtaining vehicles data. The system detects the presence of vehicles and also calculates the detected objects. The method of background subtraction on motion objects detection is proposed. By taking samples from the objects, background models are being set and extracting foreground areas from background subtraction and reducing the shadow in the foreground. A threshold method is presented to divide standard to the image and improve the detection effect. The experiment results indicate that the performance of the background subtraction method is more stable on dynamic objects detection. This advanced method can contribute the smart traffic control and analysis for smart city development.

IEEM17-P-0257

Path Location Problem for the Marine Container Terminal with Arbitrary Configuration

Etsuko NISHIMURA
Kobe Univesity, Japan

This study addresses the path location problem at container terminals with arbitrary configuration. Relatively new marine container terminals often have a rectangular configuration by making use of reclaimed land. However due to geographical reasons some terminals in the world have an irregular or polygon configuration. At the terminal with Rubber Tyred Gantry crane operated, the storage capacity depends on the path locations and the number of paths which the yard trailers move. In this paper, we will propose the heuristics algorithm to find the best path locations at the container terminal with an arbitrary configuration. From the computational results, our proposed approach can find better path location than the path location with same interval as the existed case, not only at irregular shape but also at rectangular shape.

IEEM17-P-0637

Feasibility Analysis of Renewable Based Hybrid Energy System for the Remote Community in Pakistan

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[2]*University of Science and Technology of China, China*

phenomenon in Pakistan, and it is more severe in rural communities where load shedding ranges up to 18 hours a day. The conventional methods of electricity generation are inadequate to meet the load demand. Pakistan is one of the best places in the world from the perspective of solar irradiance. The exploitable estimated potential of wind energy in Pakistan is also quite sufficient, i.e. 132,000 MW. The key objective of the study is to utilize the renewable energy resources and produce electricity at lower cost. In this paper, solar photovoltaic panel (PV) and wind system as energy sources, battery as storage with diesel generator (DG) as a backup for a remote community has been presented. A total of 8 (4 off-grid and 4 grid integrated) alternatives are considered. HOMER software is used for simulation, economic optimization, sensitivity analysis, optimal design, DG running period and the net electricity supplied by the grid.

IEEM17-P-0397

An Integrated Customer-Manufacturer Optimization Model to Determine the Optimal Product Price and Quality Level Using Theory of Utility

Anindya Rachma DWICAHYANI, Cucuk Nur ROSYIDI, Eko PUJIYANTO
Universitas Sebelas Maret, Indonesia

In facing market competition, companies are required to conduct a good strategy of pricing. By determining the right product price and quality in accordance with customer preferences, the company gains higher competitive advantages. These preferences towards risk caused by uncertainties can be expressed using utility function. In this study, we develop an integrated customer-manufacturer based optimization model using utility theory. We bridge the preferences between customer and manufacturer by minimizing the gap of utility between both parties. Several constraints are considered, including marginal profit constraint and customer utility constraint. Demand is considered to be price sensitive with a linear function. By optimizing the model, we get the information about the optimal product price and quality, in term of tolerance. We present a numerical example and sensitivity analysis to illustrate the application and feasibility of the proposed model.

IEEM17-P-0822

Modelling and Simulation of Agricultural Production System Based on IoT Cultivated Fields Information

Yusaku MATSUMOTO[1], Hironori HIBINO[1], Naoki KUBO[1], Makoto KIMURA[2], Yousuke MIZUKAMI[3]
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[2]*HATAKE Company Inc., Japan*
[3]*AGROPOLIS LLC., Japan*

A stable continuous supply of products is required to improve consumers' quality of life; thus, the development of agricultural production systems has become critically important. In agriculture (cultivated fields), goods disposals or shortages can result from exceeding the consignment criteria owing to differences in the goods supplied and the amount in demand. In this research, we develop a numerical simulation based on cultivated field information derived from the Internet of Things to conduct an advanced business evaluation of the lack of stock and the crop loss due to uncertainty regarding the amount of produce harvested.

IEEM17-P-0454

Virtualization Technologies in Product Development: A Cross-Industrial User-Study

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[1]*BMW Group, Germany*
[2]*Technische Universität Berlin, Germany*

Increasing complexity, high variance and diversity of products as well as ever-decreasing innovation cycles represent the significant challenges of the today's product development. Companies need to find possibilities to handle these changing circumstances in order to achieve their product innovations and to serve customer needs. One possible solution to deal with these challenges is the virtualization of product development. This approach seems to be increasingly inevitable for future product development. By using different virtualization technologies (VT) products can be developed more quickly, cheaper and with a better quality. However, virtualization technologies require new competencies in organizations and processes. Findings of this cross-industrial user study showed differences between automotive and non-automotive industry regarding current and prospective use of VT as well as subjective experience and intrinsic motivation of using VT. Thus, non-automotive industry seems to act more application-oriented at this time.

IEEM17-P-0926

Reliability Analysis of Cyber-Physical Systems Considering Cyber-Attacks

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A general framework is proposed for cyber-physical system reliability modeling and evaluation considering some typical cyber attacks. The impacts of attacks from cyber space on physical space are analyzed, including the denial of service attack and deception attack. The cyber intrusion is modeled by a semi-Markov process, which decides the occurrence probability of cyber-attacks. The occurrence probability is related to the attacker level and defender level, therefore the cyber intrusion process is more practical and applicable for most attack situations. A case study on industrial heat exchanger system is provided to quantify the influences of cyber attacks on system performance and reliability. Some important conclusions are also drawn, which will be useful in designing resilient cyber-physical systems.

Session	Supply Chain Management 3
Date	11/12/2017
Time	15:45 - 17:30
Room	MR332
Chairs	Nihal JAYAMAHA, *Massey University*, Nirmal HUI, *National Institute of Technology Durgapur*

IEEM17-P-0812

The Effect of Uncertainty Avoidance on Lean Implementation: A Cross Cultural Empirical Study Involving Toyota

Nihal JAYAMAHA, Nigel GRIGG, Nisansala PALLAWALA
Massey University, New Zealand

This study tests hypothesized relationships between Uncertainty Avoidance (UA) and the elements of Toyota Way-People Development, Continuous Improvement, and Operational Results-in a cross cultural context. The study uses responses obtained from 2196 Toyota employees engaged in logistics, sales and marketing functions in 22 countries. The study is important because scholars question the generalizability of Japanese management philosophies (these philosophies evolved in high UA and collectivist cultures) across diverse national cultures. The study confirms that there is greater level of acceptance of People Development, Continuous Improvement, and Operational Results in high UA cultures (e.g. Greece, Belize) than in low UA cultures (e.g. Denmark, Iceland). However, the effects of UA (mean score differences) were found to be practically small, suggesting good transferability of TW principles across international boundaries.

IEEM17-P-0429

Inventory Control Model of a 4-Echelon Production-Distribution System

Moumita TEWARY[1], Debabrata DAS[2], Nirmal Baran HUI[1]
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Present paper proposes a reorder interval-based mathematical model for a four-echelon inventory system of deterministic demand. It has four different echelons and 10 installations. The problem is posed as an optimization problem to determine the minimum inventory cost subject to different constraints. The model resulted in a mixed integer non-linear programming problem with some constraints. The optimal solution with lowest supply chain cost is obtained using an exhaustive search method. The best solution and corresponding variables are noted. Further Reorder intervals and lot-sizes of all installations are also determined in the paper.

IEEM17-P-0831

Reference Process for the Continuous Design of Production Networks

Günther SCHUH, Jan-Philipp PROTE, Stefan DANY
RWTH Aachen University, Germany

Over the past decades manufacturing companies have developed complex production networks. The design of these networks is a major challenge. Although decisions in the context of production network design have a long-term impact on manufacturing companies, there is no continuous and integrated planning of the production network in many cases. By a discussion of relevant approaches for an integrated design of production networks exiting research gaps are identified. In order to support companies in this complex planning task the aim of this paper is to present a reference process for the continuous design of production networks.

IEEM17-P-0532

Additive Manufacturing Impact for Supply Chain – Two Cases

Sobolev IVAN, Yong YIN
Doshisha University, Japan

The purpose of this research devoted to the problem of spare parts management in automotive industry. The high costs for inventory and transportation and also increased lead time arise the question to change the current scheme with implementing of Additive Manufacturing. 3D Printing as a part of Additive Manufacturing is innovative method of production of final details. It is also expected to be a disruptive for the current spare parts supply chain in automotive sphere. The biggest obstacle in implementing the 3D printers remains the high price of the professional equipment. Within this paper, we will create a simple mathematical model to understand the feasibility of 3DP implementation on distributor site for printing the plastic spare parts. The proposed model of value analyzes would be tested on a cross case study with the real data from two automotive companies.

IEEM17-P-0171

Coordination in Supply Chain Finance Under CVaR Criteria

Nina YAN, Ye LIU, Chongqing LIU, Hongyan DAI
Central University of Finance and Economics, China

In this paper, a supply chain finance (SCF) system incorporating a bank, a manufacturer and a capital-constrained retailer is constructed. Considering the retailer's risk aversion and the role of buyback contract in coordinating operational and financial decisions, we analyze each participant's optimal strategies. Based on Stackelberg equilibrium analysis, the results reveal that super-coordination can be achieved with buyback contract.

IEEM17-P-0434

Continuous Improvement of Complex Process Flows by Means of Stream as the "Standardized Cross-Enterprise Value Stream Management Method"

Christof OBERHAUSEN, Meysam MINOUFEKR, Peter PLAPPER
University of Luxembourg, Luxembourg

In numerous sectors and industries worldwide, there is a trend towards an intercompany and often international division of value creation and related work tasks. To overcome the challenges of complex cross-enterprise supply chain networks, innovative approaches to visualize, assess and enhance value streams are sought. The StreaM method, which is described in this paper, enables a comprehensive analysis, design and planning of cross-company product and information flows on different levels of value stream detail. At the same time, the entire methodology is based on a common understanding of key symbols, parameters and calculation procedures. In addition, the use of the developed StreaM method and the associated model in a case study proves its practical applicability in an industrial setting. In further validation projects, the transfer of the "Standardized cross-enterprise Value Stream Management Method" to other industry sectors is envisaged to continuously improve energy, trade or service processes.

IEEM17-P-0763

Relationship Between Stringent Customer Environmental Requirements and Environmental Performance in Sustainable Supply Chain

Md Rezaul Hasan SHUMON, Shams RAHMAN, Kamrul AHSAN
RMIT University, Australia

The recent move towards environmental sustainability around the world forced firms to adopt environmentally sustainable practice in their operations along the supply chain. The objective of this research is to critically comprehend and establish the concept of 'stringent customer environmental requirements' and to explore its impact on the supplier's capability and environmental performance in sustainable supply chain context. Using data from Bangladesh Ready-made garment (RMG) industry, this research investigates how the stringent environmental requirements from customers around the world impact the environmental performance of suppliers in garment supply chain. Result shows that the stringent customer environmental requirements, supplier's capability and environmental performance are highly correlated. It might help to understand the dynamics of environmental requirements from customers and may provide important insight to the managers of supplier organizations about how to handle unpredictable changes in environmental demands from their customers.

Session	Decision Analysis and Methods 1
Date	11/12/2017
Time	15:45 - 17:30
Room	MR333
Chairs	Ahmed EL-BOURI, *Sultan Qaboos University*, Arnesh TELUKDARIE, *University of Johannesburg*

IEEM17-P-0754

Allocation of College Students to Business Majors with the Aid of a Linear Programming Model

Ahmed EL-BOURI, Asma AL-ZAIDI
Sultan Qaboos University, Oman

The problem of assigning business students to program majors in a Middle Eastern College is considered in this study. An important characteristic that usually appears in this problem is a high variation in the demand for different programs. The allocation method currently used by the College is evaluated, in terms of overall satisfaction of student program preferences, by comparison with optimal allocations obtained from a linear programming formulation. The evaluation demonstrates the current method to be effective in assigning high-GPA students to their first choice programs, yet mediocre in overall satisfaction of the student preferences. Consequently, a hybrid approach that combines the current method with a linear programming model is proposed and analyzed. The results show that the hybridized method provides a solution that successfully integrates the strengths of the LP solution with the currently used method.

IEEM17-P-0223

Procedures to Accommodate System Fluctuations that Result in Buffer Compromised Systems Governed by the Theory of Constraints

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[1]*Aerosud Aviation, South Africa*
[2]*University of Johannesburg, South Africa*

Decision making support in a stochastic environment represents a challenging aspect for any manufacturing organisation. Disturbances in manufacturing supply chains shift operational risks as a function of time. The development of Industry 4.0 related technologies enables manufacturers to more efficiently mitigate operational risks and improve end to end efficiencies. The current research investigates technologies and concepts in the emerging blueprint of 4.0 that add value to organisational decision making capabilities. A multimethod agent based simulation model is developed within the boundaries of a Theory of Constraints (ToC) system to assess the effectiveness of the current Mode Of Operation (MOO) for prioritisation of Work In Process (WIP). The investigation is conducted using a defined WIP complement and resource pool allocation. The results show that it is possible to optimise flow through the manufacturing line through consideration of prioritisation MOO. The approach represents a transition to a new optimised state for the organisation under study; as it ventures into the realm of Industry 4.0 through use of agent based simulation modelling and analysis.

IEEM17-P-0023

Optimization of Decision Support System Based on Three-Stage Threat Evaluation and Resource Management

Afshan NASEEM, Shoab Ahmed KHAN, Asad Waqar MALIK
National University of Sciences and Technology (NUST), Pakistan

This paper demonstrates a novel decision support system for threat evaluation and weapon assignment (TEWA). The knowledge-based system is built on threat perception, optimal schedules and assignments of weapons available for the threat neutralization. Mostly, in real warfare circumstances, the quantity of threats targeting vulnerable assets/points (VA/VPs) is large in comparison with the deployed resources. Therefore, performing threat analysis and weapon assignment is critical in real-time scenarios. In this research work, an integrated unique technique is proposed for automatic TEWA technique for effective threat neutralization. Our results show that the proposed approach significantly improves on traditional manual system. In previous studies, threats are categorized based on the type assumptions and weapons are assigned accordingly. In this paper, an efficient TEWA-DSS is presented for (1) threat perception and optimum (2) multiple threat scheduling problem. This process is comprised of three stages. At first stage, threat is perceived. At the second stage, threats are evaluated. At third stage, weapons are scheduled and assigned optimally.

IEEM17-P-0747

Objective Measurement for Attractiveness of Sightseeing Spots under Minimization of Maximum Error among Pairwise Comparisons

Takashi HASUIKE[1], Hideki KATAGIRI[2], Hiroshi TSUDA[3]
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[2]*Kanagawa University, Japan*
[3]*Doshisha University, Japan*

This paper proposes a minimax problem to determine an attractiveness of each sightseeing spot based on pairwise comparison by the tourist. A tourist can subjectively and qualitatively compare two sightseeing spots, and the ranking of candidate sightseeing spots can be obtained from the standard AHP. However, it is almost impossible to set the numerical values of attractiveness of each sightseeing spot strictly. Furthermore, it is also difficult to evaluate the attractiveness objectively according to the tourist's feelings. On the other hand, by using sightseeing plans which include some popular sightseeing spots, a tourist can simultaneously do a qualitative and quantitative evaluation of multiple sightseeing spots. The main step of the proposed approach is to propose a mathematical programming problem to minimize the maximum error from the tourist's pairwise comparison and to determine the attractiveness of sightseeing spots objectively. Furthermore, the synergy effect among sightseeing spots is also considered.

IEEM17-P-0169

A Further Improved Support Vector Machine Model Along with Particle Swarm Optimization for Face Orientations Recognition Based on Eigeneyes by Using Hybrid Kernel

Yang LIU[1], Yongkui SHI[2], Mingwei XU[1], Liangliang ZHANG[1], Ning YU[1], Yonglu DING[1]
[1]*Shandong University of Science and Technology, China*
[2]*State Key Laboratory Breeding Base for Mine Disaster Prevention and Control, China*

The learning vector quantization (LVQ), back propagation neural network (BPNN), and support vector machine (SVM) models were established to recognize face orientations. A precision function (P) was proposed to compute each model's precision with confusion matrix. The aforehand models were improved by intelligent algorithms to become LVQ with K-fold cross validation (CV-LVQ) model, BPNN with GA (GA-BPNN) model, and SVM with particle swarm optimization (PSO-SVM) model. The kernel function in the PSO-SVM model was assumed to RBF kernel which had relatively weaker learning ability. Hence the PSO-SVM model was further improved with a hybrid kernel that was fused with the generalization performance of global kernel and the learning ability of local kernel. The further improved PSO-SVM (IPSO-SVM) model possessed a 1.63 to 9.25 percent higher precision than PSO-SVM model. There were no obvious differences in the average elapsed time (AET) between IPSO-SVM model and PSO-SVM model. The results show that IPSO-SVM model not only reaches an outstanding precision of 98.14%, but also was practicable for the recognition of face orientations.

IEEM17-P-0758

Fuzzy AHP Method for Prioritizing Logistics Barriers of Exporting Eggs

Pornwasin SIRISAWAT, Narat HASACHOO, Phattaraporn KALAYA
Mae Fah Luang University, Thailand

This research aims to evaluate logistics barriers of exporting eggs from Thailand to the Myanmar market in which in-depth interviews and unstructured questionnaires were used for collecting data from six logistics experts related to the eggs research field. The results of this study show interesting situations and logistics barriers are found, which comprise of five main barriers: customer barriers; exporter barriers; cost barriers; legal barriers; transportation and infrastructure barriers that make the exporting of eggs difficult and inefficient. To prioritize logistics barriers for exporting eggs, fuzzy AHP approach was used which the results have found that transportation and infrastructure barriers are the most important barriers for exporting eggs to the Myanmar market. Hence, the proposed results from this study will help to understand the real situation of logistics barriers for exporting eggs to the Myanmar market and it could be a guideline for the exporters and other related companies who need to export eggs; it will also be useful information for the researcher who needs to study other related issues in the future.

IEEM17-P-0749

An Analytical Study on Horizontally Collaborative Transportation Strategies

Long ZHENG, K. G. BAE
University of Louisville, United States

Companies are continuously searching for competitive advantages. Horizontal collaborative transportation among companies brings feasible benefits in distributing products to the market. However, each company's specific cost structure has an influence on the decisions concerning whether horizontal collaboration (HC) strategy should be adopted. This is an analytical study of conditions for adopting the HC strategy in competitive circumstances. The study investigates applying different strategy scopes for balancing costs and optimizing profits.

IEEM17-P-0158

Implementation of a Role-Based Decision Support System in an Integrated Petrochemical Enterprise

Eyad BUHULAIGA, Arnesh TELUKDARIE
University of Johannesburg, South Africa

Delivering business optimization via systems requires integration of the enterprise and manufacturing systems. Manufacturing Operation Management (MOM) Systems bridge the gap between plant systems and Enterprise Resources Planning Systems. Traditional MOM consists of a set of standalone applications that are living in silos with minimum interaction. This causes functional replication and overlap among the MOM applications, which usually lead to minimizing the full utilization of these applications. This paper describes the philosophy of the Role-Based Decision Support System (RB-DSS). This research details the process of knowledge modeling, which is based on the ISA-95 functional decomposition, extending ISA-95 into the implementation of workflow applications to execute and coordinate operations tasks and streamline plant operations with ever-changing supply chain processes. The last aspect of this research focuses on demonstrating the benefits of applying the RB-DSS together with changes to traditional MOM operations by providing standard role-based execution templates.

Session	Manufacturing Systems 1
Date	11/12/2017
Time	15:45 - 17:30
Room	MR334
Chairs	Yihai HE, *Beihang University*, Chandima RATNAYAKE, *University of Stavanger*

IEEM17-P-0165

Time Dynamic Mission Reliability Modeling of Multi-State Manufacturing Systems Based on Universal Generating Function

Kongjun GAO[1], Changchao GU[2], Yihai HE[2]
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Existing studies on reliability modeling of manufacturing systems pay more attention to the basic reliability of component, while ignoring the output and input characteristics of the manufacturing system, which cannot provide the prerequisite to implement condition-based maintenance of complex manufacturing system from a system-based view. In order to resolve this dilemma, a novel method of time dynamic mission reliability modeling of multi-state manufacturing system is proposed in this paper. First, the connotation of mission reliability of the manufacturing system is given from the viewpoint of system engineering. Second, the equipment performance is represented based on the theory of multi-state. Third, the mission reliability modeling method based on the combination of performance degradation and universal generating function (UGF) is proposed. Finally, a case study is conducted to illustrate the effectiveness of the proposed method.

IEEM17-P-0452

Implementation of Lean Principles for Performance Improvement: Use of VSM+WID for Waste Identification

Jose DINIS-CARVALHO[1], R.M. Chandima RATNAYAKE[2], Luis FERRETE[1]
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[2]*University of Stavanger, Norway*

This article demonstrates the implementation of lean principles for performance improvement in a manufacturing firm. Value stream mapping and waste identification diagrams (VSM+WID) are integrated to assess the level of currently existing waste and the overall current status of the manufacturing flow. The VSM+WID enables an increase in the awareness of relative waste distribution among different processes in the selected case study manufacturing unit. This manuscript demonstrates how to use VSM+WID to understand the current status of the manufacturing flow related challenges such as: overproduction, work-in-process, inefficient use of man-hours (e.g. unbalanced work distribution), etc. It also demonstrates the effectiveness of visualization of the performance gap between the current and future state. The aforementioned type of performance assessment enables effective identification of waste present in a manufacturing flow in order for future improvement initiatives to be taken.

IEEM17-P-0161

Challenges and Opportunities in Implementing Engineering Systems Thinking in Design, Manufacturing and Process Industries in Zimbabwe

Wilson R. NYEMBA, Charles MBOHWA
University of Johannesburg, South Africa

Engineering and manufacturing companies in industrializing countries such as Zimbabwe, largely employ traditional methods as well as conventional machine tools. Research carried out at five companies in Zimbabwe specializing in different business operations, similarly revealed that although such methods and tools are still applicable and productive, the processes are time consuming and the conventional machines often break down thereby delaying production. However, the research, which was conducted through interviews, direct observations as well as surveys, also revealed disconnections in 3 aspects of company policies, techniques employed and continuous professional development training. The research focused on establishing the challenges faced by the companies in implementing holistic approaches encompassing and integrating these 3 aspects. Recommendations were made for turning the various challenges into opportunities through adopting engineering systems thinking for integrating these aspects in order to improve capacity utilization, productivity and efficiency in the various companies.

IEEM17-P-0212

Applying Lessons Learned From Lean Implementation For SMEs – Singapore Context

Laura Xiao Xia XU[1], Feng Yu WANG[2]
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[2]*Singapore Institute of Manufacturing Technology (SIMTech), Singapore*

Due to a tight labor market and fierce competition from global competitors, Singapore's SMEs (small and medium enterprises) are trying different means to be more productive in order to compete or even survive. Lean has been identified as the most effective method to change the thinking and practice to improve operation efficiency as it has been widely accepted and applied among MNCs (Multinational Corporations). However it is a challenge for SMEs to adopt Lean principles due to factors such as organizational culture. After analyzing the characteristics and obstacles of Singapore SMEs in Lean implementation, as well as differences between MNCs & SMEs, a practical approach has been developed and applied to over 30 companies. The results show that the approach is effective and efficient. The effectiveness and efficiency of the approach is also demonstrated by a case study. Summary of the lessons learnt over 30 implementations were illustrated, which will be very valuable guides for lean implementation for SMEs.

IEEM17-P-0317

Two-Stage Assembly Flowshop Scheduling Problem with Distinct Due Windows

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This paper considers a two-stage assembly flowshop problem where there are several identical parallel machines in the first stage and a single assembly machine in the second stage. A product can be assembled in stage two only if all parts of this product have finished their processes in stage one. The objective function is to minimize total earliness and tardiness. A mathematical model is developed to describe the proposed problem and two properties are proposed to facilitate the solution procedure. For a given product sequence, a Reverse Moving Algorithm (RMA) is developed to determine the start time and completion time for each product. Since the problem is NP-complete, a Variable Neighborhood Search (VNS) algorithm combined with RMA is applied to solve the problem. To verify the proposed algorithm, an existing algorithm is presented. Computational results have shown that RMA has quite good performance.

IEEM17-P-0160

Redesign and Control of Backtracking of Process Paths in Manufacturing Plant Layouts for Productivity and Sustainability

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[1]*University of Johannesburg, South Africa*
[2]*University of Zimbabwe, Zimbabwe*

The layout of workstations, sequence and flow of parts in a manufacturing environment have significant bearings on productivity and efficiency of manufacturing companies. Research carried out at a furniture manufacturing company in Zimbabwe revealed that parts and sub-assemblies in the plant traversed long distances during processing, exhibiting crisscrossing and backtracking of process flows. Coupled with the other challenges such as failure to provide timely product deliveries to meet customer demands, the research focused on redesigning the layout of workstations using simulation and group technology for prediction of performance, identification of bottlenecks and efficient utilization of space and resources. This was aimed at controlling the backtracking of process paths by reducing travel distances and lead times. The reorganized plant achieved an average 26.5% reduction in manufacturing lead times and 48% reduction in travel distances, which translated to improvements in productivity for the sustainable and competitive manufacture of furniture for the domestic and commercial market.

IEEM17-P-0072

Towards Just-in-Time (JIT) Production System Through Enhancing Part Preparation Process

Mohd Norzaimi CHE ANI[1], Shahrul KAMARUDDIN[2], Abdul Azid ISHAK[1]
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In this paper the improvement activity in manufacturing plant has been conducted by focusing outside of production process which is part preparation activity in warehouse area. The Plan-Do-Check-Act (PDCA) cycle has been adopted to identify, analyze, verify and implement the improvement activity with the purpose of creating better management of the part preparation activity. To ensure the successful adaptation of PDCA cycle, a small group consisting of cross-functional team members has been formed to analyze and solve the issue. The ultimate objective is to ensure the process improvement will optimize the efficiency of production systems and achieving the Just-in-Time (JIT) concept. Based on the investigation and implementation of the case study industry, the result shows a successful adaptation of PDCA cycle outside of the production process. The waiting time of the production due to misaligned time of the pre-preparation part had been identified as a root cause and successfully eliminated.

IEEM17-P-0449

Product Design for Mass Individualisation for Industrial Application

Ravi K. SIKHWAL, Peter R N. CHILDS
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In the last few years, a demand for renewed product personalisation to satisfy the exact need of the customers has been observed in some markets. As opposed to customisation, which put emphasis on the satisfaction of explicit needs of a defined market segment, individualisation aims at satisfying the specific needs of a customer. Product design for Mass Individualisation (MI) is a new product design paradigm that comprises an open hardware platform and multiple modules that are integrated with the platform, as per end-users' choice. This paper identifies key areas and components which need to be focused to realise this approach and convert it into an industrial practice by an explorative study of existing product design and customisation approaches. A questionnaire survey has been conducted and results are presented for the industrial implication and insights on this approach. The findings clearly show that MI provides most individualised and technologically advanced product.

Session	Quality Control and Management 1
Date	11/12/2017
Time	15:45 - 17:30
Room	MR335
Chairs	Leif OLSSON, *Mid Sweden University*, Carman Ka Man LEE, *The Hong Kong Polytechnic University*

IEEM17-P-0002

Quantifying Leanness Combining Value Stream Mapping with a Data Envelopment Analysis Based Method - A Case Study at a Swedish Logistics Company

Victoria HJALMARSSON, Leif OLSSON
Mid Sweden University, Sweden

By describing companies through their processes it is possible to get a well-established overall understanding of the company. This case study is based on the daily operations of a small logistics company specialized in international transportation. We perform Value Stream Mapping in order to propose improvements leading to reduced processing time. Afterwards a Data Envelopment Analysis based method is used to calculate the leanness score of the current system and estimate how much the leanness can increase by the proposed improvements. Results show that waste produced by bad workplace layout and over-processing can be eliminated. A suggested solution is to introduce standardized processes and to invest in technical instruments in order to automate production. According to this study the business is 45 percent lean at present and could with simple improvements soon become 61 percent lean and finally reach an ideal state at 100 percent leanness if production is automated.

IEEM17-P-0582

An Integration Method of MFCA, Dynamic Programming, and Multiple Criteria Decision Making in Operations Improvement: A Case Study

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[2]*Muroran Institute of Technology, Japan*

This study proposed an integrated method of three concepts: MFCA, DP, and MCDM in operations improvement. The proposed procedure starts from performing MFCA calculation to evaluate material losses along the current production line and identify operations that need to be improved. The cost of positive product can be calculated for each solution. This value was subsequently used in DP with two additional criteria as the amount of investment and the score of difficulty in implementation. Three criteria were transformed to single objective in DP for finding the optimal solution. To demonstrate the application of the proposed method, one small textile company was selected as a case study. The results showed that the optimal solution was to implement only two from three solutions that can help the company to increase the cost of positive product from 84.26% to 94.73% with less investment and score of the difficulty in implementation.

IEEM17-P-0154

Quality Attributes of Robotic Vehicles and Their Market Potential

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The development of robotic, self-driving vehicles is set to revolutionize the automotive industry. While automotive manufacturers, automotive suppliers, and IT firms are pushing the technical development of this new technology, there is a gap of knowledge in the literature on the customer perceptions of quality attributes of this new technology and on how these quality attributes influence purchase intentions positively or negatively. Therefore, this study aims to analyze what customers perceive as functional, economic, hedonic, and symbolic benefits and drawbacks of robotic vehicles and how these benefits and drawbacks influence customer intentions to purchase and recommend robotic vehicles. Based on cross-national customer data, this study identifies what drives customer intentions to purchase and recommend both fully autonomous and partially autonomous robotic vehicles for different legal scenarios. The results are relevant for managers, policy makers, and researchers interested in improving customer orientation in the development of autonomous driving technology.

IEEM17-P-0438

Application of Quality Function Deployment for Halal Food Products

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The objective of this paper is to develop the tool of halal food control by applying Quality Function Deployment (QFD). The modification of House of Quality (HOQ) matrix in QFD model are necessary to be conducted in order to fit the proposed QFD model with halal food control in the company. The proposed QFD model is composed of three HOQ matrices. The matrix 1 describes the relationship between attributes of halal assurance system and product process. The matrix 2 represent the relationship between attributes of halal assurance system and the halal critical. Finally, matrix 3 explains the relationship between product process and halal critical. The case study in chicken meat processing company is used to test the applicability and how to work the proposed QFD model for halal food control.

IEEM17-P-0432

Implementation of Shainin's DOE : A Case of Plastic Injection Molding Process

Tossapol KIATCHAROENPOL, T. VICHIRAPRASERT
King Mongkut's Institute of Technology Ladkrabang, Thailand

Shainin's Varible Search DOE is one of practical experimental designs which is simply used in industry fields. The less numbers of experiments and basic calculation are the advantage over the classical DOE. In this work, Shainin's method is used to study factors effecting displacement of plastic work-piece in Injection model process. The implementation steps of experiments are provided in detail. After 22 experiments were carried out, it is found that Packing time (E), Cooling time (G) and interaction of EG are significant factors. The fraction factorial, 27-3, is also employed as a comparison to Shainin's method. The results of Shainin's method in-line with those of fractional factorial. It imply the usefulness of this practical DOE.

IEEM17-P-0207

Developing a Total Quality Management Model for Healthcare Industry: An Indonesian Hospital Case Study

Jonny , Kriswanto
Bina Nusantara University, Indonesia

This research is aimed to develop a Total Quality Management (TQM) Model for Healthcare Industry. In order to achieve this objective, several previous studies have been reviewed in order to identify eight best practices of TQM implementation in healthcare industry such as Top Management and Commitment (TMC), Teamwork and Participation (TWP), Process Management (PM), Customer Focus and Satisfaction (CFS), Resource Management (RM), Organizational Behavior and Culture (OBC), Continuous Improvement (CI), Training and Education (TE). In turn, these best practices are modeled as conceptual model and tested in order to evaluate its fitness to healthcare industry in Indonesia. A SEM (Structural Equation Modeling) -LISREL software was used to serve this objective. After administering a purposive questionnaire to several related stakeholders of an Indonesian Hospital, the LISREL software was run to see whether the model is fit or not. As a result, because the p-value 0.23 is larger than required 0.05 then the model can be confirmed to be fit.

IEEM17-P-0177

State Space Modeling of Multi-Scale Variation Propagation in Machining Process Using Matrix Model

Kun WANG, Yaxiang YIN, Shichang DU, Lifeng XI, Tangbin XIA
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Multi-scale variation quality control of mechanical products has become one of research hotspots, but little research constructs variation propagation model under multi-scale error. This paper proposes an extended stream of variation (SoV) model considering geometric error by matrix model representation. New constraint conditions are introduced into the model for Monte Carlo calculation. To verify the accuracy and applicability of this model, a case study simplified from a machining process of automotive engine head is provided. The results indicate that this method has a great engineering value in machining process.

Session	Service Innovation and Management 1
Date	11/12/2017
Time	15:45 - 17:30
Room	MR309
Chairs	Dinh Son NGUYEN, *University of Science and Technology, The University of Danang*

IEEM17-P-0914

Developing Community-Based Engagement in Smart Cities: A Design-Computational Thinking Approach

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Smart Cities development has progressed rapidly with Internet of Things (IoT), ambient intelligence and increasingly, crowdsourcing. Engaging the community thus plays a key role in developing meaningful communal growth along with other stakeholders. This paper briefly presents a pilot study on developing computational perspectives for community-based engagement and innovations in Smart Cities for the young and thereafter, to explore possibilities of engaging seniors in self and community development, and the young and old in community-based engagement and possibly in the future, the development of viable values-based innovations in information systems.

IEEM17-P-0572

Application of Queuing Theory in Service Design

Dinh Son NGUYEN
The University of Danang, Viet Nam

The requirements of clients are more complex with higher expectations and tightened schedule due to rapid development of science and technology. In the context of concurrent and global economy, satisfaction of customers' requirements is an important key in the engineering product-service design process. One of the requirements from customers is to reduce the costs, including cost of development, material costs and conversion costs. Thus, cost reduction has become an important challenge in product-service design while the satisfaction of the customers' requirements is still ensured. An approach based on the queuing theory is proposed in this paper to solve these problems. A mathematical model analysis to determine the important parameters as the mean waiting time, number of service platforms, probability of customer waiting in queue is presented in the paper. The service designer can use them to find the optimized solution for the designed service.

IEEM17-P-0825

Examining the Application of Standards for Information Technology Service Management Practice: An Empirical Study

Gregory CHIN, Younes BENSLIMANE, Zijiang YANG
York University, Canada

This paper examines the application of Information Technology Service Management (ITSM) standards and provides an integrative view on how ITSM is executed in practice. Content analysis of 150 relevant job postings is used to assess the demand for ITSM standards, identify and rank the ITSM standards applied in organizations and identify the ITSM processes commonly implemented. Findings show a high adoption rate for ITSM standards and a large preference for ITIL. Findings also show that most commonly implemented processes are those that improve compliance with service level agreements and customer satisfaction. Details for such findings and their implication are discussed.

IEEM17-P-0493

Library Facility Layout Design for Digital Native Generation

Felecia , Siana HALIM, D. WULANDARI
Petra Christian University, Indonesia

Digital native generation grows up with information technology attached to their daily life. This advantage changes their way to find information, only with one click they have all the answers in their gadget. This situation effect library that used to be the source of information, numbers of library visit has been reduced significantly in the last century. Therefore library needs basic changes to accommodate digital native generation. Library needs to facilitate their need by repositioning itself as a community hub, a place to meet, interact, learn and collaborate. Anish I and Arish Ibrahim (2014), propose to use Systematic Layout Planning (SLP) to design library facility layout. The purpose is to maximize the satisfaction of employee, management, and library users. This paper gives the framework for systematic layout planning but has not applied it using computer simulation tool such as CRAFT. Research is conducted to four universities owned libraries in Surabaya, Indonesia. Two from state universities and another two from private universities. A heuristic improvement algorithm CRAFT (Computerised Relative Allocation of Facilities Technique) will be applied to re-layout library facilities. Adjustment to each facility will also be done and as the result, new library facility layout will be more suitable to meet digital native generation needs. The implication of this adjustment is additional investment in new facilities and repositioning current layout.

IEEM17-P-0588

A Study on Entrepreneurial Education Regarding College Students' Creative Tendency, Entrepreneurship Self-Efficacy and Entrepreneurial Motivation

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The goal of this study is to explore the differences in creative tendency, CT, entrepreneurial self-efficacy, ESE, and entrepreneurial motivation, EM after college students receive entrepreneurial education. This study explores whether or not college students' CT, ESE, and EM were enhanced after taking entrepreneurial education courses, with the "creative tendency scale", "entrepreneurial self-efficacy scale", and "entrepreneurial motivation scale" as research instrument. According to the research results, the following conclusions are drawn: 1. The students' pre-entrepreneurship training intentions decreased after receiving entrepreneurial education; 2. The students' entrepreneur competition intentions decreased after receiving entrepreneurial education; 3. The students' risk-taking increased after receiving entrepreneurial education; 4. Entrepreneurial education significantly affects students' ESE, but it has no significant impact on CT and EM.

IEEM17-P-0722

Performance Assessment System Development Based on Performance Prism in Social Services

Rui ESTRADA, Sergio D. SOUSA, Isabel LOPES
University of Minho, Portugal

This paper aims to study the practical application of Performance Prism in the social services sector. To achieve this, a performance assessment system, based on the Performance Prism model, was developed in a Portuguese private institution of social solidarity.

IEEM17-P-0442

Establishing Suitable Process Improvement Methodologies for Optimizing Servicing Operations in the Banking Industries

Olasumbo MAKINDE, Thomas MUNYAI, Boitumelo RAMATSETSE
Tshwane University of Technology, South Africa

The banking industry plays a vital role in the safe-keeping and delivery of various financial transactions required by the customers. Servicing problems such as queues and other various forms of customer complaints are the major threats which limit the efficiency of service operations in the banking industry. In light of this, the aim of this paper is to propose suitable process improvement methodologies capable of alleviating these complaints in the banking industries. To achieve this, heuristic searching and benchmarking of suitable process improvement tools and other strategies from the literature desk was explored. The results of the heuristic benchmarking exercise revealed that 5Ys, Fishbone Diagram, Value Stream Mapping, Line Balancing, workshops/ training, flexible and reconfigurable service operation systems, modular and flexible banking system layout and queueing theory model are the strategies capable of reducing or alleviating the common customer complaints that are rampant in the banking industry.

Session	Reliability and Maintenance Engineering 1
Date	11/12/2017
Time	15:45 - 17:30
Room	MR308
Chairs	David VALIS, *University of Defence*, Gopinath CHATTOPADHYAY, *Federation University*

IEEM17-P-0200

Modelling Water Distribution Network Failures and Deterioration

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[2]*Mendel University in Brno, Czech Republic*
[3]*Rzeszów University of Technology, Poland*

In this article we deal with field data modelling. The data have been recorded during the operation of a drinking water distribution system. Numerous records about water distribution network failures are available. They contain failures during single months in the period of approximately 15 years. Our effort is to observe the failure rate of a water pipeline distribution mains development. To do so, two approaches are used. One is based on modelling the system behaviour when applying the Markov chain with a discrete parameter, and the other one applies a state space model. The article contains not only the description and the design of the behaviour model of water mains, but also the prediction of the water mains behaviour and state in the following period.

IEEM17-P-0670

OEE Improvement of Thermoforming Machines Through Application of TPM at Tibaldi Australasia

Vickram CHUNDHOO[1], Gopinath CHATTOPADHYAY[1], Indra GUNAWAN[2], Yousef IBRAHIM[1]
[1]*Federation University, Australia*
[2]*The University of Adelaide, Australia*

Overall Equipment Effectiveness (OEE) evaluates quantitatively how effectively a manufacturing operation is utilised. Total Productive Maintenance (TPM) was considered by Tibaldi, a leading food manufacturer in Australia for achieving OEE. This research project has identified performance gaps, developed plan and implemented it in Thermoforming area of the business. The developed methodology helped Tibaldi in improving productivity and quality through TPM involving machines, equipment, processes, and employees. This paper demonstrates how this can be achieved by reducing lead time and establishing lean environment. Productivity improvement through the devised methodology led to further enhancement of competitiveness of the organisation for domestic and international markets of processed food manufactured by Tibaldi Australia. Lessons learned from application of TPM in Thermoforming, a key asset area, is rolled out to other sections of the plat and results from this pilot study are presented in this paper.

IEEM17-P-0529

Birnbaum Importance Measure of Network Based on C-Spectrum Under Saturated Poisson Distribution

Yongjun DU, Shubin SI, Hengyi GAO, Zhiqiang CAI
Northwestern Polytechnical University, China

Importance measures usually provide numerical indicator to decide which component is more important for network reliability improvement or more critical for network failure. The concept of C-spectrum is a useful tool to implement the importance measures for network, which solely depends on network structure. In this paper, we analyze a network that consists of n components (edges). Under the condition that the distribution of the number of failed edges is given, the properties of traditional Birnbaum importance measure (BIM) are generalized and investigated. First, we derive a formula for BIM based on C-spectrum and establish a sufficient and necessary condition for comparing two edges according to their BIMs. Secondly, under the special case where the number of failed edges follows a saturated Poisson distribution with intensity λ, for enough small λ the BIM ranking is structural ranking, i.e., depending solely on the network structure through the C-spectrum. Finally, an example is presented to explain how we can rank edges according to their BIMs.

IEEM17-P-0468

Reliability Analysis of Rectification on Electromagnetic Compatibility Test

Dan LI, Wei DANG, Li SUN, Ye TIAN, Jiaqi FENG
Chinese Academy of Sciences, China

Electromagnetic compatibility is a branch of reliability discipline. In this paper, taking the EMC test problem of the integrated product on account, rectification measures and its reliability issues are the core content. The relevant issues involve the circuit principle, reliability impact factor, improvement on rectification analysis. Finally, a comprehensive consideration on EMC in reliability design is put forward by recommendations of the EMC rectification.

IEEM17-P-0193

Design and Estimation of Reliability of an Off Grid Solar Photovoltaic (PV) Power System in South East Queensland

Mandeep Singh PAHWA, Anisur RAHMAN
Griffith University, Australia

The threat of the changing climate conditions has pushed the world's interest in the renewable energy systems. Solar energy is considered as an ideal renewable energy since it is considered as more cleaner and sustainable sources of energy. However, higher capital cost of installation of 'off - grid solar photovoltaic (PV) system and lack of perception of system reliability are the major drawbacks of the solar systems which can also have a negative effect on the manufacturer's reputation and in some cases, on the technology. Hence the reliability estimation of the solar PV system becomes extremely important. The aim of this research paper is to design and estimate the reliability of an off grid solar PV system. The greatest challenge for the PV system reliability estimation is the changing input to the system which is solar radiation. This research study designs a solar PV system for a house located South east Queensland (Australia) and later estimates the reliability of this designed system. The study used both mathematical and software tools while designing and reliability estimation of the off grid solar PV system. The result of this research can be used to model any other Off grid solar PV system's reliability and availability with some modifications based on climatic factors.

IEEM17-P-0201

Modelling of a Transport Belt Degradation Using State Space Model

David VALIS[1], Dariusz MAZURKIEWICZ[2], Marie FORBELSKA[3]
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[3]*Mendel University in Brno, Czech Republic*

In this article we deal with modelling diagnostic data. They are the data measured during the operation of a conveyor belt. To be specific, we observe how the distances between measuring points change in time. The development of the distance between these points reflects the process of degradation at the point where the belt is connected with the other part. When the distance reaches its critical value, there is a threat of conveyor belt break leading to serious consequences. The modelling of belt degradation is performed with the Kalman filter applying the Local Linear Model (LLM).

IEEM17-P-0533

Ant Colony Optimization for Component Assignment Problems in Circular Consecutive-k-out-of-n Systems

Zhiqiang CAI, Wei WANG, Shuai ZHANG, Zhongyu JIANG
Northwestern Polytechnical University, China

The Circular Consecutive-k-out-of-n (Cir/Con/k/n) system consists of n components arranged in a circular sequence and each component has different reliability. The purpose of optimization is to obtain an optimal assignment which can make the Cir/Con/k/n system most reliable. As the number of components n increases, the computation time for the optimization of Cir/Con/k/n system will increase considerably. In this paper, we propose applying the Ant Colony Optimization (ACO) algorithm to obtain quasi optimal assignments for such problems. First of all, we describe the basic principles and the operation procedures of ACO through pseudo code. After that, a large number of simulation experiments on different types of systems and components are carried out to verify the effectiveness of the ACO. The results of simulation experiments demonstrate the advantage of ACO in the optimization of Cir/Con/k/n system.

IEEM17-P-0331

Justification of Maintenance Management: AHP Approach

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[1]*Guru Gobind Singh Indraprastha University, India*
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[3]*Delhi Technological University, India*

In recent times, many organizations have been implementing maintenance management but they have been failing in their attempts to get adequate success. The aim of this study is to find out benefits of modern maintenance management (MMM) over traditional maintenance management (TMM) which leads to the development of World-Class Modern Maintenance Systems (WCMMS). Implementing modern maintenance management needs resources and other operational changes. Therefore, deciding about its implementation is major task for organizations. To solve this critical situation, the authors used Analytic Hierarchy Process (AHP). By using this approach, global desirability index of modern and traditional maintenance management have been calculated for justification of study.

Session	Operations Research 4
Date	12/12/2017
Time	09:00 - 10:45
Room	MR327
Chairs	Mangesh GHAROTE, *Tata Consultancy Services*, Li ZHU, *Dalian University of Technology*

IEEM17-P-0674

Multi-Objective Stable Matching with Ties

Nitin PHUKE[1], Mangesh GHAROTE[2], Rahul PATIL[3], Sachin LODHA[2]
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[2]*Tata Consultancy Services, India*
[3]*Indian Institute of Technology, Bombay, India*

Stable Matching (SM) has received a lot of attention from researchers due to its useful applications in practice. Gale and Shapley were the first to propose a polynomial-time algorithm to find an SM solution, for matching with strict preferences. However, their algorithm often produces extreme stable solutions, favouring either men or women. In practice, the real-life problems have multiple objectives (equitable and welfare) and preferences are not strict, consequently ties occur. With the inclusion of ties and objectives, the problem becomes NPhard. A few researchers proposed local search and evolutionary algorithms to solve multi-objective SM problem with ties, but these methods were not scalable. In this paper, we propose an efficient Goal Programming and Repair Heuristics based approach to solve this problem. On comparison with other related works, our approach shows significant improvement in respective objectives (equity and welfare). This approach with slight modification can be proved useful for solving other hard variants of the SM problem.

IEEM17-P-0363

Key Performance Indicators for Manufacturing Operations Management in the Process Industry

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The international standard ISO 22400 has defined a set of Key Performance Indicators (KPIs) to evaluate the performance of manufacturing operation. However, the defined KPIs seem to be inspired from the discrete production context, and hence do not automatically fit the process industry context. The process industry is defined as the industry in which the raw material undergoes conversion during a continuous process in order to become finished products. To make the defined KPIs more suitable for evaluating the operational performance in process industry, this paper analyzes the different characteristics of process industry and discrete industry, and proposes a new framework for organizing KPIs in process industry. Some modifications are discussed to make the proposed ISO 22400 KPIs fit to the process industry. Such a study can provide useful ideas for manufacturing engineers and decision-makers to define and measure suitable KPIs for performance evaluation in process industry.

IEEM17-P-0769

Supply Chain Coordination and Revenue-Sharing Contract with Backlogs for a Perishable Product

Renfei LUO, Zhaotong LIAN, Chang Boon LEE
University of Macau, Macau

We consider a supply chain system involved in a perishable product with a fixed lifetime. The retailer is using a periodical reviewed (s, S) policy to manage the inventory and sell the products with backlogs. The supplier and the retailer coordinate the system using a revenue-sharing contract in order to improve the channel performance and maximize the total profit of the system. We show that coordination between supplier and retailer with revenue-sharing contract is possible to improve the performance of the system. Considering the risk of product expiration, the optimal coordination contract is different for system selling perishable product compared with normal long lifetime product.

IEEM17-P-0737

A Capacitated Location-Routing Problem with Customer Satisfaction Under Facility Disruption

Pooya POURREZA, Reza TAVAKKOLI-MOGHADDAM, Soroush AGHAMOHAMADI, Ali BOZORGI-AMIRI, Yaser RAHIMI
University of Tehran, Iran

This paper presents a mixed-integer programming model for a capacitated location-routing problem with customer satisfaction under disruption risk. The aim of this problem is to find the location of medical service centers (MSCs) and the best route of vehicles to serve customers. To solve the problem, a hybrid NSGA-II algorithm is proposed and the related results are compared with the traditional NSGA-II as a well-known evolutionary algorithm. The Taguchi method is used to tune the best values of parameters to run the algorithms. The computational results represent that the hybrid NSGA-II has a better performance than the NSGA-II.

IEEM17-P-0584

Time-Varying Hyperparameter Strategies for Radial Basis Function Surrogate-Based Global Optimization Algorithm

Peng JIANG[1], Christine SHOEMAKER[2], Xiao LIU[1]
[1]*Shanghai Jiao Tong University, China*
[2]*National University of Singapore, Singapore*

Radial Basis Function (RBF) surrogate-based global optimization has been shown to be efficient for complex problems with computationally expensive and high-dimensional functions. Based on the DYCORS (DYnamic COordinate search using Response Surface models) algorithm framework, this paper proposes two Time-Varying Hyperparameter DYCORS (TVH-DYCORS) strategies to accelerate RBF surrogate-based optimization algorithms, which include a time-varying perturbation strategy and a time-varying weight pattern strategy. The TVH-DYCORS algorithm is evaluated by a 124-variable benchmark problem from the automotive industry as well as six other high-dimensional optimization test problems. The computational results demonstrate that the proposed algorithm has potential to achieve better solutions, compared with conventional genetic algorithm and two previously proposed RBF surrogate-based optimization algorithms.

IEEM17-P-0593

A New MILP Formulation for Rebalancing Enhanced Index-Tracking Portfolios

Oliver STRUB
University of Bern, Switzerland

The enhanced index-tracking problem consists of revising, i.e., rebalancing, a portfolio such that it achieves a given excess return over a financial index and minimizes the tracking error, i.e., the deviation of the portfolio returns from the index returns. Several mixed-integer linear programming (MILP) formulations of this problem have been proposed. However, these formulations may lead to portfolios with a negative excess return or a high tracking error. We present a new MILP formulation to rebalance a portfolio such that it replicates the value development of an appropriately constructed tracking target over a historical in-sample period. The resulting portfolios achieve a high excess return and a low tracking error, both in-sample and out-of-sample, which is demonstrated in a computational experiment based on 27 real-world problem instances.

IEEM17-P-0672

Two-Dimensional Lease Contract Model with Coordination for New and Used Equipment

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[2]*Bandung Institute of Technology, Indonesia*

This study proposed a two-dimensional lease contract – age and usage limits – for new and used equipment. Under the lease contract, the lessee agrees that an additional cost will be charged when the usage rate exceeds a threshold value. The lessor performs both preventive and corrective maintenance actions. The decision problem for the lessor is to find the optimal price of each lease option offered, and for the lessee is to select the best lease option. We modeled using a cooperative game theory formulation, and the optimal decisions for the lessor and the lessee are coordinated in order to reach a win-win solution.

Session	Technology and Knowledge Management 2
Date	12/12/2017
Time	09:00 - 10:45
Room	MR328
Chairs	Charles MBOHWA, *University of Johannesburg*, Michel ALDANONDO, *Toulouse University*

IEEM17-P-0478

Constraints Driven Reverse Logistics Model for Plastic Solid Waste (PSW)

Bupe MWANZA, Arnesh TELUKDARIE, Charles MBOHWA
University of Johannesburg, South Africa

The recovery and recycling of Plastic Solid Waste (PSW) is an important aspect of achieving sustainability. The study reviewed technical constraints (Modeling levers) that influence households' participation in waste recovery and recycling programs from both developed and developing economies. A questionnaire based on the identified levers is developed and distributed to test the validity and significance of the levers. The results are adopted in the development of a levers' based reverse logistics (RLs) model for PSW in the Zambian context. The model provides a new and useful engineering approach for the management of PSW in both developed and developing economies influenced by similar levers.

IEEM17-P-0666

Customer Supplier Relation: Towards a Constraint-Based Model for Bids

Delphine GUILLON[1], Abdourahim SYLLA[1], Elise VAREILLES[1], Michel ALDANONDO[1], Eric VILLENEUVE[2], Christophe MERLO[2], Thierry COUDERT[3], Laurent GENESTE[3]
[1]*Université de Toulouse – Mines Albi, France*
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[3]*Université de Toulouse – ENI Tarbes, France*

During a bidding process, bidders have to submit offers that will suit the best to the customers' requirements. The OPERA project aims at developing method, model and tools to help bidders to develop more accurate offers. One of the major tasks during the bidding process is the elaboration of offers. In this paper, we present a first version of a constraint-based model for offers (bids) elaboration which gathers three types of data: (1) general data characterizing the potential customer and the overall contexts, (2) data defining the technical system and (3) data defining the delivery process relevant to the technical system. The system will be limited to a 3-level decomposition. The process is composed of activities characterized by a couple (resources, workload). Four end user companies are involved in the OPERA project: two in the industrial sector and the two others in the service one.

IEEM17-P-0373

Knowledge Sharing in Thai SMEs in Manufacturing Sector

Chayaruk Thanee TIKAKUL, Avril THOMSON
University of Strathclyde, United Kingdom

The establishment of the AEC in 2015 is expanded market, increase opportunity for SMEs, however, the market is more competitive in ASEAN. Nowadays, SMEs play significant roles in country economic. In order to survive during the transition period, SMEs need the correct supporting tools to improve their productivity and efficiency. Globally, the adoption of KM in SMEs is becoming widespread. Despite, a large number of studies on KM, only a few studies focus on SMEs especially in Thailand. Knowledge sharing is a key step in KM approach. Therefore, the aim of this study is to identify the current practice of Knowledge Sharing in Thai SMEs within the manufacturing sector. Questionnaires were distributed to SMEs in Thailand, via online and paper based version. The total numbers of responses were 311 respondents from 20 Thai SMEs in manufacturing sector. Overall, the result shown is the biggest cultural and practical barrier sharing is Knowledge sharing is an extra workload and lack of time, respectively.

IEEM17-P-0216

Lean Execution of Engineering Projects: The Potential Application of Case- Based Reasoning to Facilitate Cross-Project Knowledge Transfer

Andika RACHMAN, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Engineering firms have not completely utilized the potential advantages of inter-project knowledge transfer. The lack of knowledge transfer from past projects to new arrivals creates wasteful endeavor in the form of reworking previously solved problems in new projects. This situation increases firms' operational expenses, especially in the era in which efficient and effective project delivery gives an advantage over competitors. The difficulty of retrieving relevant historical projects in a timely manner is one reason why firms struggle to learn from past projects. Therefore, there is a need for a mechanism to effectively retrieve project experience. This manuscript proposes case-based reasoning (CBR) as the methodology to counter this problem and facilitate the reuse and adaptation of prior project experience, to avoid the occurrence of repeated problems. A case study from an engineering firm, providing asset integrity management solutions in the energy sector, is provided to illustrate a CBR development.

IEEM17-P-0297

Transformation of Working Environments Through Digitalization: Exploration and Systematization of Complexity Drivers

Benedikt Andrew LATOS, Markus HARLACHER, Philipp M. PRZYBYSZ, Susanne MÜTZE-NIEWÖHNER
RWTH Aachen University, Germany

Digitalization has a significant impact on our working life and it allows whole industries to rethink their value chains. This paper examines how digitalization relates to complexity in work systems with respect to relevant organizational fields of work organization. 23 semi-structured interviews with experts from science and economy were conducted and analyzed. Key findings are that digitalization has far-reaching, interrelated implications for all organizational fields. Moreover, digitalization-related aspects were identified which have the potential to increase complexity in work systems.

IEEM17-P-0562

Extended CAD-Models – State of Practice Within Three Companies

Tim HEIKKINEN, Joel JOHANSSON, Fredrik ELGH
Jönköping University, Sweden

Product platforms and product family design have been recognized as successful methods to enable mass-customization strategies. However, companies working with products where pre-defined product variants are not feasible require a more generic platform with re-usable components as well as engineering resources. Extended CAD-models is an approach where CAD-models are utilized as carriers of information to support re-usability of both geometric content and engineering activities, decreasing product development lead-time and enabling the definition of a product family within Engineer-To-Order business contexts. The following paper presents the approach in more detail and the results of a multi-case study where three Swedish industrial companies were interviewed. Results show that all companies store information within the CAD-models to support re-usability. Several challenges were expressed such as managing responsibilities and modeling flexible CAD-models. Future trends involve the concept, but to which extent is not clear.

IEEM17-P-0361

Analysing Service Quality Using Customer Expectations and Perceptions in the South African Telecommunication Industry

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University of Pretoria, South Africa

Service quality is a differentiator for organizations in the South African telecommunications industry. This is in no doubt as a result of increasing competition. The competition is influenced by new participants such as Internet Service Providers. In addition, the sudden rise of over-the-top applications creates a new form of competition. This paper seeks to ascertain what customers expect from telecommunications providers and how they feel about the service after consuming it or interacting with the telecommunications organization. The study looks at the influence from the customers' perspective. The assumption is that the quality of the service leads to future customer behavior. The SERVQUAL model is used to analyse the customers' expectations of the services before interacting with the telecommunications provider and the customers' perceptions of the services after interacting with the telecommunications provider. The research findings show that consumers value assurance from their telecommunications service providers. In essence, it is of paramount importance that telecommunications organization focus on assurance and responsiveness if they are to remain relevant.

Session	Human Factors 3
Date	12/12/2017
Time	09:00 - 10:45
Room	MR329
Chairs	Markus HARTONO, *University of Surabaya*, Nantakrit YODPIJIT, *King Mongkut's University of Technology North Bangkok*

IEEM17-P-0535

The Extended Framework of Kansei Engineering, Kano and TRIZ Applied to Logistics Services

Markus HARTONO[1], Amelia SANTOSO[1], Dina Natalia PRAYOGO[2], Ivon [1]
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[2]*University of Indonesia, Indonesia*

As one of the most rapidly growing service sectors in today's business, providing excellent quality in logistics services is a must. In services, recent research shows that affect/emotion (known as Kansei) and Kano's attractive performance are deemed to be sensitive in dealing with total satisfaction, rather than usability and functionality. However, the ideas for service improvement are often contradictory. Hence, this study proposes an integrated model of Kansei Engineering and Kano incorporating TRIZ (Teoriya Resheniya Izobretatelskikh Zadach) which contributes to the improvement of logistics services. A case study in IT-based logistics services has been conducted. The service attribute 'cleanliness of helmet for customer' has been regarded as the most critical, which dealt with Kansei professional, innovative, cheap, and precise. In addition, the modularity-based helmet cover and inner sponge has been proposed for TRIZ-based improvement.

IEEM17-P-0920

A Low-Cost Portable 3D Human Motion Analysis System: An Application of Gait Analysis

Nantakrit YODPIJIT[1], Manutchanok JONGPRASITHPORN[2], Kengkaj PONGMIT[1], Teppakorn SITTIWANCHAI[1]
[1]*King Mongkut's University of Technology North Bangkok, Thailand*
[2]*King Mongkut's Institute of Technology Ladkrabang, Thailand*

Human movement is fast and complicated. Human movement analysis systems are used in occupational biomechanics to have a better understanding of the kinematics of human movement. The purpose of the current research project is to create a low-cost portable human movement analysis system that can be used to investigate human movement for three-dimensional (3D) kinematics analysis using two cameras in an application of gait analysis. This gait analysis system performs image analysis with MATLAB. The design and development method has five major steps, which include (1) the design and calculation of XYZ coordinates (body segment), (2) the design and development of human movement analysis system, (3) the design and development of system calibration, (4) the determination of a 3D Cartesian system, and (5) the design and development of human movement tracking and recording systems. Findings indicate that the total costs of a human movement analysis systems are currently less than 1,500 USD. In addition, this human movement analysis system has many practical uses for outdoor research projects.

IEEM17-P-0894

Information Security in Communication Network of Memory Channel Considering Information Importance

Takaaki KAWANAKA[1], Shuichi ROKUGAWA[1], Hiroshi YAMASHITA[2]
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[2]*Meiji University, Japan*

The authors of this paper have described the structure of a communication network between people, using Shannon entropy, and developed it from a memoryless channel model to a memory channel model in recent years. They have also described the internal sharing of corporate information and information security using a memory channel model. However, organizations have information of both high and low importance, which is an aspect that previous models were unable to describe, creating a discrepancy between the proposed model and reality. This study addresses this problem by incorporating the importance of information in the model, and quantitatively analyzes how different types of communication network structures and information security measures influence the information sharing policies of organizations. In this study, the model gives important suggestions for information security measures within the organization.

IEEM17-P-0516

The Importance of Compliance with the Expectations of the Value of Stakeholder in Order to Achieve Success in the Implementation of Lean Projects

M.A. GÓMEZ GAVITO, Pablo NUÑO DE LA PARRA, Cesar DE LA LUZ DE JESÚS
Universidad Popular Autónoma del Estado de Puebla, Mexico

Many of the enterprises, institutions, and organizations are currently concerned about improvement projects that solve immediate problems, due to increased costs in production, reduction of resources, demanding and competitive markets that demand new paradigms to be profitable. However, these projects are a short term without having a holistic view of the strategy, and the fulfillment of the expectations of all stakeholders value limits. Within this dynamic, fast implementations of project Lean, the lack of fulfillment of expectations of value, make to not achieve the correct performance and commitment of those involved, not reaching the proposed goals, not taking into account the shared value. The article's proposal is to check that he ensures the success of the projects to meet these expectations of value, Lean to strengthen the innovation of new forms of work, raising productivity and positioning in the markets; as well as promoting social and economic progress in the region.

IEEM17-P-0583

Applying the Purdue Pegboard to Evaluate Precision Assembly Performance

Yu-Cheng TSENG, Kai-Yin CHANG, Pin-Ling LIU, Chien-Chi CHANG
National Tsing Hua University, Taiwan

Ten participants were recruited in the Purdue Pegboard test and the precision assembly task. Data was collected through ten repetitive trials of each test. How the learning effect might influence the actual assessment was checked. ANOVA results showed that difference between groups was significant for the precision assembly task ($p<0.05$), the Purdue Pegboard Right Hand Subtest ($p<0.05$)) and Assembly Subtest ($p<0.05$). Fisher's LSD procedures further pointed out the learning effect, where after the 6th trial, there was stable performance on the Purdue Pegboard Right Hand Subtest. Similarly, the Assembly Subtest became steady after the third trial, while the precision assembly task required at least six practice sets. The score results, excluded from the impact of the learning effect, were later examined by the Pearson correlation coefficient. Participants with higher scores on the Purdue Pegboard Assembly and Both Hands Subtest generally spent less time on the precision assembly task.

IEEM17-P-0604

Effects of Search Strategies on Fault Diagnosis Performance

Qiuran LUO, Xuansheng DING, Weiwei QIU, Zhizhong LI
Tsinghua University, China

This paper investigates the effects of two diagnostic search strategies (decision table search and hypothesis-and-test search) on fault diagnosis performance, and whether cognitive styles could mediate these effects. A simulated nuclear power plant main control room prototype was employed as a test case for fault diagnosis experiments. Performance was measured by diagnosis accuracy, completion time, frequency of display switching occurrences, mental workload, and self-reported confidence level in the diagnosis task. Results revealed a significant effect of search strategy on the number of display switches, with significantly fewer occurrences for the group using the decision table search strategy as compared to that of the hypothesis-and-test search strategy group. No significant effect of search strategy was observed on the other diagnosis performance measures after controlling for possible effects of cognitive styles. The results suggest a potential advantage of using a decision table search strategy for fault diagnosis given its smaller associated magnitude of display switching.

IEEM17-P-0495

Application-Specific Design of Assistance Systems for Manual Work in Production

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Due to rising demand for customer-specific products, a growing number of product variants is increasing complexity in production systems. Since automated production systems are often not economical in high-variant production scenarios, human flexibility plays an important role. In recent years a variety of assistance systems have emerged that support manual work by collecting, processing and providing information. However, this technological leap is not widely applied in the industry yet. This paper presents an approach to application-specific design of assistance systems for manual work in production. Required assistance functions, application-specific requirements and a technology database are used for the preselection of technologies and components for an assistance system. Alternative assistance system solutions are generated according to application-specific needs and compared through an economic evaluation. An application of this approach is shown for a manual assembly system in the learning factory for cyber-physical production systems.

IEEM17-P-0033

Introducing Process Building Blocks for Planning the Division of Labor in Human Robot Work Systems

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The approach of hybrid automatization offers with the interaction of humans and robots new improvement potentials in production and assembly from an ergonomic, flexibility and cost point of view. Indeed just a couple of such hybrid solutions were implemented practically yet. On the one hand empirical knowledge is missing and on the other hand only a few planning solutions for the division of work in human-robot work systems are available. This paper introduces a planning approach to describe and design work systems in Human Robot Inter action. For this purpose Process Building Blocks for robot motions are defined. In combination with the existing process building bloc system MTM-1 for human motions, it is possible to describe, design and assess hybrid work systems taking mutual motions of human beings and robots into account and directly generate cycle time information. This is especially useful in the early planning stage of work systems, where different alternatives can be assessed with a relatively low analyzing effort.

Session	Systems Modeling and Simulation 3
Date	12/12/2017
Time	09:00 - 10:45
Room	MR330
Chairs	Amos H.C. NG, *University of Skovde*, Tatsushi NISHI, *Osaka University*

IEEM17-P-0281

Improving the Material Flow of a Manufacturing Company via Lean, Simulation and Optimization

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Companies are continuously working towards system and process improvement to remain competitive in a global market. There are different methods that support companies in the achievement of that goal. This paper presents an innovative process that combines lean, simulation and optimization to improve the material flow of a manufacturing company. A description of each step of the process details the lean tools and principles taken into account, as well as the results achieved by the application of simulation and optimization. The project resulted in an improved layout and material flow that employs an automated guided vehicle. In addition, lean wastes related to transport, inventory levels as well as waiting times were reduced. The utilization of the process that combines lean, simulation and optimization was considered valuable for the success of the project.

IEEM17-P-0751

A Multi-Commodity Flow Model for Guide Path Layout Design of AGV Systems

Shuhei AKIYAMA[1], Tatsushi NISHI[1], Toshimitsu HIGASHI[2], Kenji KUMAGAI[2], Michi HASHIZUME[2]
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In this paper, we consider the guide path layout design problem for automated guided vehicle (AGV) systems. Two types of mathematical models: the detailed model and the multi-commodity flow model are proposed. The detailed model considers the detailed pickup and delivery routing of AGVs in the design of guide path layout whereas, the multi-commodity flow model considers the multi-commodity flow from the pickup node to the delivery node. We compare the performance of these two models for the guide path design problem in a real case. The computational results show the multi-commodity flow model can solve large scale layout model with sufficient accuracy.

IEEM17-P-0262

Simulation Study on Evolvement Mechanism of Group Events in Large Projects

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Group events triggered by the construction of large projects always have a bad effect and in urgent need to reveal its evolvement mechanism and find ways to handle them. To analyze the evolvement mechanism of these events systematically, in this paper: first, the core factors influen-cing the large projects group events are analyzed and identi-fied. Then integrating previous studies and practical situa-tions, a complete factor system is built on three levels. Second, a nonlinear simulation model is constructed to quantify the core factors. The mood function is applied to describe the conflict degree of group events. Then the simulation process is carried out to reveal the intrinsic evolution among group events. Finally, two sets of scenario experiments are designed to simulate the evolution of group events in large projects. The results both conform to the practical situation, which proves the effectiveness of the model.

IEEM17-P-0611

A Modelling Approach for Maintenance Resource-Provisioning Policies in a Wind Farm Maintenance System

Winda Nur CAHYO
Islamic University of Indonesia, Indonesia

In this paper, the application of combined system dynamics and a life-cycle cost model is discussed. The main purpose of this paper is to highlight that the combined model is capable to serve the optimization process for a complex engineered asset at the corporate level instead of local department optimisation. The application of the mode is supported by a case study about maintenance and its resources-provisioning system of generator in a wind farm. The research method follows the established method for system dynamics modelling combined with the development of a life cycle cost analytical model in the output analysis. The result shows that the combination of system dynamics and life-cycle cost model is capable to overcome the modelling complexity associated with interrelated maintenance programs of engineered assets in a complex technical system and it is a suitable modelling approach for providing an integrated decision support model for maintenance resource-provisioning management.

IEEM17-P-0125

A Review of Modelling Approaches for Conceptual Design of Complex Engineering Systems (CESs)

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It is proven that the conceptual design has high impacts on performance of Complex Engineering Systems (CESs). Designers devise models as a key artifact in engineering design. Different modelling approaches have different ontologies serving different purposes in design process. However, it is hard to find many scholarly papers that comprehensively review existing modelling approaches which can be applied in conceptual design of the aforementioned systems. This article aims at reviewing the existing literature in this context to understand fundamental concepts of existing modelling approaches and formalisms, how they can serve conceptual design and what their relative strengths and shortcomings are. The review also suggests possible future directions in this research context.

IEEM17-P-0764

Crowdsourced Delivery for Last-Mile Distribution: An Agent-Based Modelling and Simulation Approach

Ping CHEN, Stanislav CHANKOV
Jacobs University Bremen, Germany

Crowdsourced delivery is considered a possible solution to the last-mile on-demand delivery challenge. The purpose of this paper is to investigate the performance of the crowdsourced last-mile delivery with regard to service level and assets utilization. An agent-based simulation model is developed and two parameters are studied: (1) supply/demand ratio, the ratio between the number of crowd couriers delivering packages and the number of packages and (2) maximum detour time accepted by crowd couriers. The main findings are twofold. Firstly, high supply/demand ratio enables the crowd to achieve high service level with very little time spent on detour. Secondly, high levels of maximum detour time accepted by the crowd can increase service level when the supply/demand ratio is comparatively low, but it may also create competition among crowd couriers for delivery orders.

IEEM17-P-0874

Predicting Atmospheric Corrosion Rates of Copper in Taiwan Industrial Zones Using Artificial Neural Network

Chien Ming LO, Ya-Ping CHIU, Min-Der LIN
National Chung Hsing University, Taiwan

This study employed artificial neural network (ANN) to develop a regional forecasting model to predict atmospheric corrosion rates of copper within general industrial zones and coastal industrial zones in Taiwan. Analyzed data are based on the results of metal atmospheric corrosion rates monitoring project executed by The Institute of Harbor & Marine Technology Center in Taiwan. The results reveal that among the different models utilized in this study, the winter and annual corrosion rates predicted by ANN have the most accurate performance. For the corrosion predictions of C5 and CX levels, all of the models have better performance for the winter and annual corrosions than other seasons. But for C3 and C4 levels, none of the models can obtain accurate corrosion predictions. The performance of different models will also be compared, and the results may provide useful information for reference of design and maintenance of copper objects in Taiwan.

Session	Supply Chain Management 4
Date	12/12/2017
Time	09:00 - 10:45
Room	MR332
Chairs	Linda ZHANG, *IESEG School of Management*, Diana FEIBERT, *Technical University of Denmark*

IEEM17-P-0292

Application of Interpretive Structural Modelling for Analyzing the Factors of IoT Adoption on Supply Chains in the Chinese Agricultural Industry

Danping LIN[1], Carman Ka Man LEE[2], W.C. TAI[2]
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[2]*The Hong Kong Polytechnic University, Hong Kong SAR*

The contemporary supply chain is complex and interrelated. Agricultural supply chain has started to make use of advanced technology in broad areas. Internet of Things (IoT) refers to the inter-networking of embedded devices (things), which enable these things to collect and exchange data so as to streamline the value chain. The advantages of IoT adoption include real time monitoring and control, thereby increasing the operation efficiency. However, the application of IoT in the Chinese agricultural supply chain remains at an early stage. The evaluation of influencing factors of the IoT practices in a structural model is conducted to investigate their interrelationship. In this study, we adopt the interpretive structural modelling to analyze the interrelationship among factors that influence IoT adoption in Chinese agriculture. Ten factors have been inputted into the proposed model, and MICMAC analysis is further conducted to visualize the relationship based on the study that have been derived.

IEEM17-P-0481

An Integrated Process and Digitalization Perspective on the Shipping Supply Chain – A Literature Review

Diana FEIBERT, Mette Sanne HANSEN, Peter JACOBSEN
Technical University of Denmark, Denmark

The maritime transport industry operates in an environment characterized by fluctuating fuel prices and low freight rates in a dynamic competitive market. Shipping companies must therefore adopt responsive supply chains whilst containing costs. This study investigates what extant literature can offer from an integrated digitalization and business process management perspective to enhance supply chain performance for shipping companies. The main themes identified in literature have been categorized according to their contributions to achieving responsive and efficient supply chains. Furthermore, the drivers of enhanced supply chain performance have been identified and an agenda for future research is proposed. This study therefore contributes to the research field of maritime transport by enfolding extant literature and guiding decision makers in their efforts to achieve responsive and adaptive shipping supply chains.

IEEM17-P-0695

Blockchain Application in Food Supply Information Security

Daniel TSE, Bowen ZHANG, Haoran MU, Shenli CHENG, Yuchen YANG
City University of Hong Kong, Hong Kong SAR

With the increasingly serious problem of food safety in China. It directly or indirectly endangers people's health, quality of life and safety of life, the global economy, politics and society as a whole have a greater impact. As an effective means of product quality and safety management and control, many countries and regions have been researched, developed and operated of the traceability system. On the one hand, these technologies have not been able to achieve more accurate traceability, these results cannot be directly used in Chinese market. Therefore, the article introduces the concept of Blockchain technology, puts forward the application of Blockchain technology in information security of the food supply chain and compares it with the traditional supply chain system.

IEEM17-P-0096

A Design Methodology for Biomass Energy Supply Chains Based on Weighted K-Means Algorithm

Hongyan DAI[1], Yali LIU[1], Yining CHANG[1], Songlin CHEN[2]
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[2]*Nanyang Technological University, Singapore*

Effective utilization of low-quality resources like Biomass is conducive to economic development, environmental sustainability and social benefits. However, there is a complex supply chain behind biomass energy while the current practice for biomass energy supply chain design is mainly based on experience through a trial and error process, which has largely constrained the development of biomass energy in China. Based on global optimization, we propose a practical methodology for designing discrete biomass energy supply chain systems. To determine the optimal network structure, the number of collection points, and the corresponding facility capacity, we extend the conventional weighted K-means algorithm to solve the model by taking into consideration of the unique characteristics of biomass energy supply chains. The feasibility of our methodology is validated through designing a biogas supply chain for Jiangsu. The results obtained from the case study provide a scientific and systematic methodology for designing biomass energy supply chains.

IEEM17-P-0166

Supply Chain Collaboration – A Case Study of Textile and Apparel Industry

Thi Phuong Dung HO, Arun KUMAR, Nirajan SHIWAKOTI
RMIT University, Australia

Over the last few decades, the benefits of supply chain collaboration (SCC) are established by scholars and practitioners. However, the existing literature has also demonstrated that collaboration is the most difficult part of supply chain strategies. In practice, most of the organizations end up in failures for SCC initiatives. Given this trend, this research aims to investigate how SCC practices are implemented in an organization. Further, it is to identify the main reasons for the failures. An in-depth case study of one textile – apparel industry in Vietnam is used to examine those issues. While internal collaboration and continuous improvement activities are affirmed to be critical factors for effective SCC, the results demonstrate that the lack of information integration and scientific management has limited the organization's ability to achieve them. These failures lead to poor performances such as high late delivery, poor quality percentage and the inefficiency in operating the system.

IEEM17-P-0898

A Simulation-Based Modeling Approach to Assess the Multi-Echelon Supply Chain Network Design

Inoka MUNASINGHE , Thashika RUPASINGHE, Ruwan WICKRAMARACHCHI
University of Kelaniya, Sri Lanka

The modern industries are compelled to become more competitive for providing a quality product at a minimum cost. To achieve this objective, a proper assessment of the behavior of supply chain environment needs to be carried out along with proper Supply Chain Network Design (SCND). This study provides a simulation based approach for assessing the influence of the facility and product differentiation on supply chain network design with six distinctive scenarios. Furthermore, this simulation based approach can be used as a basis for making strategic decisions in the retail industry for minimizing the total distribution network cost. The findings of this study yield the appropriate number of facilities and product combinations for specific time periods and critical information to carry out Greenfield analyses.

IEEM17-P-0869

Toward Sustainable Reverse Logistics Implementation: A Conceptual Framework of the Quattro Bottom Line Approach

Hesti MAHESWARI, Gatot YUDOKO, Akbar ADHIUTAMA
Institut Teknologi Bandung, Indonesia

Reverse logistics activities are staying as the form of the environmental protection often that fail to reach the lofty ideas in maintaining i.e. the balancing of profit achievement, planet conservation, and people harmony. Therefore, it is important to show the shifting of reverse logistics phenomena through this conceptual paper expected to be useful in building the novel theories to ensure the firms to implement it thoroughly. The results are showing the first-time people began conscious with the idea of returning the electronic products as the research topic, then the awareness of firms' capability, resource commitment, and stakeholder motivation in reverse logistics. Afterwards, most of firms failed to integrate the goals since their target solely for profit and reputation. At the end of this paper, the need for the firms' readiness toward sustainable reverse logistics through the Quattro Bottom Line approach will be found.

IEEM17-P-0518

Vendor Managed Inventory on Two Echelon Inventory System with Optimum Accelerated Lead Time and Component Commonality

Yosi Agustina HIDAYAT[1], Tota SIMATUPANG[1], Sebrina [1], Nashir ARIANSYAH[2], Wibisana SEMBADA[1]
[1]*Institut Teknologi Bandung, Indonesia*
[2]*Telkom University, Indonesia*

We proposes a model to manage VMI supply chain which has multi items product with certain commonality degree where it facilitates buyer to control the lead time. We present a solution technique to solve VMI supply chain problems by comparing lead time as parameter and lead time as decision variable that is possible to be accelerated. Before lead time acceleration is considered, the optimal solutions are obtained simultaneously. On the other sides, we have developed an algorithm for finding solutions when lead time acceleration is allowed. This proposed model is suitable for an organization which implements continuous review on its inventory policy. It can be implemented when the market is monopolistic because back-ordered is allowed and buyer is willing to delay demand fulfilment in order to reduce holding cost.

Session	Decision Analysis and Methods 2
Date	12/12/2017
Time	09:00 - 10:45
Room	MR333
Chairs	Kasin RANSIKARBUM, *Ubonratchathani University*, Alberto BELLINI, *University of Bologna*

IEEM17-P-0029

Multi-Criteria Selection Problem of Part Orientation in 3D Fused Deposition Modeling Based on Analytic Hierarchy Process Model: A Case Study

Kasin RANSIKARBUM[1], Namhun KIM[2]
[1]*Ubonratchathani University, Thailand*
[2]*Ulsan National Institute of Science and Technology, South Korea*

Additive manufacturing (AM) or 3D printing (3DP) is now perceived as an industrial revolution technology in this digital 4.0 era. It has become popular in various industrial fields thanks to its key advantages in almost unlimited design freedom and material efficiency. However, challenges in AM process planning still exist and require substantial studies. In this research, we study an operational-level, decision-making problem for the orientation selection of the 3DP part to understand process instability and efficiency issues. In addition, as quantitative methods to determine the part orientation accounting for user's knowledge and preferences are limited, we illustrate economical and mechanical-desire preferences from a decision maker using analytic hierarchy process (AHP) framework. Trade-offs among conflicting criteria for parts produced from fused deposition modeling (FDM) are analyzed and compared to obtain the optimal part orientation to be produced. The robust result shows that a perpendicular direction affects how part is to be selected.

IEEM17-P-0659

The Determinants of Asset Mothballing in the Offshore Supply Market

Roar ADLAND, Oda SVÆREN
Norwegian School of Economics, Norway

We evaluate the determinants of the mothballing (lay-up) decision for Offshore Supply Vessels (OSV) in the North Sea using panel logistic regressions and Cox proportional hazard models. We find that the market condition is the most important determinant and that the probability of layup is increasing with lower oil prices, spot dayrates and fleet utilization. Age, fuel efficiency and vessel size also influences the probability of a vessel being mothballed. Our results are important for fleet managers in assessing the attractiveness of vessels and for the banks that finance them.

IEEM17-P-0232

An Extended TODIM Method Under Probabilistic Dual Hesitant Fuzzy Information and its Application on Enterprise Strategic Assessment

Zhiliang REN[1], Zeshui XU[1], Hai WANG[2]
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[2]*Nanjing Audit University, China*

In this paper, an extended TODIM method under the probabilistic dual hesitant fuzzy environment is proposed based on a revised score function and an equiprobability distance measure. The TODIM method can deal with multi-criteria decision making problems considering the DMs' psychological behavior. The probabilistic dual hesitant fuzzy set (PDHFS) is a very useful tool to handle the uncertainty in decision making process due to its ability that can describe the aleatory uncertainty and epistemic uncertainty in a single framework simultaneously. A revised score function of the probabilistic dual hesitant fuzzy element (PDHFE) is proposed to distinguish different probabilistic dual hesitant fuzzy information. In addition, we give an axiomatic definition about the distance measure of the PDHFEs and propose an equiprobability distance measure, which satisfies people's intuition better. Finally, we develop a new TODIM method and use a numerical case on enterprise strategic assessment to show its effectiveness and availability.

IEEM17-P-0233

Dual Probabilistic Linguistic Term Set and its Application on Multi-Criteria Group Decision Making Problems

Wanying XIE, Zeshui XU, Zhiliang REN
Southeast University, China

In real life, multi-criteria group decision making problems are usually tend to be qualitative. Decision makers (DMs) prefer to express their decision making information with natural language. The probabilistic linguistic term set (PLTS) is one of the most popular tools to assist DMs to display their respective decision-making information. To extend the PLTS, in this paper, we give the definition of dual probabilistic linguistic term sets (DPLTSs), which can reveal the complexity and uncertainty of this real world more accurately. In addition, we define some basic operation laws of the DPLTS. A score function and an accuracy function of the DPLTS are defined to compare two DPLTSs. Finally, we develop an aggregation operator of DPLTS for information fusion and use a specific case to demonstrate its availability and effectiveness.

IEEM17-P-0596

Modelling the Emergence of Modularity and its Limits, Markov Decision Process and Agent Based Modelling Approach

Imane BOUAMAMA, Tomoatsu SHIBATA
Tohoku University, Japan

With increasingly competitive markets and technological advances driving the world towards a "converging commonality", adopting "modularity" seems to be more and more appealing for companies and businesses wishing to adapt to various market conditions and to benefit from decentralized innovations. However, the decision to adopt a modular product architecture often comes with a need to carefully analyze the implications of such a decision on the firm's performance, considering the current market state and the future technological shifts. This paper will propose a way to meet this need by constructing mathematical definitions to model the factors influencing the performance of firms before and after adopting modularity.

IEEM17-P-0697

Towards a Data-Driven Enterprise: Effects on Information, Governance, Infrastructures and Security

Alberto POLZONETTI, Matteo SAGRATELLA
E-Lios, Italy

The way towards an enterprise whose actions and strategies are truly based on the centrality of data and information requires investing on the information governance front, reshaping the corporate infrastructures according to a hybrid cloud perspective, as well as changing the security approach. This paper provides an overview of the opportunities, challenges and critical issues that companies have been facing and, in addition, it briefly tackles the very topical subject of cognitive computing.

IEEM17-P-0771

An Artificial Intelligence Based Model for Implementation in the Petroleum Storage Industry to Optimize Maintenance

Tawanda MUSHIRI[1], Robin HUNGWE[2], Charles MBOHWA[1]
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[2]*University of Zimbabwe, Zimbabwe*

Sporadic equipment breakdowns and unplanned downtime due to the predominant use of Reactive Maintenance and Preventive Maintenance at Company X necessitate the enhancement of the maintenance management system. This paper presents an Artificial Intelligence based model for optimizing the conventional maintenance strategies currently employed. Critical equipment at the fuel depot was identified through the Nowlan and Heap risk analysis matrix procedure. The critical equipment identified was pumps, storage tanks, valves and the standby power supply system. Ishikawa diagrams and FMECA analysis were then used in optimizing the Preventive Maintenance strategy and developing the Intelligent Maintenance model for each critical equipment. The focus of the AI Maintenance model was on pumps, as pumps were identified to be the most critical equipment. An Expert System was developed, tested and run for the pumps. The pump diagnosis application developed was programmed using Jess, a rule based system that accepts input from the operators.

Session	Manufacturing Systems 2
Date	12/12/2017
Time	09:00 - 10:45
Room	MR334
Chairs	Ali SIADAT, *Arts et Metiers ParisTech*

IEEM17-P-0323

Proposing an Assignment Mathematical Model in Assembly Line Manufacturing System with Considering Human Factors' Role in Product Quality

Erfan ASGARI[1], Lazhar HOMRI[2], Ali SIADAT[1], Zeynab SAZVAR[1], Ali BOZORGI-AMIRI[1]
[1]*University of Tehran, Iran*
[2]*Arts et Métiers ParisTech, France*

Customers' desires and requirements are increased day to day. Manufacturing companies should adapt themselves to them as soon as possible to survive in the global market. Therefore they looking for a way to decrease their costs. In addition, customers want products with the best quality. Therefore quality should be considered too. This article is tried to identify different human factors which have effects on human performance and as a result, quality of products. In the following, these factors are integrated with worker assignment in a defined assembly line. The proposed model is a multi-objective linear mathematical model that is solved with augmented ε-constraint method and GAMS solver software. In continuous, some computational examples are presented to test this method. As results, it can be mentioned that always there is a pay-off table between costs and quality. It means that there is a conflict between them. So it's up to decision maker to choose the best solution based on situations.

IEEM17-P-0466

Rapid Tooling Road to Rapid Manufacturing

Niranjan Kumar SINGH, Sivadasan MAMBETA
National Institute of Foundry and Forge Technology, India

Additive Manufacturing (AM) has begun gaining popularity in rapid product development. These machines work with metals, ceramics, polymers and its composites. But polymer is the principal feed material for prototyping. The industry is in the early stage of developing the applications of Additive Manufacturing (AM) technologies beyond prototyping by leading it to Rapid Manufacturing (RM) and Direct Manufacturing (DM). Current direct rapid tooling and DM based AM machines are unable to offer the products on economic scales. The indirect Rapid tooling is a promising option in this regard. This work investigates Indirect Rapid Tooling; Indirect Tooling is experimented considering the popular RTV (Room Temperature Vulcanised Rubber) soft tooling method. Stepped bar modelled through AM method in ABS plastic was replicated to a batch of it,in stainless steel employing RTV rubber tooling and investment casting. Dimensional deviations become the critical issue when RTV mold is used which makes the objective for this study. The dimensional deviations in X, Y and Z directions were investigated and reported using Grey Taguchi method of Design of experiment. The work explored the feasibility of Indirect rapid tooling as a road to Rapid manufacturing. This work is a contribution toward realising rapid manufacturing in industrial production through the application of AM and conventional manufacturing.

IEEM17-P-0298

Enhancing Smart Maintenance Management Using Fog Computing Technology

Mohammad ASHJAEI, Marcus BENGTSSON
Mälardalen University, Sweden

In order for factories to stay competitive in the current open global market, there should be efforts to put on optimizing the value stream of producing goods. Within this context, Industrial Internet of Things (IIoT) has been emerged as a technology aiming at achieving high productivity performance in manufacturing. A smart manufacturing approach also requires a smart maintenance management as it plays a crucial role in securing the productivity. IIoT applications are traditionally completed by the cloud computing technology to serve the required services. In this paper, we argue that maintenance processes have requirements that cannot be accomplished by solely the cloud computing technology. We identify several of these requirements. Then, we propose a platform using the fog computing technology, as a recently raised technology in IIoT, to enhance the smart maintenance management. We also discuss the ability of the platform in fulfilling the identified requirements.

IEEM17-P-0324

Reflective and Formative Constructs in the Implementation of Sustainable Manufacturing with 'SMEET' Framework

Keshav G. VALASE, D.N. RAUT
Mumbai University, India

Manufacturing industries adopting Sustainable Manufacturing (SM) practices can avail competitive advantage in present scenario. Though considerable research has been carried out in the field of SM it focuses on three basic domains of sustainability - Social, Economical and Environmental. A more comprehensive approach is needed for the implementation of SM. Literature review revealed that applications of Structural Equation Modeling (SEM) are growing in the field of manufacturing. SEM model specification becomes crucial as the nature of relationship between constructs and observed-variables affects the results of model analysis. Thus the primary aim of this paper is to discuss the importance of reflective and formative nature of such relationship. Authors also propose a SMEET framework for SM, with five domains of 'Social, Manufacturing, Environmental, Economical and Technology'. Further work of empirical study and analysis of data will provide wide scope for the consideration of proposed SEM model in engineering manufacturing industries.

IEEM17-P-0551

Development of a Projection-Based Assistance System for Maintaining Injection Molding Tools

Sven HINRICHSEN, Daniel RIEDIGER, Alexander UNRAU
Ostwestfalen-Lippe University of Applied Sciences, Germany

The maintenance of a tool for injection molding or forming is usually accompanied by its disassembly and assembly. The duration of the assembly activities is often a large part of the total activity time for the maintenance of the tool. The degree of performance of the employees in the execution of these disassembly and assembly activities is often low. In addition, allowances occur (e.g. searching for work equipment). At the Industrial Engineering Lab of the Ostwestfalen-Lippe University of Applied Sciences, a prototype of an assistance system was developed to support the assembly activities in toolmaking. With the help of this system, the operator is guided step by step through the assembly process. The economic potential of the system exists in the reduction of training times, the avoidance of assembly errors and the increase of labor productivity.

IEEM17-P-0636

Towards Capability-Based Worker Modelling in a Smart Factory

Susanne VERNIM[1], Hendrik WALZEL[2], Alois KNOLL[1], Gunther REINHART[1]
[1]*Technical University of Munich, Germany*
[2]*Fortiss GmbH, Germany*

New technologies and the emphasis on digitalization in industrial companies lead to major changes in production environments. A significant reorganization of production processes is one of the results. This takes place in different production areas and transforms companies into so-called Smart Factories. One of the most important questions in this context is how this transformation affects the involved employees in production and how they have to adapt to their new working environment. Therefore, it is necessary to examine the consequences for human workers and to raise awareness within the involved companies so that they can manage these changes successfully. To measure and evaluate the consequences, a way to de-scribe human work and capabilities in different scenarios has to be developed. Such capability-based descriptions have yet only been used for elements of production systems, for example assembly systems. In this paper, we propose a new model to characterize the capabilities of a human worker based on these approaches.

IEEM17-P-0589

On a New Modelling Approach for Circular Layouts and its Practical Advantages

Philipp HUNGERLAENDER[1], Kerstin MAIER[2], Joerg POECHER[2], Christian TRUDEN[2]
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[2]*Alpen-Adria Universitaet Klagenfurt, Austria*

We consider a new facility layout problem. The Directed Circular Facility Layout Problem (DCFLP) seeks to optimally arrange machines on a circular layout with given material flow direction. The DCFLP allows for a wide range of applications and contains several other relevant layout problems
as special cases. We model the DCFLP as a Linear Ordering Problem and solve it using an Integer Linear Program and a Tabu Search heuristic. In our computational study we show that the DCFLP is easier to solve for both exact and heuristic approaches than other related layout problems.

IEEM17-P-0614

Automated Generation of Orienting Devices for Vibratory Bowl Feeders

Cosima STOCKER, Melanie HELL, Raven REISCH, Gunther REINHART
Technical University of Munich, Germany

Vibratory bowl feeders (VBF) are most frequently used to sort and feed bulk material in automated production systems. To correctly orient the parts for further manipulation, a set of orienting devices has to be selected and sequenced. Today, the design process is expensive and time-consuming, as it is based on a manual trial-and-error approach and requires experienced specialists. Therefore, the goal is to develop a method for the automated, computer-aided generation of orienting devices based on physics simulation. This paper presents the concept of an automated configuration system, starting with a part-specific library of possible traps. For each of these traps, the distribution of orientations after passing the trap is calculated. Based on these distributions, an adapted algorithm solves the configuration task automatically. The paper closes with the discussion of this concept and gives an outlook on future work.

Session	Quality Control and Management 2
Date	12/12/2017
Time	09:00 - 10:45
Room	MR335
Chairs	Leif OLSSON, *Mid Sweden University*, Aries SUSANTY, *Diponegoro University Indonesia*

IEEM17-P-0294

Application of Safety Assessment Model to Dog Products

Shu Lun MAK, H. K. LAU
The Open University of Hong Kong, Hong Kong SAR

The market of dog products grows rapidly in the past two decades as the number of domestic dogs has doubled. Many manufacturers came to design and produce new dog products for this huge market. Although some third-party laboratories provided testing and consultancy services to these manufacturers, there is no mandatory/voluntary standards or regulations for the designers to review their products for the dog market. This paper proposed a safety assessment model for product designers to assess the safety of their newly designed dog products.

IEEM17-P-0395

A Critical Review of Product Safety in Industry 4.0 Applications

Chi Ho LI, H. K. LAU
The Open University of Hong Kong, Hong Kong SAR

Product safety is one of the key successful factors to protect consumer and enhance market competition in manufacturing industries. The number of product inspections has been growing in the past decade but the number of product recalls has been increasing conversely. Product safety is seldom documented in the Industry 4.0 applications as most of researches are focusing on increasing the productivity and monitoring production activities in real time. This paper is sought to evaluate the product safety in the worldwide and discuss the opportunities of applying Industry 4.0 to predict the product safety in new product development process proactively. An overview of product recalls and Industry 4.0 applications will be introduced. Industry 4.0 technological components and inspection methods in manufacturing industrial will be presented. Finally, challenges and opportunities will also be addressed in applying Industry 4.0 model to product safety.

IEEM17-P-0422

The Application of 6S Methodology as a Lean Improvement Tool in an Ink Manufacturing Company

Nita SUKDEO
University of Johannesburg, South Africa

The lean 6S methodology, which comprises of 5S + safety, is a powerful and effective lean improvement tool which can be applied to any type or size of organisation. The traditional 5S was expanded to 6S in order to incorporate the concept of safety awareness in the organisation. It can be adapted to all processes within any organisation or industry. The 6S pillars are; sort, set in order, shine, standardize, sustain and safety. The purpose of this paper is to explore the application of the 6S methodology as a lean tool, in order to reduce waste, improve quality, increase productivity and enhance organisational performance. Two data collection methods were used to ensure the proper implementation of the lean 6S methodology. Within the framework of this case study, a 6S audit was conducted over a 8 week period and the audit score showed an increase from a score of 50 in week one to 90 in week 8, and organisational photography was utilised as a research tool to indicate the before and after application of lean 6S. By ensuing the 6S methodology, a significant improvement in safety, productivity, job satisfaction, quality initiatives, efficiency and housekeeping, can be achieved.

IEEM17-P-0465

A Six Sigma Approach Applied to the Analysis of Variability of an Industrial Process in the Field of the Food Industry

Fátima CARNEIRO, Americo AZEVEDO
University of Porto, Portugal

In a high-volume production environment it is particularly important to ensure that key process variables and parameters are within the specification limits. Often, adjustments and changes to the process are required to ensure all applicable quality requirements. In most cases, problems are not caused by an isolated factor. In fact, they are the result of interactions between several factors, including quality ingredients, parameter settings and other processing conditions. In the biscuit manufacturing industry, the thickness and weight of the biscuit are two of the most important product's quality characteristics. Regardless of the product purchased by the customer, the declared weight is considered a specification, so any deviation of these characteristics from their nominal values leads to a change in the weight of the packages. In this paper, we explore a six-sigma approach in the improvement of an industrial biscuit production.

IEEM17-P-0525

The Impact and Effectiveness of Participating In External Quality Assurance Programmes in Quality Management and Improvement at a Local Institute Medical Laboratory, South Africa

Sambil Charles MUKWAKUNGU, Charles MBOHWA
University of Johannesburg, South Africa

This study was conducted in a Medical Laboratory in Johannesburg, South Africa, to evaluate the effectiveness and impact of participating in External Quality Assurance (EQA) programs towards improving the correctness of lab results and continuous quality improvement. The study followed a quantitative approach whereby survey questionnaires were emailed and handed out to laboratory personnel. The participant's responses were summarized and analysed using frequency tables and histograms. The data analysis results indicated that the EQA programs play a vital role in quality management and improvement. Most participants indicated that they understood the role the EQA programs play and felt that it is necessary for a medical laboratory to participate in such programs, coupled with other quality assurance and quality control procedures such as IQC, daily QC procedures, corrective action and continuous education. This research showed that EQA plays a vital role in the correct interpretation and reporting of the lab results.

IEEM17-P-0335

The Influence of Traceability System Practice to Product Recall Capability in Bulk Food Industry: Observation and Interview

Ivan GUNAWAN, Iwan VANANY, Erwin WIDODO
Institut Teknologi Sepuluh Nopember, Indonesia

Technological advancement and the increasing of food recalls should be drivers for improving the companies' traceability system performance. However, the challenges of implementing a traceability system for each industry are different. Food industries with continuous processing and bulk product are chosen as the research objects because many previous studies suggest that the characteristics of these industries can be the obstacle in implementing traceability system. This paper explores the influence of implemented traceability system to the company's product recall capability. For this purpose, two cases of the food industries which have implemented traceability system are compared. The methods used to collect information from the companies are interview with insiders and observation. Through this methods combination, barrier factors to develop traceability systems in the bulk food industry can be revealed. Thereby, those will support the discovery of solutions in improving product recall capability.

IEEM17-P-0433

Factors Affecting a South African Construction Company's Suppliers' Performance

Sambil Charles MUKWAKUNGU, Kabelo NKOAGATSE, Charles MBOHWA
University of Johannesburg, South Africa

The aim of the paper is to present the finding of an investigation conducted at a local branch of an international company involved in the construction of renewable power plant in South Africa. The study followed a quantitative design approach to identify the correlation between the organizations internal controls and its supplier's performance. Therefore, a purposive sampling technique i.e. questionnaires, was electronically sent out by email to 40 employees involved in the construction of renewable power plants. The results of the study revealed the organization failed to define and implement an effective supplier selection process. The results also revealed that the expected quality performance of the supplier was not clearly documented and quantified in the contract documents. There was no consideration taken by the organization about employee's capability and competence in managing the project. Due to the nature the study, the results cannot be generalised throughout the whole industry.

Session	Service Innovation and Management 2
Date	12/12/2017
Time	09:00 - 10:45
Room	MR309
Chairs	Daniel MO, *Hang Seng Management College*, Huey Yuen NG, *Singapore Institute of Manufacturing Technology (SIMTech), Singapore*

IEEM17-P-0268

Design of Mass Customized Paratransit Services

Daniel MO, Yue WANG, Tommy CHEUNG
Hang Seng Management College, Hong Kong SAR

In the decades characterized by ageing population, many community transportation organizations face challenges to serve various needs of people sustainably because of limited social welfare expenditure. This research aims to design mass customized services that provide multiple types of paratransit service through better system design and optimization of vehicle resources. In this paper, we focus on integrating scheduler route (SR) service with dial-a-ride (DAR) service, along with the option of a shared ride program. In the first part, we study how different types of paratransit services can be represented systematically under the same family structure. The identified commonality of processes among different service types will lead to the optimization of vehicle scheduling. Then, in the second part, we will develop a mechanism for scheduling vehicles to serve different types of passengers. Illustrated in a numerical example, 20% more passengers could be served by the integrated model of two service types.

IEEM17-P-0467

Categorization of Business Model Patterns and Mapping of Their Relations with Business Model Building Blocks

Huey Yuen NG
Singapore Institute of Manufacturing Technology (SIMTech), Singapore

Most cases of business model innovation (BMI) are actually enabled by a limited number of business model (BM) patterns. Hence, a good understanding of the extant BM patterns and their contexts of application is extremely important. In the literature, many BM patterns have already been identified but they have not been systematically arranged based on firm's strategic intents for BMI, which makes comparison among them cumbersome. Also, there is no clear linkage between these BM patterns and the BM building blocks. These two limitations combined reflect many firms' challenges in applying the BM patterns in practice. The "Integrated BMI Model" developed in this study categorizes the BM patterns based on firm's strategic intents for BMI, and map out the specific BM building blocks affected by the BM patterns. This model has two practical applications: (1) systematic selection of BM patterns for BMI, and (2) assessment of firms' current BM patterns.

IEEM17-P-0180

Modelling the Core Areas of Municipal Performance Towards an 'Ideal' Municipality

Bingwen YAN[1], Ogochukwu Iruoma NZEWI[2]
[1]*Cape Peninsula University of Technology, South Africa*
[2]*University of Fort Hare, South Africa*

Municipal performance plays a vital role in measuring an ideal municipality (IM) in South Africa. The IM includes a democratic and accountable government, the needs of local community, sustainable services, etc. However, the existing studies reflect a lack of sufficient models showing the relationship between these core areas of concern (CAC) and their significance to key performance areas (KPAs). This paper presents a conceptual model that represents the CAC and KPAs and the key determinants of an IM. The model was tested through Structural Equation Modelling to determine the relationships among the CAC, KPAs and IM. A comprehensive multi-layered approach to the complex issues facing local government in South Africa was utilised. The model shows that it is crucial for local municipalities to look into the CAC for continuous improvement of KPAs. The paper further recommends that the model can be used to measure KPAs at national level.

IEEM17-P-0806

Improving Project Management Practice: An Engineering and Construction Case Study

Sofia CARVALHO, Anabela TERESO, Gabriela FERNANDES
University of Minho, Portugal

The implementation of project management best practices is a preponderant factor for the success of companies. Organizations need to respond quickly, efficiently and in an integrated way to the challenges emerging from daily routines. This paper focuses on presenting a solution for the implementation of project management initiatives in an Engineering and Construction company, which was at an embryonic stage of project management maturity. The company aimed at improving its project management maturity level, in order to increase the likelihood of success of its projects. Six project management improvement initiatives in which the company should focus its efforts were identified, considering its organizational context, through four research methods: survey, document analysis, observation and focus groups. Three dimensions were considered for the development of this proposal: People and Organizational Knowledge; Processes, Tools and Techniques and General Management System.

IEEM17-P-0234

Evaluation of the Influencing Factors on General Aviation Tourism Industry of Xi'an Based on AHP and Fuzzy Comprehensive Evaluation Method

Hongru YAN, Huaqi CHAI
Northwestern Polytechnical University, China

Tourism industry has enormously flourished owing to the development in the economic conditions as well as with the improvement in the people's living standards. General aviation tourism has become a new form of tourism. This paper evaluated the factors which influence the general aviation tourism industry of Xi'an using Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation method, and the following primary factors are considered for evaluation, supply resources of the system, industrial policies, economic level and market demand. The main objective of this research is to promote the development of general aviation tourism industry.

IEEM17-P-0680

Creativity in Organization: A Literature Review

Retno INDRIARTININGTIAS[1], Subagyo [2], Budi HARTONO[2]
[1]*University of Trunojoyo, Indonesia*
[2]*University of Gadjah Mada, Indonesia*

This paper aims to report the results of a literary review on research in the field of creativity. The study was conducted systematically on 35 articles in the field of creativity using systematic review methods. The results show that the research area of creativity with the object of general organization has been widely practiced. Most of these studies utilized qualitative methods. In contrast, similar studies within the context of creative study is still limited, both in qualitative research and in quantitative research. Results show the importance of research on creativity, especially in the creative industries. The direction of future research, put forward by researchers is expected to extend understanding on creativity in creative industries.

Session	Reliability and Maintenance Engineering 2
Date	12/12/2017
Time	09:00 - 10:45
Room	MR308
Chairs	Masdi MUHAMMAD, *Universiti Teknologi PETRONAS*, Zied HAJEJ, *LGIPM/Lorraine University*

IEEM17-P-0534

Intelligent Fault Diagnostic Model for Rotating Machinery

Masdi B. MUHAMMAD, Umair SARWAR, Mohammadreza TAHAN, Zainal Ambri A KARIM
Universiti Teknologi PETRONAS, Malaysia

The aim of this paper is to present an intelligent fault diagnostic to assess the changes and detect malfunctions in rotating machinery using real-time data. This developed model interprets performance condition monitoring data and determines machine health status with the use of Artificial Neural Networks (ANN). The ANN networks were trained for principle performance parameters from which actual system performance can be predicted based on given set of input parameters. The validity of the proposed model was evaluated through a case study on twin-shaft 18700 KW industrial gas turbine engine to detect a fault happened in engine bell-mouth. The results show the networks trained using Levenberg-Marquardt (LM) training function can achieve a more accurate results compared to Bayesian regulation (BR) and scaled conjugate gradient (SCG) training functions. In addition, the results also showed that both power output parameter and the fuel flow rate can be effectively used to monitor the performance of gas turbine.

IEEM17-P-0753

Reliability Analysis for Gap Null Gate by Bivariate T-Distribution

Houbao XU, Mei LI
Beijing Institute of Technology, China

The length of the reliability window is the key problem in designing the gap explosive null gate. Either too long or too short of the length will lead the gap null gate failure. This paper regards the two threshold values of the gap null gate as variables and formulates the reliability window as a triple response problem. Using bivariate t-distribution, this paper presents the probability model of the successful response. The parameters in the model are estimated by constructing score test statistics. To illustrate the effectiveness of the method presented in the paper, an example of how to derive the reliability window based on experimental data is shown at the end of the paper.

IEEM17-P-0120

Performance-Oriented Preventive Maintenance Policy for Deteriorating Single-Machine Manufacturing Systems

Biao LU, Xiaojun ZHOU
Shanghai Jiao Tong University, China

For manufacturing systems, reliability and product quality are two essential performance indicators. These two indicators usually decline as the machine deteriorates with age and usage. Preventive maintenance (PM) is effective on mitigating the machine deterioration and thus improves both the reliability and product quality. In this case, this paper proposes a performance-oriented PM policy for the single-machine systems. PM is triggered whenever the machine failure rate reaches the failure rate threshold (FRT), or the product defective rate reaches the defective rate threshold (DRT). The optimal PM plan is obtained by minimizing the total cost, including PM cost, minimal repair cost and quality loss, with FRT and DRT as the decision parameters. The defective rate and quality loss are quantitatively evaluated based on a process model developed to mathematically describe the impact of machine deterioration on product quality. The effectiveness and superior performance of the proposed PM policy is demonstrated through a case study.

IEEM17-P-0415

Cost Sustainability of TFR Electric Locomotives Operating on the Natal Corridor

Bheki MAKHANYA[1], Renju MATHEW[2], Hannelie NEL[1], Jan-Harm PRETORIUS[1]
[1]*University of Johannesburg, South Africa*
[2]*Transnet Freight Capital, South Africa*

Transnet Freight Rail, one of the largest railway companies on the African Continent, is revamping itself to be amongst the top five railway enterprises in the global market by the year 2020. However, studies and publications suggest that the company is facing the challenge of increasing rolling stock maintenance cost whilst committing lowering the cost of doing business in South Africa. In the literature reviewed, little research has been conducted to understand the factors affecting the enterprise. This study examines factors affecting the performance and sustainability of the TFR electric locomotive fleet operating in the Natal Corridor; and highlights the potential areas of improvement for cost sustainability of these trains.

IEEM17-P-0922

Nonparametric EWMA Chart for Simultaneous Monitoring of Event Frequency and Magnitude

Shuo HUANG[1], Jun YANG[1], Amitava MUKHERJEE[2]
[1]*Beihang University, China*
[2]*Xavier School of Management, India*

Traditionally, control charts for joint monitoring of the event frequency and magnitude are designed on the assumption of a parametric distribution. However, when there is a lack of knowledge about the underlying distribution, the parametric control charts may be not suitable in some real applications. Therefore, distribution free control charts have attached much attention in recent years. In this paper, we propose a nonparametric EWMA chart based on Mathur statistic. The control limits can be obtained via simulation method. Some in control and out of control performances are discussed and the results indicate the proposed chart can successfully detect shifts in different general bivariate processes. Finally, an example is given to illustrate the implementation of the proposed method.

IEEM17-P-0908

The Characteristic of Cold Metal Transfer (CMT) and its Application for Cladding

Nelson Edoh IMOUDU[1], Yonas Zewdu AYELE[2], Abbas BARABADI[1]
[1]*UiT The Arctic University of Norway, Norway*
[2]*Østfold University College, Norway*

Corrosion and wear has been a major challenge in most of our industries. Cold Metal Transfer (CMT) process has been selected as a weld technique in most manufacturing industries, because of its low heat inputs that makes it a promising method for manufacturing application. The aim of this paper is to study the competence of CMT welding process in cladding of mild steel. Furthermore, fault tree analysis was performed for hot cracking that can probably be experienced during cladding.

IEEM17-P-0927

Study on Fault Diagnosis of SVM for Mechanical and Electrical Product Based on Improved Conjugate Transformation

Hui ZHENG, Jun-xia ZHANG
Tianjin University of Science & Technology, China

In order to avoid the fault diagnosis of human error, and improve the accuracy of fault diagnosis, this paper proposes the concept of key fault characteristic units on the basis of fault characters of mechanical and electrical products based on the theory of extenics and support vector machine method. Besides, according to the theory of conjugate analysis, the paper provides representation for key fault characteristic units. On this basis, an improved SVM global optimization classification algorithm based on conjugate transformation is proposed. Take fault diagnosis of rotary vane pump as an example to compare sample classification accuracy under different kernel functions and verifies the feasibility and effectiveness of the method.

Session	Operations Research 5
Date	12/12/2017
Time	11:15 - 12:45
Room	MR327
Chairs	Trang NGUYEN, *Viettel Reseach and Development Institute*, Gitae KIM, *Hanbat National University*

IEEM17-P-0575

On the Mathematical Program in Theater Anti-Aircraft Distribution Problem

Trang T. NGUYEN, Trung Q. BUI, Bang Q. NGUYEN, Su TRAN LE
Viettel Research and Development Institute, Viet Nam

The military theater anti-aircraft distribution problem is associated with determining positions of defender's missiles within a potential geographic area of operation. This research focuses on formulating and solving a mathematical model to aid decision makers to maximize defender's efficient course of actions assuming that an aircraft attacking plan is observed. The developed model is a Mixed Integer Program (MIP) and solved using our proposed constraint-based local search algorithm as well as CPLEX solver. Experimental results on the simulated data allow us certainly establish the quality of any defensive plan.

IEEM17-P-0553

Travel Time Estimation in Vehicle Routing Problem

Gitae KIM
Hanbat National University, South Korea

Vehicle routing is a well-known problem in operations research. The problem aims to find an optimal route for vehicles touring all customer locations. Travel time is one of objectives in vehicle routing problem(VRP). The travel time of a route is the sum of travel times between two customers in the route. In reality, there are multiple road segments between two customer sites. Thus, probability distribution of travel time between two customers can be derived by the convolution of distributions of road segments within the arc of two locations. This paper suggests a method of estimation of travel time of the arc in the network of VRP. An example addresses how the method applies to estimate the distribution of the travel time.

IEEM17-P-0070

Mixed-Integer Second-Order Cone Programming for Truss Topology Optimization with Self-Weight Load and Limitation on Number of Nodes

Yoshihiro KANNO
Tokyo Institute of Technology, Japan

Taking into account the self-weight load is crucial for designing large-scale truss structures. However, the self weight of a truss has been often ignored in Structural optimization, because of the difficulty stemming from its dependency on the truss design which itself is to be optimized. This paper presents a mixed-integer second-order cone programming approach to truss topology optimization under the self-weight load and the upper bound constraint on the number of nodes. The latter constraint is practically significant from the viewpoint of fabrication cost. It is also illustrated through the numerical experiments that the constraint on the number of nodes often yields a simple truss design, which is preferable from the viewpoint of manufacturability.

IEEM17-P-0902

Development of Integrated Tactical Level Planning in Container Terminal

Dina Natalia PRAYOGO, Akhmad HIDAYATNO, Komarudin
University of Indonesia, Indonesia

A container terminal is a location comprising of a seaside and container storage yard areas. In seaside areas, there are two tactical level planning decisions: i.e.: berth allocation and quay crane assignment problems. Meanwhile in container storage yard area, the planning of yard templates is concerned with the allocation of container storage space to each container vessel. These three tactical level decisions are interrelated and dependent on each other. This paper discusses the development of integrated planning of these three tactical level decisions at container terminals, namely berth allocation problem, specific quay crane assignment and multi-period container storage yard templates. The objective of the optimization model takes into consideration the balance of the requirement of shipping liners owners and port container terminal managers. This integrated tactical planning model is solved by using a functional integration framework with feedback loop structure. A numerical example is used as an illustration of the application of the integrated planning decision model in a container terminal that can result in a good solution.

IEEM17-P-0750

Minimizing the Height of Stacked Egg Cartons: A Comparison of Solving 3D Bin Packing Problems and Packers' Experience

Narat HASACHOO, Pornwasin SIRISAWAT, Phattaraporn KALAYA
Mae Fah Luang University, Thailand

Packing a carton into a container for distribution is directly related to a firm's efficient use of space and handling performance. This is because packing patterns are often left up to an operator's own experience. Especially in situations where there is a small order, optimally planned packing patterns are often neglected even when an order for a set of cartons needing to be shipped is already known. Hence, this paper has compared packing patterns from an operator's own experience by using a case study of a transportation company against those obtained from solving a three-dimensional bin packing problem (3D-BPP) on a minimum stack height by using a case of egg cartons which can be freely rotated and placed into the bin at any positions which keep its edges parallel to the bin edges. The results found no scenario in which an operator's experience is superior to those obtained from 3D-BPP.

IEEM17-P-0828

Using Meta-Heuristic Algorithms and Hybrid of Them to Solve Multi Compartment Vehicle Routing Problem

Masoud RABBANI, Zahra TAHAEI, Hamed FARROKHI-ASL, Niloofar AKBARIAN SARAVI
University of Tehran, Iran

The aim of Vehicle Routing Problem (VRP) is finding a reasonable routes for vehicle serving customers. Transportation has a significant effects on environment and these effects can be dangerous. So, an extension of vehicle routing problem called Pollution Routing Problem (PRP) is introduced to address environmentally issues. Load and speed are most important factors that can change the amount of pollution emitted by vehicle. Pollution routing problem calculates not only traveled distance, but also the amount of greenhouse emitted by fleet of vehicles. In this study, a new kind of green vehicle routing problem called multi-compartment green vehicle routing problem (MCGVRP) is presented. The aim of this problem is to minimize the cost of changes in load, speed and payment to drivers by considering pollution emitted by vehicle. Two meta-heuristic algorithms including genetic algorithm (GA) and simulated annealing (SA) are selected to solve the presented problem along with a hybrid metaheuristic algorithm. Finally, the results obtained by these methods are compared with each other.

Session	Technology and Knowledge Management 3
Date	12/12/2017
Time	11:15 - 12:45
Room	MR328
Chairs	Ville OJANEN, *Lappeenranta University of Technology*, Charles MBOHWA, *University of Johannesburg*

IEEM17-P-0439

The Impact of Digitalization on Product Lifecycle Management: How to Deal with it?

Yan XIN, Ville OJANEN
Lappeenranta University of Technology, Finland

This paper aims to create a comprehensive understanding on the impact of digitalization on product lifecycle management, and provide suggestions for manufacturing companies to achieve competitiveness in the digital age. Based on an analysis of 35 journal articles and conference papers, it was found that digitalization closes the product information loop and extends the traditional PLM to the whole product lifecycle, which makes Closed Loop Lifecycle Management possible. To achieve competitiveness, actions related to partnership, standardized and industry-wide accepted data, security, and people should be considered by the manufacturing companies.

IEEM17-P-0199

How Knowledge Management Impacts Performance: An Empirical Study in Chinese Knowledge-Intensive Enterprises

Yana YUAN, Huaqi CHAI, Liang LIU
Northwestern Polytechnical University, China

Developing an understanding of relationship between knowledge management and organizational performance is of central important to management scholars. In this paper, based on a sample of Chinese knowledge-intensive enterprises engaged in aviation and aerospace sectors, we test our hypotheses through a combination of qualitative and quantitative analysis, as well as the composed method of normative analysis and empirical research. More specifically, we consider how knowledge management impacts organizational performance in enterprise by two routes, the knowledge management process and the environmental impact factors. We find that the knowledge management process and the environmental impact factors positively affect organizational performance, respectively. This paper is one of the empirical supports for the role of environmental impact factors as a mediator between knowledge management and organizational performance. We further outline the implications of these findings for practice and future research.

IEEM17-P-0469

Factors Influencing Intention to Use of Smartphone Applications in Thailand

Massoud MOSLEHPOUR[1], Khoirul AMRI[1], Paoleena PROMPRASORN[2]
[1]*Asia University, Taiwan*
[2]*SGC, Thailand*

This study aims to investigate customer behavior and attitude by exploring factors that influence smartphone users' intention to download and use applications. Structural Equation Modeling is used to test the model and the proposed hypotheses. Descriptive analysis and factor analysis are also conducted to verify validity and reliability of the data. The results showed that perceived east of use (EU), perceived image (PI) and perceived cost (PC) show significant influence on CS. Perceived cost (PC) and customer satisfaction (CS) show significant influence on intention to use (IU), however perceived east of use (EU) and perceived image (PI) didn't have significant influence on intention to use (IU). This study analyzed a total sample of 400 Thai respondents. The results of this study can be useful for the marketers and other researchers to distribute, improve and study more about smartphone applications and user behavior. The app developers can use this research to improve and develop new applications based on consumers' needs.

IEEM17-P-0385

Technology Management, R&D Investment, and Small and Medium-Sized Enterprise Growth

SooGeun AHN, Jeewhan YOON, YoungJun KIM
Korea University, South Korea

Using an augmented version of Gibrat's law, we theorized and examined the persistence of firm growth when firms increase their research and development (R&D) investment. Using 17 years of data from 1361 firms (616 small and medium-sized enterprises [SMEs] and 745 large firms), this study analyzed the effect of the dynamic interaction between past growth rate and R&D investment on the current growth rate of firms. Based on a quantile regression analysis, study findings suggested that SMEs showed declining growth after high growth. However, we also found that high-growth SMEs that increased their R&D investment could achieve persistence of growth in the following year. Implica-tions are discussed for research, practice, and policy.

IEEM17-P-0404

Research on Foreign Capital R&D Ecosystem in China Based on Dissipative Structure Theory

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[1]*Northwestern Polytechnical University, China*
[2]*Northwestern University, China*

Innovation Ecosystem has been a new model of technological innovation. Currently, foreign capital R&D ecosystem in China is one of the most important components of the national innovation system. Dissipative structure theory and Brusselator Model are introduced to describe the evolution of the ecosystem composed of multiple R&D networks. This paper evaluates the foreign capital R&D ecosystem's entropy nationwide based on an investigation about 351 foreign capital R&D institutions in China. It further analyses the ecosystem's deviation degree from the dissipative structure. The paper confirms that the status of foreign capital R&D ecosystem has not reached dissipative structure; while the status in Eastern China is closer to the optimal status than in Western China. The empirical conclusion indicates relative maturity of the ecosystem in Eastern China. In both Central China and Western China, the deviation degree is obviously higher than other regions.

IEEM17-P-0530

Collaboration Between SMEs and its Stakeholders: Cross-Tabulation Analysis for Indonesian SMEs Using GEM Data

Ceicalia TESAVRITA[1], Cindy Marika Amalia WIBOWO[1], Iwan Inrawan WIRATMADJA[2]
[1]*Universitas Katolik Parahyangan, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

This research aims to map collaboration activity in Indonesian SMEs, using GEM (Global Entrepreneurship Monitor) data in 2013. Collaboration was defined as an evolving process that happens as a result of interaction between two or more entities through joint activity with common goals. Data was collected using survey with random sampling method in 16 cities/districts in Indonesia. Using cross-tabulation analysis, characteristics that were distinguish SMEs which collaborate with its stakeholders and those which doesn't, were identified. This research also found that collaboration in SMEs can be divided into two forms, which is formal collaboration and informal collaboration. Based on the output, SMEs collaboration can also be classified into four forms which are (1) produce goods and services, (2) material supply, (3) marketing activity, and (4) increasing effectivity. Further analysis was done to map SMEs activities and method in each collaboration form. This research found that SME's that participate in collaboration was mostly were in established business stage (more than 42 months). SME's on this stage did collaborate with its stakeholder, mainly to produce/sold goods/services, develop product/services, and to sell products/services.

Session	Safety, Security and Risk Management 1
Date	12/12/2017
Time	11:15 - 12:45
Room	MR329
Chairs	Lovelin Auguskani P, *St.Xavier's Catholic College of Engineering*, Om Prakash YADAV, *North Dakota State University*

IEEM17-P-0805

Risk Reduction Using Grievance Handling Mechanism in Handloom Industry

Lovelin Auguskani P[1], Sree Devi V[2], Darwin Jose Raju A[1], Jerlin Priya J.M[3], Marsaline Beno M[1]
[1]*St.Xavier's Catholic College of Engineering, India*
[2]*Manonmaniam Sundaranar University, India*
[3]*Annammal College of Nursing, India*

The present study aims to reduce threats of complaints in Handloom industry to the use of grievances handling mechanism. The grievance means any dissatisfaction whether expressed or not that an employee thinks, believes are the symptoms of conflict in the enterprise are to be found out. The grievance handling mechanism is used the dealing with the complaints of employees working in industries whether they are affected individuals or an organization. Risk is a concept that denotes a potential negative impact of value that may arise from a future event. Handloom industries follow the logical application of policies, dealings, practices to identifying analyzing and monitoring the risk. The grievances handling mechanism helps to reduce the loss of likelihood. Hypothesis tested used for effectiveness of grievance handling process and employees relations with the management to reduce the risk management.

IEEM17-P-0688

Analysis of Risk Sources in New Product Development Process Using Fuzzy Failure Mode Analysis

Avanish Singh CHAUHAN[1], Om Prakash YADAV[2], Ajay Pal Singh RATHORE[1], Gunjan SONI[1]
[1]*Malaviya National Institute of Technology Jaipur, India*
[2]*North Dakota State University, United States*

New product development (NPD) is a key driver of progress and competitive gain in all business organizations, yet risks and threats are inherent in any NPD project. Thus, understanding, detecting, handling, and diminishing risk is imperative for organizations. Suitable risk management policies can considerably advance the chances of success of NPD project. This study starts with the revision of literature to identify major risk sources in NPD process and then suggests applicability of fuzzy failure mode analysis (FFMA) approach to state priority of risk sources in a case of automotive new product development process. It highlights key risk sources, their prioritization and categorization on the basis of criticality. Also, a risk alleviation strategy is suggested for risk mitigation.

IEEM17-P-0131

New Product Development Project Risks in Saudi Firms - Preliminary Findings

Abdullah ALRABGHI[1], Muhammad AKRAM[2], Abdulaziz ALHARBI[1], Owais NAGRO[1], Abdullah BUKHARI[1]
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[2]*Cranfield University, United Kingdom*

New product development (NPD) is inherently a risky endeavor due to increasing customer demands and dynamic business market. There are considerable evidences that NPD projects suffered from risks and were prone to over cost, schedule overrun and poor technical performance. Although the research on risk in NPD project is extensive, the literature about risks associated to NPD projects conducted in Saudi context is scarce. Keeping in mind the current complexity, turbulence and dynamism in Saudi economic environment, it is essential that Saudi firms effectively manage NPD project risks to enhance NPD operations. With data collected from Saudi firms developing new products, this paper provides an assessment of the likelihood of occurrence of NPD project risks and their potential negative impact. Overall, this research provides the foundation for the first large-scale empirical investigation on NPD project risks in Saudi context and advances our understanding of the antecedents of NPD project risks.

IEEM17-P-0472

The Uncertainty Importance Analysis for the Fault Tree and its Probability Density Evolution Algorithm

Guijie LI, Chaoyan XIE, Fayuan WEI, Bin LIAO
China Academy of Engineering Physics, China

In the conventional system reliability, the fault probability of the bottom events is assumed as the determinate value. However, the fault probability of the bottom event is usually uncertain which would result that the system fault probability is uncertain. In order to evaluate the effect of the uncertainties of the fault probability on the system fault probability, based on the structure function of the fault tree, the moment-independent importance measure (MIIM) model for the system reliability is developed. This IM model could not only measure the influence of the uncertainty of the fault probability on the entire system fault probability distribution, but also can provide the ranging of the fault probabilities. The probability density evolution model is developed to solve the IM efficiently. An electro-mechanical actuator system is employed to test the rationality and validity of the presented MIIM. The efficiency and accuracy of the developed algorithm also is tested.

IEEM17-P-0574

Apply HFACS to Accident Investigation System Interface Design

Ting-Yi LIN, Kang-Hung LIU, Chien-Chi CHANG
National Tsing Hua University, Taiwan

This study proposes a new methodology for conducting analyses using new user interfaces based on Human Factors Analysis and Classification System (HFACS). The objective of this research is to evaluate the performance of this new methodology for its use by people who are not ergonomic experts. We developed two accident investigation system interface alternatives which are based on the HFACS model. The participants were asked to conduct analysis with assistance of both alternatives in four cases. The results indi-cate both alternatives could be considered as good appliances to assist those who have no background knowledge about HFACS. The correct rates have significant difference between the two alternatives in one case, which is related to risky factors of supervisory and upper-level management. This finding has important implications that people who are not familiar with HFACS can regularly provide accurate analyses with the assistance of our investigation system in-terface.

IEEM17-P-0711

Petri-Net Based Safety Analysis of Process Systems

Jianfeng ZHOU
Guangdong University of Technology, China

Safety analysis is very important to prevent events that may cause catastrophic accidents in process industries. Although traditional safety assessment methods including fault tree (FT) have been used widely in this field, they still lack in dynamic structure representation and uncertainty processing, which are important for the process safety analysis. In this study, a safety analysis approach based on the probabilistic Petri-net (PPN), which extends the basic Petri-net, is proposed. Probabilities are assigned to the tokens in the Petri-net, and the probability dependencies of events can then be modeled by a PPN. The enabling rule of a transition and the execution rule of an enabled transition are provided, through which the dynamic evolution process of the system can be revealed by the flowing of tokens, and the probabilities corresponding to the occurrence of events can be updated. A case that vapor cloud may overflow from a tank is studied to illustrate the proposed approach. The result is validated by comparing with that of the fault tree analysis.

Session	Systems Modeling and Simulation 4
Date	12/12/2017
Time	11:15 - 12:45
Room	MR330
Chairs	Abdul-Wahid SAIF, *King Fahd University of Petroleum & Minerals*, Tatsushi NISHI, *Osaka University*

IEEM17-P-0052

Network-Based Process Control and Improvements with Fuzzy Time Delay Modulator

Abdul-Wahid SAIF, Muneeb A. AKRAM
King Fahd University of Petroleum and Minerals, Saudi Arabia

One of the major drawbacks behind using data networks is their induced network delay effect in the control loop. This effect not only degrades the performance, but can also destabilize the controlled process. This paper proposes a fuzzy logic based control modulation technique for network based process control. The technique is based on modulating the control signal provided to the network based controlled process under the objective of overcoming network delays besides maintaining the stability and controlling the performance as much as possible. The proposed technique, which can be used with any type of process controller, is illustrated via application on a Jacketed Reactor Control process.

IEEM17-P-0038

Modeling and Simulation of Cascading Failure on R&D Network Based on Different Node States Under Attack Strategies

Yue SONG, Naiding YANG, Yanlu ZHANG, Jingbei WANG
Northwestern Polytechnical University, China

Since cascading failure has negative and significant impact on R&D network, it is essential to research the characteristics of cascading failure for keeping R&D network safety. Firstly, the paper introduces the weighted scale-free network model to generate a R&D network. Then we develop overloaded function and restoration function to propose the cascading failure model of R&D network based on three states of nodes. Finally, the paper simulates the model. The results show that cascading failure can be stopped when the value of tolerance parameter exceeds the threshold value; the tolerance threshold value declines with the increase of tunable parameter, which indicates failure nodes with higher loads are easier to trigger cascading failure; the cascading failure size decreases with the increase of the value of restoration parameter; R&D network has strongest robustness under random attack, but is the most vulnerable to cascading failure under high-degree attack, which implies the importance of protecting high-degree nodes.

IEEM17-P-0663

A System Dynamics Case Study of Resilient Response to IP Theft from a Cyber-Attack

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[1]*Technical University of Denmark, Denmark*
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Undesirable changes in supply chain physical operations derived from disruptions in the transmission or storage of digital information are reported daily despite the Information Technology (IT) protection available. Once a disruption materializes, the company losses will depend on the coherence and swiftness of the supply chain response (resilience). However, current resilience frameworks are qualitative, do not address evolution over time as a relevant aspect, and thus do not provide indications on how to design a resilient response. This paper contributes to closing this gap by developing a system dynamics model from an actual case of resilient response after a cyber-attack. Both case-specific and generic structures are extracted from the case data analysis, and a reaction mechanism is proposed that results in the observed behavior. The identification of these structures should eventually aid decision makers in the process of designing a resilient supply chain response.

IEEM17-P-0411

Throughput Analysis of Random Storage Systems Operated Under the Closest Eligible Location Rule

Anja HESSLER, Christoph SCHWINDT
Clausthal University of Technology, Germany

We study the performance of a storage and retrieval system executing single-command cycles under the closest eligible location rule to serve a random storage. For each arriving storage or retrieval request, the closest eligible location rule selects a storage location that incurs a minimum cycle time. The performance of the system is analyzed in terms of the expected maximum system throughput, which is obtained from the reciprocal expected cycle time. Assuming that the arrivals of storage and retrieval requests follow independent Poisson processes, we propose a mathematical model based on Gordon-Newell networks to develop closed-form expressions for the expected cycle time. In a numerical experiment, we investigate characteristic curves of the expected cycle time and the obsolescence of inventory for varying number of stock keeping units. Comparing our model to alternative approaches shows that the latter tend to significantly underestimate the expected maximum system throughput under the closest eligible location rule.

IEEM17-P-0384

An Optimization Model for Quality Improvement Investment Decisions Considering Learning and Forgetting Curve

Mega Aria PRATAMA, Cucuk Nur ROSYIDI, Eko PUJIYANTO
Universitas Sebelas Maret, Indonesia

Continous quality improvement is one of the keys to win the market competition. A product with high quality at competitive price will attract the customers to purchase. One way to maintain the quality improvement is by reducing product variance. In this paper, a quality improvement optimization model is developed to determine optimal investment allocation to certain component process by considering learning and forgetting curve. Maximum return on investment is the objective function of this model. Exponential learning investment function is used in this paper with taking into consideration the forgetting as the result of interruption. The model implementation will showed by numerical example and solved using Oracle Crystal Ball software.

IEEM17-P-0538

A Graphical Method for Multi-Signal Flow Graph Modeling and Testability Analysis Based on Visio Control Component

Jinsong YU, Yidong ZHENG, Diyin TANG, Y. YANG
Beihang University, China

This paper proposed a method for constructing the graphic modeling system on the basis of Visio drawing control through a lot of research about the technology of testable modeling and analysis. A regional growth algorithm based on the idea of image segmentation is put forward to obtain the fault-test dependency matrix and corresponding testability indicators such as fault detection rate(FDR) and fault isolation rate(FIR) are calculated according to the matrix. The optimal decision tree is also generated in this paper using AO* algorithm, which provides effective and reliable guidance for fault isolation. At last, the functions of the testability modeling and analyzing are verified taking a tape player as the research object. The experiment results show that the scheme is feasible and has important reference value for developing testability analysis tools.

Session	Supply Chain Management 5
Date	12/12/2017
Time	11:15 - 12:45
Room	MR332
Chairs	Aries SUSANTY, *Diponegoro University Indonesia*, Allen H. TAI, *The Hong Kong Polytechnic University*

IEEM17-P-0381

Performance Measurement of the Relationship Between Farmers-Cooperatives-Industrial Processing Milk in a Dairy Supply Chain: A Balanced Supply Chain Management Scorecard Approach

Aries SUSANTY, Arfan BAKHTIAR, Ratna PURWANINGSIH, Dina Firma DEWANTI
Diponegoro University, Indonesia

This research has several purposes. First, identify the metrics on each perspectives in the balanced supply chain management scorecard. Second, develop the scale of measurement of each metric. Third, utilize the analytical hierarchy process to measure the relative importance of each metric and perspective, and fourth, measure the current performance of each metric and give some feedback. As a pilot testing, the object of this research was represented by the relationship between the individual dairy farmers and two selected dairy cooperatives located in Semarang District and also by the relationship between two selected dairy cooperatives and the industrial milk processing which is where the cooperative sells its milk. There were 28 metrics used in this research and the result of measurement indicated that the performance of the relationship between farmers, dairy cooperatives, and industrial processing milk had total score 2.82. The total score was subject to improve since the highest total score could be achieved was 5. Then, among 22 metrics, 10 metrics should be improved since those metrics have high importance but low performance.

IEEM17-P-0491

Optimal Replenishment Policy for Inventory Systems with an Unreliable Supplier

Allen H. TAI
The Hong Kong Polytechnic University, Hong Kong SAR

In this paper, a mathematical model is developed for an inventory system which orders replenishment from two external suppliers. One supplier is reliable which only delivers perfect quality items; the other supplier is unreliable which supplies some imperfect quality items. The inventory is capable of inspecting imperfect quality items. The average profit per unit time is formulated and a numerical method for obtaining the optimal replenishment policy is presented.

IEEM17-P-0372

Distribution Center Capacity Analysis in Stochastic Environment: An Application of Value Stream Analysis and Monte Carlo Simulation

Ammar M. AAMER
Sampoerna University, Indonesia

The main objective of this research is to develop a simulation based capacity analysis model. We applied value stream analysis and Monte Carlo simulation, in a stochastic Distribution Center (DC) operations environment, in order to analyze the capacity level and make informed staffing and operations decisions. A simulation model was developed to provide a baseline for management to understand workflow and DC available capacity. The results showed that the DC under study was capable of receiving and shipping 30% to 40% higher units per shift. In addition, the results showed that there was an imbalanced workflow caused by original flow design, and daily work scheduling and planning.

IEEM17-P-0524

A Comprehensive Model for Supply Chain Performance Measurement: Application in the Coal Beneficiation Plant of Steel Manufacturing Company

Md. Asif EQUBAL[1], Azhar EQUBAL[2], Archana KUMARI[3], Rajkumar OHDAR[2]
[1]*Cambridge Institute of Technology, India*
[2]*National Institute of Foundry and Forge Technology, India*
[3]*Marwari College, India*

Companies are looking for a single solution or a set of matrices that they can apply to measure their supply chain performance but literature reveals that such a single solution does not exist. An important component in supply chain design and analysis is the establishment of an appropriate performance measurement and evaluation system. An effective supply chain performance measurement system must align with a company's own supply chain processes. In this paper, a comprehensive supply chain performance measurement and evaluation (CSCPME) methodology based on the study of several established performance measurement models is developed. The critical performance measures reflect the five specific criteria, viz. effectiveness, efficiency, quality, productivity, and profitability. The proposed CSCPME is applied to a real case study for one of its performance measure (effectiveness) evaluation. The developed CSCPME methodology may provide a framework for companies to build their in-house supply chain performance measurement systems.

IEEM17-P-0913

Model Development of Rescue Assignment and Scheduling Problem Using Grasp Metaheuristic

Amelia SANTOSO[1], Dina Natalia PRAYOGO[2], Joniarto PARUNG[1], Hazrul ISWADI[1], D.A. RIZQI[1]
[1]*University of Surabaya, Indonesia*
[2]*University of Indonesia, Indonesia*

Natural disasters could not be avoided by humans. Indonesia is often facing natural disaster. Natural disasters can cause social, economic, and environmental impacts. This problem encourages researchers to take an active actions in disaster management issues. This research develops Rescue Team Assignment and Scheduling Problem by considering the required capability for the disaster incident locations and capability of rescue teams to handling time and applying fuzzy logic for travel times and severity of incident locations. This research also develops the solution method by applying GRASP Metaheuristics approach to solve this problem in a reasonable computation time.

IEEM17-P-0346

Last Mile Distribution in Humanitarian Logistics Under Stochastic and Dynamic Consideration

Meilinda Fitriani Nur MAGHFIROH, Shinya HANAOKA
Tokyo Institute of Technology, Japan

Humanitarian Logistics has gained attention as it is expected to make a difference in disaster operations success. While managing pre-disaster decision is important, the ability to served victims as quickly after disaster stroke can help minimize the suffering. Last mile distribution is an inherent risk in humanitarian logistics due to its high uncertainty and dynamic nature. Thus, building responsive last mile distribution system is essential in the face of unpredictable demand and conditions. This study proposed last mile distribution model in considerations of the stochastic and dynamic situation. By incorporating flexible vehicle routing process, it is yearned to be able to minimize unmet demand while being responsive at the same time.

IEEM17-P-0844

Multi-Objective Optimization of the Competitive Supply Chain Network Design Based on a Huff Model

Niloofar AKBARIAN SARAVI, Reza TAVAKKOLI-MOGHADDAM, Zahra TAHAEI
University of Tehran, Iran

The aim of a Huff location problem is to locate facilities on a competitive environment to maximize the market share. The customer behavior is formulated based on a Huff gravity model. This paper considers a social impact along with economic and environmental aspects in order to construct new facilities in a competitive supply chain. This problem is a multi-objective mixed integer non-linear programming (MINLP). To deal with the problem, two multi-objective meta-heuristics (i.e., non-dominated sorting genetic algorithm (NSGA-II) and multi-objective particle swarm optimization (MOPSO)) are proposed to cope with this problem. The results verify the superiority of the NSGA-II over MOPSO in terms of some comparison metrics. Additionally, a two-stage algorithm is developed to sort non-dominated solutions generated by the NSGA-II. In the first stage, Pareto-optimal solutions are obtained by the NSGA-II, then in second stage, a ranking method based on TOPSIS is performed to select the best solutions among Pareto-optimal one.

Session	Decision Analysis and Methods 3
Date	12/12/2017
Time	11:15 - 12:45
Room	MR333
Chairs	Ainul Akmar MOKHTAR, *Universiti Teknologi Petronas*, Alberto BELLINI, *University of Bologna*

IEEM17-P-0556

Assessing Performance of Aging Air-Cooled Heat Exchangers Using Inspection and Performance Data

Ainul Akmar MOKHTAR[1], Masdi B. MUHAMMAD[2], Hilmi HUSSIN[1], Mohd Amin ABDUL MAJID[1]
[1]*Universiti Teknologi Petronas, Malaysia*
[2]*Universiti Teknologi PETRONAS, Malaysia*

This paper focused on one of the aging assets in gas processing plants which were the air-cooled heat exchangers. The heat exchangers have been operating for more than 20 years since the plant started and may have a greater risk of breakdowns. Thus, the main objective of the study was to assess the performance of the air-cooled heat exchangers and to determine the necessary actions for continued operation. Since there was no failure data, inspection data and performance data were used in this study. The performance analysis model used was based on the heat duty of the heat exchanger. The results from the analysis revealed that the critical level of percentage of tubes plugged before triggering the alarm at the compressor is 20.5%. Hence, it is proposed that the safe running level is to ensure that the percentage of tubes plugged is not more than 20%, else a planned replacement must be initiated. For the trip level, the results from the heat duty showed that 33% will trigger a trip at the compressor.

IEEM17-P-0244

Energy Balance of Waste Management Systems: A Case Study

Alberto BELLINI, Alessandra BONOLI
University of Bologna, Italy

Public policies for waste regulation can foster sustainable production systems in related fields. It is a common perception that waste to energy plants (WTE) are optimal solutions in terms of energy balance for dismissed materials, since they recovery part of the energy as electricity and heat. A few researchers state that there is an optimal threshold beyond whom separated collection of waste is of no use, since it results in a reduction of total energy recovered. This paper investigates the effects of the reduction of unsorted waste in terms of climate factors and energy balance. It is shown that energy saving density from recycling is higher than energy recovery from incineration, hence, source segregated recycling is a better option for waste management. The paper proposes a benchmark to assess the net energy balance of different waste management systems. A case study is reported, based on data of Emilia-Romagna, Italy, where unsorted waste was recently reduced of about 30% thanks to a dedicated waste tax and policies to promote waste separation and re-use. The case study is used to validate the proposed benchmark, while the method is general and can be used for different waste management systems and in different countries.

IEEM17-P-0506

Schools location through hybrid multi-criteria methodology to satisfy demand of extended school day program in Colombia

Jonathan CALIXTO, Nicolas TABARQUINO, Pablo MANYOMA
Universidad del Valle, Colombia

This research develops a hybrid methodology of multi-criteria decision analysis, which allows taking into account different factors for location of educational establishments in Cali (Colombia), in order to implement a national strategy called extended school day. This strategy seeks to increase equity by offering better opportunities to students in public schools, through increasing stay hours in educational establishments. The national government wants to build new schools and adapt existing facilities for extended school day. With our methodology development, it is possible to analyze different sites to construct a new educational establishment, and based on this evaluation, to define priority vector to reduce school infrastructure deficit and increase service coverage.

IEEM17-P-0507

Effect of Socioeconomic Status on Lung Cancer Survival: A Mediation Analysis Based on Bayesian Network Approach

Kartika Nur ANISA, Shi-Woei LIN
National Taiwan University of Science and Technology, Taiwan

Identifying factors and mechanisms that influence survival time of cancer patients is critical for healthcare decision makers. Besides the medical conditions, socioeconomic status (SES) of a patient may also significantly affect the prognosis of the disease. This study aims to investigate key determinants that affect lung cancer survival and to evaluate the direct and indirect effects (via other mediating variables) of SES on survival time. Bayesian Networks (BNs) were proposed and implemented to analyze a large database from The Surveillance, Epidemiology, and End Results (SEER) of the National Cancer Institute of the United States. Results show that the cancer stage at diagnosis is the most critical factor for determining survival time. Investigation of the underlying mechanism identifies both direct and indirect effects of SES on survival time, but the mediation analysis also indicates that the disparity on timely diagnosis (i.e., stage at diagnosis) caused by SES is only marginally significant.

IEEM17-P-0261

Development of Intelligent Building Management System Evaluation and Selection for Smart Factory: An Integrated MCDM Approach

Chih-Hao YANG
University of National Defense, Taiwan

Intelligent building management system (IBMS) has been recognized as a promising solution to growing issue of smart factory under industry 4.0 applications. Management systems play an important role in providing for operation optimization for the intelligent building. Considering IBMS evaluation and decision planning, this study present an integrated MCDM approach for evaluation and determination of management systems for the smart factory is analyzed, take into technological integration, government policy, product application and financial value, by using the Decision Making Trial and Evaluation Laboratory (DEMATEL), the Analytic Network Process (ANP) and VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR). This study contributes to the sustainable development - operation research (OR) literature, especially concerning the incorporation of the smart industry characteristic measurement into intelligent building management system, by utilizing MCDM decision model for intelligent building management system projects.

IEEM17-P-0601

OPBI: An Open Pipeline for Biomarker Identification

Sugandima VIDANAGAMACHCHI[1], Mahesan NIRANJAN[2]
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Biomarker discovery is one particular pipeline utilized in shotgun proteomics, which is made up of series of phases starting from a set of mass spectrum files and ending with some significantly expressed proteins that are related to a particular disease condition. Different techniques and tools have been introduced to perform protein identification and biomarker identification, and they still consume days/hours to carry out the processes. Further, they ignore MS1 information and consider only the information included in MS2 spectra. In this paper, we present an open-source, R-based, accurate biomarker identification pipeline, which provides solutions to time consumption problem in current biomarker discovery pipelines and utilizes the information of MS1 spectra. The developed pipeline was validated using three raw datasets of PRIDE database. We observed around 2-4 times speed-up and FDR ranges from 0.0003 to 0.0009. The biomarker identification system is accurate and operates in a considerable speed than commonly used, open-source MaxQuant tool.

Session	Manufacturing Systems 3
Date	12/12/2017
Time	11:15 - 12:45
Room	MR334
Chairs	Linda ZHANG, *IESEG School of Management*, Kerbache LAOUCINE, *HEC Paris/Qatar Foundation*

IEEM17-P-0019

Interpretive Ranking Process-based Lean Manufacturing Barrier Evaluation

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In the literature, diverse obstacles or barriers have been reported to result in the unsuccessful implementation of lean manufacturing in firms. However, little is known about these barriers' importance levels with respect to performances measures in lean implementation. In view of the lack of research and the importance in understanding them, this paper evaluates lean barriers in terms of their levels of importance in accordance with performance measures. The evaluation is based on a novel ranking technique – Interpretive Ranking Process (IRP). In the IRP-based evaluation, a group discussion technique is used to determine the most important lean barriers and performance measures; a number of matrices are developed for calculating the ranks of lean barriers. Upon validating the ranks, an IRP-based lean barrier evaluation model is developed. The model can help the practitioners better understand lean barriers and their levels of importance in lean implementation.

IEEM17-P-0906

Transiting Toward the Factory of the Future: Optimal Buffer Sizes and Robot Cell Design in Car Body Production

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[2]*HEC Paris, Qatar*

Recent improvement in robotics has sharply increased the adoption rate of robotic systems as robots are now more cost-effective when compared to human labor and a lot easier to use. Consequently, more people with little or no experience of line design are overseeing line automation. This paper proposes an easy-to-use tool with an application in a car-body shop - extension for application to other processes is feasible with minor modifications. In car-body shops, most of the operations are performed by robots that load and weld stamped steel parts. These robots are organized in cells separated by buffers. One of the main objectives of car-body shop designers is to keep cost as low as possible with no impact on the production rate and the quality of the parts produced. To do that, they have at their disposal two main levers: the size of buffers and the number of robots. Adding more buffers could reduce the impact of disruptions and, consequently, increase the production rate. On the other hand, adding robots will speed up the lines which would also increase the production rate. Both add significant but different costs. Also, additional robots means additional failures, and this may reduce or reverse the increase in production rate. Given a target production rate, the goal of the method submitted in this paper is to help production line designers answer the following questions: What robot and buffer space allocation will meet the target at least cost? This paper proposes a judicious analytic solution based on simplifying yet realistic assumptions.

IEEM17-P-0748

A Random Forest Method for Obsolescence Forecasting

Yosra GRICHI, Yvan BEAUREGARD, Thien-My DAO
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Driven by the frequent technological changes and innovation, obsolescence has become a major challenge that cannot be ignored in which the life cycle of the components is often shorter than that of their systems. Basically, obsolescence problems are often sudden and not planned which causes delays and extra costs. On the other side forecasting appears to be one of the most efficient solutions to solve this problem. This paper aims to provide new light and help industries to generate different solutions to the problems of obsolescence. Specifically it presents a framework for forecasting the obsolescence based on random forest (RF) algorithm which has proven as the best predictor for forecasting obsolescence risk based on a previous comparative study with a high degree of accuracy.

IEEM17-P-0450

Use of Additive Manufacturing for Polymer Tooling: Case Study from Reaction Injection Molding

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University of Stavanger, Norway

Manufacturing tooling for injection molding has traditionally been associated with high cost and long lead times, due to the complex geometry and demanding machining requirements. This has caused injection molding to be limited to large-volume production, as the tooling needs to amortize over large volumes to achieve a low unit cost. Additive Manufacturing (AM) technologies enables a high degree of complexity at a low cost, which enables cost-efficient manufacturing of the geometries required for injection molding tooling. Using AM tooling for thermoplastics injection molding presents a challenge, as it requires high pressures and temperatures, which destroy the tooling after only a few shots. Hence, this study focuses on investigating the use of softer polymer tooling with Reaction Injection Molding (RIM), which requires lower temperatures and pressures than those of thermoplastics injection molding. A case study has been performed to assess both the cost implications and how the use of AM tooling for RIM affects organizational agility.

IEEM17-P-0015

A Hybrid Backtracking Search Algorithm for Permutation Flow-Shop Scheduling Problem Minimizing Makespan and Energy Consumption

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[2]*Jianghan University, China*

With the advent of sustainable manufacturing, energy consumption becomes an essential consideration in the scheduling problem. However, traditional permutation flow-shop scheduling problem (PFSP) always only considers the production efficiency as its objective. In this paper, a hybrid backtracking search (HBSA) is proposed to minimize both the makespan and energy consumption for PFSP. In HBSA, the simulated annealing (SA) is hybrid with original backtracking search to update the population and then a local search algorithm is applied. Considering the effects of different operators on BSA, we analyze the effectiveness of initialization, crossover, and mutation and use the efficient strategy to improve its performance. Finally, the proposed HBSA is tested on the several benchmark problems to evaluate its performance, and the results are compared with genetic algorithm and branch and bound algorithm. The results validate its effective.

IEEM17-P-0741

Hybrid Simulation Method by Cooperating Between Manufacturing System Simulation and Computational Fluid Dynamics Simulation First Report: Optimization for Energy Consumption per Unit of Production Throughput Considering Compressed Air Feed

Hitoshi NAGASAWA[1], Hironori HIBINO[1], Motonobu HASHIMOTO[2], Norifumi KASE[2]
[1]*Tokyo University of Science, Japan*
[2]*ITOCHU Techno-Solutions Corporation, Japan*

For enhancing the energy efficiency of a manufacturing system as a whole, it is critical to optimize energy consumption including that in the utility systems, which supplies compressed air, and that in each production line. However, there has been no progress in the research of methods for optimization. Hence, in this research, a method, which is a hybrid of a manufacturing system simulation and computational fluid dynamics simulation, is proposed for evaluating the operation of both production lines and compressed air systems simultaneously. The proposed method is used to evaluate the deficiencies and excesses in the supply from a compressed air system and the reliability of the supply of a compressed air system in response to the daily production schedule. Moreover, the energy consumption per unit of production throughput is optimized for various compressed air feed.

Session	Quality Control and Management 3
Date	12/12/2017
Time	11:15 - 12:45
Room	MR335
Chairs	Yaping LI, *Nanjing Forestry University, Shanghai Jiao Tong University*, Niranjan Kumar SINGH, *NIFFT, Ranchi,JKD,INDIA*

IEEM17-P-0546

Robust Inference Traceability Technology for Product Quality Enhancement

Qi XIU, Keiro MURO
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In manufacturing industry, it is important to analyze defect manufacturing data for product quality enhancement. Manufacturing data for defect analysis are retrieved by individual ID, which is unique identifier assigned to each individual product. However, in production lines existing machining processes such as sintering process and cutting process, individual ID can't be attached. Hence, there arises a problem that manufacturing data for defect analysis can't be prepared. Therefore, we developed Robust Inference Traceability (RIT) technology which can accurately estimate individual ID in various manufacturing conditions such as processing time variation, parallel process and reversal of production order. RIT manages it by absorbing lead time variation and estimating production time. The result of applying RIT to actual manufacturing data shows that the technology obtained an average inference accuracy of 92.9%. As a result, it can be estimated that product quality can be enhanced by defect analysis such as root cause analysis.

IEEM17-P-0660

An Application of Fractional Factorial Method to Obtain Robust Solutions at a Glove Manufacturing Environment in Sri Lanka

Achinthya PERERA, Pramila GAMAGE
University of Peradeniya, Sri Lanka

Variation is inevitable in any phenomenon. It is a crucial requirement to make a continuous effort to improve the performance and quality of products or processes to clutch the competitive advantage of the industry. Hence, the concept of 'robustness' was developed as a major characteristic of design engineering and product development in modern manufacturing to make the process and/or the product insensitive to variations transmitted from noise factors. Thus, the intent of this paper is to provide an application of fractional factorial design techniques to improve the level of abrasion resistance of industrial gloves by making a robust process in a Sri Lankan manufacturing context. The results show that one main factors (vulcanizing agent), and 04 two way interactions—32 experimental runs were conducted by manipulating 11 factors–have a significant impact ($p<0.10$) on abrasion level of the industrial gloves. The confirmation run results also verified the robust solution obtained from fractional factorial experimental design.

IEEM17-P-0784

Spectral Network Approach for Multi-Channel Profile Data Analysis with Applications in Advanced Manufacturing

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[2]*Micron Technology, Singapore*

In the advanced manufacturing, a lot of sensors are used to collect real-time process signals for statistical monitoring. Motivated by the complex correlation structures of these mutli-channel profile signals, this paper proposes a monitoring scheme for their cross-correlations with the help of spectral network approaches. In particular, we first construct a network model for multi-channel profiles by extracting their features based on the multi-channel functional PCA. The topological structure of the network can represent the cross-correlations of multi-channel profiles. Then we propose to monitor the topological structure using its spectrum information. Numerical studies in a certain fabrication process demonstrate the applicability and efficiency of the proposed methodology.

IEEM17-P-0364

Quality, Excellence and Culture in the Pursuit of Organizational Agility

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Operational excellence programs have proved to be valuable in helping companies improve their quality practices and their performance. However, after some time, these programs seem to stagnate and to be unable to keep pushing organizations forward. We believe that this problem is due to the lack of integration between excellence and agility, which we see as a natural goal for organizations that wish to promote a true culture of excellence in face of highly unstable business environments. This paper presents our research approach to the problem, and early results from investigating the influence of a culture of excellence in promoting an enduring capacity to change.

IEEM17-P-0691

An Optimization Design of the Exponentially Weighted Moving Average Control Chart

Mona AGHNIAEI, Mohammad SHAMSUZZAMAN, Sadeque HAMDAN
University of Sharjah, United Arab Emirates

Statistical Process Control (SPC) charts are generally utilized in detecting process shifts to guarantee the product quality. The Exponentially Weighted Moving Average (EWMA) control charts indicate better performance in detecting small shifts in process parameters. This study presents a model for the optimization design of the EWMA chart monitoring process mean. The optimization model aims to limit the aggregate expected cost including sampling cost and quality cost based on random process shift. The model has been created and the performance of the proposed EWMA chart has been compared with that of a traditional EWMA chart.

IEEM17-P-0801

Optimization of Green Sand Casting Parameters Using Taguchi Method to Improve the Surface Quality of White Cast Iron Grinding Plates – A Case Study

Lakshman SAMARAWEERA, Shiron THALAGALA, Pramila GAMAGE, Manjula NANAYAKKARA
University of Peradeniya, Sri Lanka

This research focuses on the optimization of parameters in green sand casting process; specifically to improve the surface quality of white cast iron grinding plates using statistical design of experiments techniques. Four controllable factors; Bentonite (A), charcoal (B), water content (C), sand mixing time (D) and one noise factor; pattern (E) were considered as the influential factors which have an impact on surface quality of the cast grinding plate. Taguchi method was used as the experimental method to conduct the experiments. The analysis of the experiment shows that main factors A ($p = 0.061$), D ($p = 0.021$), B ($p = 0.180$) and AB ($p = 0.060$) two way interaction have a significant impact (at 10% significance level) on surface quality of grinding plates. Finally, the results obtained through the confirmation run verified the optimum parameter settings produced by the Taguchi method gives robust solutions to improve the surface quality of grinding plates successfully.

Session	Service Innovation and Management 3
Date	12/12/2017
Time	11:15 - 12:45
Room	MR309
Chairs	Satya SHAH, *University of Greenwich UK*, Huey Yuen NG, *Singapore Institute of Manufacturing Technology (SIMTech), Singapore*

IEEM17-P-0482

An Overview of Sustainable Practices in Food Processing Supply Chain Environments

Olumide OJO, Satya SHAH, Alec COUTROUBIS
University of Greenwich, United Kingdom

Climate change has been a great challenge that the world is facing, it is a menace to the society and it is causing more damage than expected. The researchers are working tirelessly to reduce its impact on the planet in order to save the future. Mitigation of greenhouse gas emission and other sustainable practices is encouraged every day to make the world a better place to live Sustainable practice has been identified as one of the major tools to control this greenhouse gas emission especially in the emergent nations where industrialization is now growing rapidly. This paper discusses and analyzes the food security and food processing industry in the emergent nations. It also reviews literature on food processing, supply chain environments, sustainability and sustainable practices in relation to how these could help in promoting the sustainable development and environmental protection goals in the emergent nations.

IEEM17-P-0182

How Do Employees Inspire Innovative Work Behavior? Transformational Leadership and Work Motivation Perspectives

Jen-Chia CHANG, Chia-Ying LEE, Pai-Yen WEI, Wei-Cheng HUANG
National Taipei University of Technology, Taiwan

In the rapidly changing 21st century, a new type of work methods and behavior is necessary and important. Research has unveiled the factors impacting innovative work behavior, but the underlying mechanisms for sustained inspiration remained far from fully understood. To fill that knowledge gap, this study investigated 50 good performance companies in Taiwan, and used the factors work motivation and transformational leadership to test the study's hypotheses; responses from 150 employees were used in the analysis. The findings suggest that both work motivation and transformational leadership are positively related to innovative work behavior, and that continuous transformational leadership and enhanced employee motivation can make employees produce results from innovative work behavior.

IEEM17-P-0366

Design of an Evaluation Methodology for the Service Design and Development Process from Concurrent Engineering: The Case of the Advertising Sector

Dayni REYES, Rita PEÑABAENA-NIEBLES
Universidad del Norte, Colombia

This paper presents the design and validation of a methodological proposal for the evaluation of the Advertising Design and Development Process (ADDP) from the perspective of Concurrent Engineering (CE). First, a model for the ADDP that allows the concurrence of activities was design and then an evaluation methodology was established. As result of the methodology, a measurement instrument was developed integrating organizational, technological, human, information and market factors to detect failures during the PDCA cycle. Finally, this instrument was validated to make the necessary adjustments so that the measurement tools are correctly raised.

IEEM17-P-0477

Sustainable Supply and Demand Chain Integration within Global Manufacturing Industries

Elmira NAGHI GANJI, Satya SHAH, Alec COUTROUBIS
University of Greenwich, United Kingdom

Given the emerging industrial management strategies considering three pillars of sustainability in particular, there is a vital need to determine the differences of sustainability practices within both supply and demand distribution systems through global manufacturing environments providing with the successful global trade and logistics. This research paper aims to explore the interactions and advantages of sustainability applications within both supply and demand chain management. The research framework adopted consists of survey questionnaire method which is conducted within a global tyre manufacturing company. The research results and analysis justify the need for the application of ethical codes, supply chain transformation and the effective association of industry executives, professional bodies and the government. The research study also identifies that the vital incentive factors for the organisation towards sustainable supply demand chain (SSDC) are mostly the financial benefits of doing so and therefore, a positive mind-set shift towards greening practices is required.

IEEM17-P-0878

Product-Service System for Indonesian Industrial Estate Firms: A Conceptual Framework

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Institut Teknologi Bandung, Indonesia

Indonesian industrial estate firms give important contribution to industrial development toward national economic enhancement. Due to their significant roles, they need to be sustained. The initial problem faced by industrial estate firms is their limited resources, particularly in the availability of land and/or building. Thus, the industrial estate firm must gain profit from both products and services. To help industrial estate firms to sustain, this article proposed product-service system (PSS) concept that combine tangible products consumption and services. PSS categorized into three types, product-oriented, user-oriented, and result-oriented. Each type has its own characteristics and compositions of products and services. It will then be used to study Indonesian industrial estate firms in order to attain sustainability. It is discovered that 2015 Indonesian Industrial Estate Awards Winners (KIIC, Jababeka, Batamindo, and MM2100) have practiced all types of PSS, mainly for supporting services, although they still emphasize on selling products.

IEEM17-P-0649

Unlocking the Economic Value and Potential of Design for Manufacture and Assembly in a Developing Country for Sustainability

Wilson R. NYEMBA[1], Rodney MUZOROZA[2], Tauyanashe CHIKUKU[2], Charles MBOHWA[1]
[1]*University of Johannesburg, South Africa*
[2]*University of Zimbabwe, Zimbabwe*

Design for Manufacture and Assembly (DFMA) principles are aimed at 'doing it right the first time' in the minimum possible time with the least or optimal number of parts. However, this depends on the operating environment and thus differs from place to place. This normally presents challenges to engineers tasked with product development, compounded by poor macro-economic conditions. Research carried out at a boilermaking company in Zimbabwe at a time when the country was facing an economic crisis revealed that due to inadequate infrastructure, the company would have lost the potential to supply ethanol storage tanks. The research was aimed at exploring the potential and maximizing the economic value of DFMA by modifying them to suit the environment and in so doing, helped the company to secure the business opportunity for the sustainable production and supply of storage tanks.

IEEM17-P-0423

The Delivery of Service Quality to Increase Customer Repurchase Behaviour and Customer Satisfaction at Fast Food Outlets in Central Johannesburg, South Africa

Save AKILIMALISSIGA, Nita SUKDEO, Andre VERMEULEN
University of Johannesburg, South Africa

The purpose of this paper is to determine the satisfaction level and repurchase behaviour of customers from fast food outlets (FFO), with regard to the five service quality dimensions. The focal point of the paper is to evaluate the fast food outlets (FFO), service quality through customer satisfaction. The higher the level of customer satisfaction, the greater the impact on customer retention and repurchasing behaviour. A questionnaire was established from SERVQUAL (Perceptions vs Expectations) and repurchasing behaviour concepts. The research required a convenient sampling method. Data obtained was analysed using description analysis to determine whether service quality perceived, leads to repeat purchases. After the composite analysis was conducted, it indicated a disparity between customers' perceptions and expectations. The overall service quality of the three combined fast food outlets using the SERVQUAL instrument resulted in negative gap average of (-0.6174) indicating that customers' expectations exceed perceptions. Consequently, customers are dissatisfied with service perceived.

Session	Reliability and Maintenance Engineering 3
Date	12/12/2017
Time	11:15 - 12:45
Room	MR308
Chairs	Zied HAJEJ, *LGIPM/ Lorraine University*, Masdi MUHAMMAD, *Universiti Teknologi PETRONAS*

IEEM17-P-0509

A Jointly Integrated Maintenance and Emission Optimization for a Manufacturing and Remanufacturing System

Zied HAJEJ, Nidhal REZG, Salim BOUSLIKHANE
Lorraine University, France

This study treated an optimal integrated maintenance under ecological constraint for a closed-loop system. The industrial scheme is composed by a manufacturing and remanufacturing units to meet a random demand with a given service rate and by respecting the retractation right. The production scheme subjected to random failures and a carbon emission. The goal of this study is to propose a new production strategy to find the economical plans of manufacture and carbon emission quantities as well as the optimum plan of maintenance actions with minimal repair for the production and remanufacturing machines.

IEEM17-P-0050

A Simple Algorithm to Verify Cycles in MSNs for a Given Demand Level

Shin-Guang CHEN
Tungnan University, Taiwan

In applications of network theory, paths and cycles are important features to explore in a network. There are many methods to explore such features in graphs, namely binary-state networks. However, there are only limited methods to explore paths or cycles in multistate networks (MSNs). Nonetheless, in dynamic situation, the various flowpatterns make cycles changing in MSNs by given different demand levels. For example, the traveling salesmen problem, shortest path problem, or maximal flow problem under flowconstraints are this kind of applications. Therefore, efficiency is important in such applications. This paper proposes an efficient algorithm to explore cycles in MSNs for a given demand level. Various examples are explored to illustrate the proposed method.

IEEM17-P-0305

Cause Analysis of Representative Troubles at Distillation Tower Using Discriminant Analysis

Jun OKITSU[1], Toshiaki MATSUO[1], Hiroki YAMAMOTO[1], Haslinda Bt ZABIRI[2], Lemma Dendena TUFA[2], Marappagounder RAMASAMY[2]
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[2]*Universiti Teknologi PETRONAS, Malaysia*

In order to improve crude distillation unit (CDU) operating efficiency, a cause analysis method to identify CDU anomalies based on discriminant analysis was proposed. The method identifies sensors in CDU that behave different between during anomaly and normal period using discriminant analysis. To detect cause of troubles with the identified sensors, category table to categorize sensors based on domain knowledge and statistical analysis using histogram were introduced. Binary distillation experiments using a mixture of ethanol and water carried out on test equipment at Universiti Teknologi PETRONAS (UTP) confirmed that the method could detect causes in 6 troubles out of total 7 heat exchanger related troubles that were experimented in the equipment.

IEEM17-P-0609

Reliability Modeling of Incomplete Common Cause Failure Systems Subject to Two Common Causes

Jin QIN, Ruoxing GU, Guijie LI
China Academy of Engineering Physics, China

In this paper, the Common Cause Failures (CCFs) we consider are caused by random loads and strength. Unlike the general reliability model for CCF systems, failure modes are regarded as the basic units instead of components. Firstly, the reliability models of typical series systems and parallel systems are developed based on failure mechanism analysis, GLSI model and conditional probability theory. Secondly, the reliability model of a specific series-parallel system subject to two kinds of Common Causes (CCs) is developed based on reliability block diagram. Furthermore, the general modeling procedures of CCF systems subject to two kinds of CCs are presented. Finally, by using Monte-Carlo simulation, a group of data is given to verify the CCF model of the given series-parallel system and the CCF model is compared with the independent-failure model. It can be concluded that the CCF modeling method proposed in this paper is applicable for incomplete CCF systems subject to two-kind common causes.

IEEM17-P-0613

Bi-Level Optimization for Maintenance Service Contracts Involving Three Parties Using Genetic Algorithm

Nur F. SA'IDAH, Andi CAKRAVASTIA, Udjianna S. PASARIBU, Bermawi P. ISKANDAR
Bandung Institute of Technology, Indonesia

This paper deals with a Maintenance Service Contract (MSC) involving three parties – Manufacturer, Service Agent and Customer. We formulate decision problems of the three parties using Stackelberg game theory formulation and integrate the three interdependent decision models using a bi-level optimization formulation. As the objective functions and their constraints are all in non-linier form, then we need to use Karush-kuhn Tucker condition to convert the optimization problem into a single level optimization. A genetic algorithm is used to obtain the optimal solution (i.e. the best option and its optimal price) for each party.

IEEM17-P-0624

Joint Optimization of Preventive Maintenance and Economic Production Quantity with Considering Demand Adjustment

Xuejuan LIU, Rui PENG, Qunxia LI, Xiaoyang MA
University of Science and Technology Beijing, China

An integrated cost model for jointing preventive maintenance (PM) and economic production quantity (EPQ) in a multi-product system is proposed in this paper. Assume the production horizon is finite, which is composed of several production cycles, some types of the products should be produced in lots within the cycles. For less disturbing to the production process, and according to the situation in reality, we also assume PM should be done at some setup time epoch. The demand should be adjusted because the downtime caused by maintenance and setup is random. The objective of this paper is to optimize EPQ and PM schedule through minimizing the expected cost per product influenced by adjustment coefficient of demand within the planning horizon. A case study is presented to show the availability of the model.

Session	Operations Research 6
Date	12/12/2017
Time	13:45 - 15:30
Room	MR327
Chairs	Philipp BAUMANN, *University of Bern*, Temel ONCAN, *Galatasaray University*

IEEM17-P-0608

Optimal Staff Assignment and Routing in Personalized Home Care

Philipp BAUMANN
University of Bern, Switzerland

The increasing demand for labor intensive medical services such as personalized home care has contributed considerably to the rising cost of health care systems throughout the world. An efficient deployment of medical personnel has therefore become a priority for many medical service providers. In this paper, we address a real-world staff assignment and routing problem that was reported to us by a Swiss home care provider. The problem is to determine a multi-day visiting schedule that satisfies various constraints related to time windows, skill requirements, and the availability of personnel. Visiting schedules are evaluated based on service quality and deployment efficiency. We develop a novel mixed-binary linear programming formulation for this problem that is particularly efficient for long planning horizons. Our computational results demonstrate that the proposed formulation outperforms a recently-introduced formulation and is able to devise optimal or near-optimal solutions for real-world problem instances in short running times.

IEEM17-P-0290

Iterated Exact and Heuristic Algorithms for the Minimum Cost Bipartite Perfect Matching Problem with Conflict Constraints

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[2]*Boğaziçi University, Turkey*

In this study we address the Minimum Cost Bipartite Perfect Matching Problem with Conflict Pair Constraints (MCBPMPC) on bipartite graphs. Given a cost attached to each edge, the MCBPMPC is to find a minimum cost perfect matching on a bipartite graph such that at most one edge is chosen from a set of conflicting edge pairs. Two formulations, specially tailored iterated exact and heuristic algorithms are introduced. Computational experiments are performed on randomly generated instances. According to the extensive experiments, the iterated exact algorithm yields promising performance.

IEEM17-P-0231

Green Vehicle Routing Problem with Path Flexibility

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[2]*Polytechnique Montréal and CIRRELT, Canada*

In this paper, we consider the vehicle routing problem in the context that — multiple paths are optional between each customer pairs, while only one path is implied in traditional vehicle routing problems. We proposed the Green VRPTW-PF model, which takes the fuel consumption of acceleration and waiting on traffic lights into consideration. The model aims to determine the routes for a heterogeneous fleet of vehicles so that the sum of driver's wage, fuel consumption cost and emission cost is minimized. We generated a set of instances and solved them by a commercial solver. Numerical experiments show that: 1). path flexibility has a significant influence on the optimal solution when considering green issues; 2). it's not always the best choice to travel on the shortest path between two customers; 3). acceleration and waiting fuel consumption has little impact on objective function.

IEEM17-P-0497

Heuristic Approach of Exact Bin-Packing Model

Amandus JOHANSSON, Manfred AXELSSON, Klas GUSTAVSSON
Mid Sweden University, Sweden

Bin packing problem has gained a wide interest in academia and in practice since the problems quickly becomes intractable as the problem grows. In this paper two models are compared: one model that generates exact solutions for bin packing problem and one that uses the same fundamental approach on the problem but extended with a heuristic combination of next-fit and a combinational best-fit. The results proves that the heuristic approach has competitive features of linearity as the problem grows, but still with satisfying optimums in the evaluated instances.

IEEM17-P-0436

Towards Extending Algorithmic Strategy Planning in System Dynamics Modeling

Maximilian MOLL
Bundeswehr University, Germany

Acknowledging the importance of System Dynamics, this paper takes a first step towards extending the policy optimization capabilities, by allowing the controlled parameters to vary in time. To achieve this, for the first time a REINFORCE algorithm is being applied to a System Dynamics model. In order to improve performance, several instances are being made to compete against each other in several stages. A simple model is being used to compare this new approach to both the existing one and the optimal solution. It is shown that as expected the time varying parameters outperform the traditional constant parameter optimization and even almost reach optimality in some cases. Finally, a comparison is being drawn, when applying the same methodology to a system with noise.

IEEM17-P-0620

Dynamic Lot Sizing with Time-Varying Demand and Return Rates for a Product Life Cycle

Hong SUN, Weida CHEN, Zhiliang REN
Southeast University, China

In this paper, we propose dynamic lot sizing policies for a hybrid manufacturing and remanufacturing system in according with product life cycle. Demand rate and return rate are time-varying over the finite production horizon. Customer demand can be satisfied by new products or remanufactured products. The main objective is to minimize total cost of full product life cycle by optimizing the manufacturing and remanufacturing lot sizes. Optimal manufacturing and remanufacturing lot sizing policies in each phase are derived. Numerical results show that the remanufacturing activities replace manufacturing activities gradually with returns increases. The frequency of manufacturing in maturity phase is more than in introduction phase, whereas the frequency of remanufacturing in maturity phase is less than in decline phase. Therefore, the remanufacturing enterprise needs to determine its lot sizing policy based on the life stages of product.

IEEM17-P-0866

Green Vehicle Routing and Scheduling Problem with Optimized Travel Speed

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Arab Academy for Science, Technology, and Maritime Transport, Egypt

Among all logistics activities, transportation is presented as a major source of air pollution and other environmental concerns worldwide. Road transportation significantly increases carbon dioxide, which is a known greenhouse gas emissions of vehicles. Therefore, environmental targets are added to economic targets in the vehicle routing decision making to find the right balance between these two dimensions. Research into quantifying emission rates based on travel speeds and for different vehicle sizes, showed that based on the vehicle type and using specific emission coefficients, optimum travel speeds that minimize carbon dioxide emissions can be obtained. In this paper we propose a mixed integer programming model for the green vehicle routing and scheduling problem with time dependent travel speeds and heterogeneous fleet, in which vehicles are characterized by different capacities, costs and emissions factors. The model aims at minimizing CO2 emissions by minimizing the deviation of travel speed from optimum travel speeds.

Session	Technology and Knowledge Management 4
Date	12/12/2017
Time	13:45 - 15:30
Room	MR328
Chairs	Lena Stephanie FELIX, *Nanyang Technological University*, Ville OJANEN, *Lappeenranta University of Technology*

IEEM17-P-0879

Singapore's NEHR: Challenges on the Path to Connected Health

Lena Stephanie FELIX
Nanyang Technological University, Singapore

Singapore enjoys the rare distinction of being ranked among the healthiest countries in the world with one of the most efficient healthcare systems. However, what is needed in the present context is a transformation of the country's healthcare system in view of the looming 'silver tsunami' (a rapidly ageing population), which may render the country's predominantly hospital-centric healthcare model unsustainable in the mid to long run. The present study casts light on the key issues surrounding the design and implementation of the National Electronic Health Records (NEHR) in Singapore and suggests how these issues may be addressed.

IEEM17-P-0656

Achieving Strategic Growth in Microenterprises through Information Technology: UK Micro Enterprise Case Study

Satya SHAH, Matthew LONG, Elmira NAGHI GANJI
University of Greenwich, United Kingdom

Technology is a powerful tool that aims to assist efficient and effective use of resources within businesses. The paper examines to provide an understanding on the use of Information Technology tools and its influence on a UK microenterprise. It aims to explore further understanding on the strategic growth of any microenterprise firms. Through research findings and that of the analysis, it develops reasons and factors towards achieving greater time efficient practices with the use of information technology tools to achieve strategic growth for the business in the challenging economic markets. The paper presents the preliminary case study of UK microenterprise through observational findings examining general business processes, the challenges and drawbacks within the working environments and that of the use of technological tools. The findings of this case study will further enable the researchers to develop a novel framework to assist and enable any microenterprise in achieving overall strategic growth.

IEEM17-P-0633

Mechanisms for Effective Tacit Knowledge Transfer in University Laboratory: An Agent-Based Approach

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[3]*Bandung Institute of Technology, Indonesia*

Source, recipient, and knowledge characteristic play an important role towards tacit knowledge transfer effectiveness. Moreover, to foster the transmission of tacit knowledge, it is required to define the mechanism, whether it is a formal or informal mechanism. Therefore, the effect of transfer mechanism together with the source, recipient, and knowledge characteristic towards tacit knowledge transfer effectiveness should be properly examined. Since knowledge transfer is considered as a complex system, the usage of agent-based approach is perfectly qualified. The purpose of this study is to examine tacit knowledge transfer effectiveness by generating all possible scenarios based on source, recipient, and knowledge characteristic in formal and informal transfer mechanism using agent-based modeling and simulation approach. The result of this study found that the developed model has successfully generated the knowledge transfer effectiveness score by the error of 5%. The informal mechanism for some activities is the better strategy for transfer mechanism.

IEEM17-P-0905

Research on the Key Factors of Tacit Knowledge Diffusion in Customized Titanium Processing Enterprises Based on ISM Model

Qinglin BAO, Huaqi CHAI, Kang WU
Northwestern Polytechnical University, China

In the context of knowledge-based economy, tacit knowledge is been highly valued and becomes the source of the core competitiveness of enterprises. Based on the literature reviews on tacit knowledge diffusion, ISM model is used in this paper to analyze and identify the key factors with a hierarchical structural model in customized titanium processing enterprises. It helps enterprises to improve knowledge innovation efficiency, enhance the knowledge application ability and strengthen technical capabilities and the talent storage capacity. After three steps of analysis of ISM model, the results showed that the influence factors on the tacit knowledge diffusion were prioritized. Employees and enterprises aspects had a direct impact on the tacit knowledge diffusion, whereas internal and external environment aspects were the basic influence factors that supported the other two aspects. Thus, managers may improve the tacit knowledge diffusion efficiency based on such advises.

IEEM17-P-0759

Design and Development of a Training Module for Data-Driven Product-Service Design

Anies Faziehan ZAKARIA, S.C. Johnson LIM
Universiti Tun Hussein Onn Malaysia, Malaysia

Product–service design (PSD) is an integration of tangible product and intangible service. It comprises large number of design information aimed to offer better package design that satisfies customer requirements. The main challenge faced by designers is to ensure all the data and information is organized and readily accessible during design analysis e.g. product-service cost, configuration and quality etc. Previous literature studies are focused on data and knowledge management during design process. However, data analytics core skills such as data preparation, pre-processing and visualization with embedded programming skill are less emphasized. Thus, it is necessary for designers to have skills for managing data-driven design that helps in decision making. This study proposed design and development of a training module for data-driven PSD using ADDIE model. An expert assessment was conducted to measure the usability of our proposed training module. Our findings showed that the usability score of the module falls within the acceptable range and therefore it is suitable to be used for data-driven PSD training.

IEEM17-P-0330

Servitization and the Wider Services Communities: A Bibliometric Study

Alan PILKINGTON[1], Jawwad RAJA[2], Juliana HSUAN[2], Thomas FRANDSEN[2]
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For several years attention has been directed to the possible value for manufacturers shifting focus downstream in the value chain. As such the topic of servitization is emerging as a distinct and prominent research area. But even with this growing significance, there is only limited prior research analysing the citation patterns in service research, and none has focused on the emergence of servitization, associated terms, and its strong cross disciplinary nature. We use bibliometric analysis to uncover the literature development in service research and identify the changing dominant research themes. Specifically, we present the outputs of the co-citation networks for three periods: 1990s (early period), 2000s (middle), and 2010s (recent) and see a shift in orientation from a narrowly focused Operations Research tradition to a more managerial and strategic emphasis that places services, and specifically the emergence of servitization, at the centre stage of strategy and value creation.

Session	Safety, Security and Risk Management 2
Date	12/12/2017
Time	13:45 - 15:30
Room	MR329
Chairs	Nantakrit YODPIJIT, *King Mongkut's University of Technology North Bangkok*, Om Prakash YADAV, *North Dakota State University*

IEEM17-P-0924

Environmental Analysis of Biomass Power Plants for Sustainability in Thailand

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[2]*King Mongkut's University of Technology North Bangkok, Thailand*

The environmental impact of electricity generation is becoming more critical as electricity consumption continues to increase. This is because the world's population is growing very fast and modern communities use large amounts of electric power. This paper presents the assessment and management of environmental risk of 7.5 and 9.9 MW biomass power plants in Thailand. Three environmental factors (air, sound, and water) have been examined in this research project. In the environmental analysis, comparisons of measured environmental data from the sites and environmental standards by USEPA (United States Environmental Protection Agency) and Thailand's PCD (Pollution Control Department) are performed. This research project focuses on sustainability that impacts economic, social, and environment aspects by communities, companies, and individuals. The sustainable development of the research project can lead to a coherent and long-term balance between these three aspects. Recent findings from the environmental monitoring system revealed that quality levels of all three environmental factors are under the standards. It is implied that these two biomass power plants do not negatively affect the environment and satisfy the essential needs of humanity.

IEEM17-P-0377

High School Students' Knowledge and Seismic Risk Perception: The Case of Mexico City

Jaime SANTOS-REYES, Tatiana GOUZEVA
Instituto Politécnico Nacional, Mexico

A cross-sectional seismic risk perception study was conducted for the case of a high school students in Mexico City. The sample size of the population was N=302. Moreover, a nonprobability sampling was considered in the study. The working hypothesis was considered at a significant level of α=0.05. The relationship between the independent and dependent variables in relation to the psychological issues has been assessed by employing the non-parametric Mann-Whitney U and the Kolmogorov-Smirnov tests. Some of the preliminary results are: a) females are more knowledgeable than males on why an earthquake occurs; b) the Morning school students are more knowledgeable than Afternoon school students on the issue related to earthquake prediction and the time to get to safety once a 'seismic early warning' is activated; c) 73.8% of the students that participated in some sort of seismic risk educational programmes know the time to get to safety; d) 44% participants that discuss seismic risk issues at home have a defined meeting place after the occurrence of an earthquake; e) when participants do not discuss earthquake preparedness at home, 35.8 of them have a first aid kit; f) 19.6% of the participants experienced "a lot of fear" during the occurrence of an earthquake; and g) 7.28% feel scare when thinking or talk about earthquakes.

IEEM17-P-0907

Quantitative Risk Analysis of Components Under High Stress

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Lack of availability (reliability and maintainability) data is a key challenge during the design process of a new equipment or a production plant for a new location. Lack of data will also increase the uncertainty associated with design significantly. One solution is to use the collected historical data from similar equipment or results from high stress tests, such as Accelerated Life Test (ALT). However, the available studies mostly, focused on the estimation of the probability of failure of the component. The main purpose of this paper is to propose a framework for quantitative risk estimation for a components under high stress. In this paper, the ALT concepts is used to estimate the probability of the failure and associated consequences.

IEEM17-P-0694

Awareness of Information Security and its Implications to Legal and Ethical Issues in Our Daily Life

Daniel TSE, Zehan XIE, Zhaolin SONG
City University of Hong Kong, Hong Kong SAR

Information security issue becomes increasingly concerns in the current environment with fast development of information technology, in which most of the concerns are rising from legal and ethical aspect. It is always questioned that are individuals and organizations aware of information security and the relevant regulations. How would they act when encountering information security misuse? How much power do regulations and ethics have on restricting information security misuse? This research study will mainly analyse legal and ethical issues in information security including the public awareness of information security and their impact. We formed three hypotheses based on the relevant court case review and the related literature, and have discussed whether the hypotheses are supported or not and several interviews to the victim of information security victim.

IEEM17-P-0567

Injury Prediction Based on Safety Climate Questionnaire Score Using Artificial Neural Networks

Yu Cheng CHANG, Szu Yu LEE, Pin-Ling LIU, Chien-Chi CHANG
National Tsing Hua University, Taiwan

According to the statistics of the Ministry of Labor in Taiwan, there are over 54,000 occupational accidents each year from 2011 to 2015. One third of the accidents happened in the manufacturing industry, of which the steel manufacturing industry is a part. Steel industry employees are undoubtedly working in an extremely vulnerable environment. Therefore, it is important to improve workers' safety. Predicting accidents may be one solution for managers to understand the dangers ahead of time, so that they can implement protective actions. Artificial Neural Networks (ANNs) is a widely used method for prediction. It has been used in many areas and objectives. In this study, we use an ANNs model to predict whether an operator in the steel industry will encounter an accident. The prediction factor is the score from safety climate questionnaire, which is an easy way to assess the safety of the organization. The results showed that the prediction accuracy is 61.72%. Therefore, it's a potential method to predict accidents in steel industry.

IEEM17-P-0700

Procurement and Reserves Polices for Humanitarian Logistics

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[2]*City University of Hong Kong, Hong Kong SAR*

Physical reserves for humanitarian aid such as medicine or drugs, compressed food, etc., may be wasted if they are not used timely, as they will expire after certain period. This paper focuses on reducing reserves wastage by utilizing the market as a channel to recycle valuable reserve inventory. A government-led pricing model is proposed. This model tackles a one-buyer-one-seller procurement and reserves cooperation system to yield possible optimal decisions for both parties. Properties and characteristics of the optimization approach are discussed. Findings of this paper can provide meaningful guidance for the government or non-profit organizations in procurement management as well as setting reserves policies in humanitarian logistics.

Session	Systems Modeling and Simulation 5
Date	12/12/2017
Time	13:45 - 15:30
Room	MR330
Chairs	Amos NG, *University of Skovde*, Stanislav CHANKOV, *Jacobs University Bremen*

IEEM17-P-0279

Lean, Simulation and Optimization: A Maturity Model

Ainhoa GOIENETXEA URIARTE[1], Amos H.C. NG[1], M. URENDA MORIS[2], Mats JÄGSTAM[2]
[1]*University of Skövde, Sweden*
[2]*Jönköping University, Sweden*

This article presents a maturity model that can be applied to support organizations in identifying their current state and guiding their further development with regard to lean, simulation and optimization. The paper identifies and describes different maturity levels and offers guidelines that explain how organizations can grow from lower to higher levels of maturity. In addition, it attempts to provide the starting point for organizations that have applied lean or are willing to implement it and which may also be considering taking decisions in a more efficient way via simulation and optimization.

IEEM17-P-0650

Analysis of Human Arm Motions at Assembly Work as a Basic of Designing Dual Robot Arm System

Bernadus KRISTYANTO, Brilianta NUGRAHA, Anugrah PAMOSOAJI, Kristanto NUGROHO
Universitas Atma Jaya Yogyakarta, Indonesia

An analysis of human arm motions has been studied as a preliminary result prior to the design of an artificial shoulder-attached double-arm robot to imitate human arms' motions. For modeling the dual arm robot, a DH-parameter's based forward- kinematics of the arms are analyzed. Since in the real world human hands hold various types of objects with distinct weights and volumes, we take into account unpredictably center of mass of the entire arms as uncertainty. For this purpose, the model to follow must be based on human's behavior. Therefore, human anthropomorphic is required to be applied for determining the robot's parameters. In addition, human motion limitations must be considered as the limitation of the robot's motions as well. Simulations of the results are presented to verify the performance of the model and will be used as model for adaptive controller design.

IEEM17-P-0399

Integrated Vendor-Buyer Inventory Model Considering Imperfect Quality and Inspection Errors with Controllable Lead Time

Amanda SOFIANA, Cucuk Nur ROSYIDI
Universitas Sebelas Maret, Indonesia

A joint production-inventory model of two-stages (vendor-buyer) for items by considering defective items and inspection errors with controllable lead time is developed in this paper. The assumption of the demand is assumed to be normal distribution. The production process is not perfect, which is produces a paticular number of defective items. An inspection process of the shipment lot is hold by the buyer to sort out the item qualities. The human inspector may missclassify a defective item as a good one or missclassify a good item item as defective one. The lead time of shipment can directly affects inventory investment in safety stock, the customer service level, and the competitive abilities of a business, so we decide to take lead time also as control object. An optimal solution for the expected integrated total annual cost is provided and for the illustrative purpose, numerical example is also presented. This paper gives complement to the current literatures that used in this study, so that this one model can cover all aspects that considered in the previous literatures.

IEEM17-P-0770

Concurrent Scheduling of a Job Shop and Microgrid to Minimize Energy Costs Under Due Date Constraints

Ashley THORNTON[1], Cedric SCHULTZ[2], Sami KARA[1], Gunther REINHART[2]
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[2]*Composite and Processing Technology IGCV, Germany*

Energy Conscious Production Scheduling is a developing field. This paper proposes a MILP formulation that allows for the concurrent scheduling of energy supply and job processes with the aim of minimizing energy cost while guaranteeing due dates. The energy system includes TOU grid pricing, dispatchable generators, an electrical storage system and a solar array. This was compared to a base case of makespan minimization and the potential cost savings are quantified.

IEEM17-P-0338

Using Gradient Boosting Regressor to Predict Stress Intensity Factor of a Crack Propagating in Small Bore Piping

Arvind KEPRATE, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Estimating the value of the stress intensity factor (SIF) for a crack propagating in small bore piping is essential for predicting the remnant fatigue life (RFL) of the aforementioned asset. Currently, the finite element method (FEM) is utilized to predict the SIF. The main shortcomings of SIF prediction using the FEM are high computational cost and considerable time-consumption. In this manuscript, the authors propose using gradient boosting regressor (GBR) as an alternative to FEM for predicting the SIF of a propagating crack. The GBR is firstly trained and then validated by using 70 and 30 SIF values, respectively, obtained by FEM. During the validation process, the coefficient of correlation (R^2) between the SIF values obtained by FEM and by GBR is 0.977, indicating good agreement between the two. The time required to predict the SIF of 30 data points is reduced from 30 mins (for FEM) to one second with the help of the proposed GBR. Good prediction accuracy and less time-consumption of GBR make it a suitable alternative to FEM for SIF prediction.

IEEM17-P-0044

Mitigation Strategy Against Cascading Failures of the R&D Network

Jingbei WANG, Naiding YANG, Yanlu ZHANG, Yue SONG
Northwestern Polytechnical University, China

As the cascading failures of the R&D network may lead to severe consequences, it is necessary to propose a mitigation strategy to keep it safe. According to the previous research, we develop a R&D network based on the BBV generation algorithm and propose the mitigation strategy on protecting some enterprises to avoid the cascading failures, then we explore the effects of mitigation strategy under different values of some critical parameters through numerical simulation. The simulation results show that the HP strategy is the best, followed by the KP strategy and RP strategy, parameter ζ and μ are two critical parameters related to the process of the cascading failures of the R&D network. This paper can provide a useful theoretical basis to protect the safety of the enterprises of the R&D network and improve the R&D efficiency.

IEEM17-P-0410

Design of an Agent-Based Model to Simulate Governance in Inter-Organizational Project Networks

Jaakko KUJALA, Tapio VUORINEN
University of Oulu, Finland

Agent-based simulation models provide a means of analyzing and understanding the functioning of complex socio-economic systems, which often involve multiple interacting entities and non-linear and stochastic interactions. In such models, agents may be individuals or organizations, characterized by such properties as objectives, values, capabilities and resources. Project networks are temporary inter-organizational networks of heterogeneous actors whose purpose is to accomplish a complex set of tasks and reach shared goals. The variety of actors in project networks and the complexity of their interactions makes agent-based simulation a logical choice for simulating such networks. This paper present a design of an agent-based simulation for simulating governance in project network. Key design principles are introduced, along with practical examples of how specific governance mechanisms can be implemented in the model. Additionally, advantages and challenges of agent-based simulation as a research method is discussed.

Session	Supply Chain Management 6
Date	12/12/2017
Time	13:45 - 15:30
Room	MR332
Chairs	Ciwei DONG, *Zhongnan University of Economics and Law*, Weihua LIU, *Tianjin University*

IEEM17-P-0745

The Coexistence of Printed Book and Electronic Book in a Book Supply Chain

Yanping CHENG[1], Ciwei DONG[2], Renjun LIU[2]
[1]*Central China Normal University, China*
[2]*Zhongnan University of Economics and Law, China*

The prosperity of diversified book market has significantly affected the management of book supply chain. In this paper, we construct a theoretical model to study the coexistence of printed book and electronic book in a book supply chain, which consists of one publisher, one printed book retail store, and one electronic book retail store. We derive the optimal wholesale price, retail price of printed book and retail price of electronic book to maximize the profits of the three parties in the supply chain. Besides, we find that the electronic book retail store should set a much lower price of electronic book than that of printed book set by the printed book retail store. Moreover, by further studying the effects of wholesale price, unit production cost of printed book and royalty rate of electronic book, some managerial insights are discussed in the paper.

IEEM17-P-0347

The Choice of Buy-Back Contract in Logistics Service Supply Chain with Demand Updating and Mass Customization Service

Weihua LIU
Tianjin University, China

This paper explores the choice of buy-back contract in the service capacity purchasing of a logistics service integrator (LSI) in an environment of demand updating and mass customization service. Two optimal models are built: with or without a buy-back contract respectively. The conditions whereby an LSI benefits from using a buy-back contract are discussed, along with an analysis of the influences of various parameters upon the choice of buy-back contract. Many important results have been found. For example, the choice of whether to use a buy-back contract is closely related to the optimal customized degree and optimal service price, regardless of the level of demand updating.

IEEM17-P-0570

Heterogeneous Vehicle Routing Delivery on Collaborative Distribution Using Genetic Algorithm – The Case of Yogyakarta City

Anna Maria Sri ASIH[1], Bertha Maya SOPHA[1], Yusnia KHAIRUNNISA[1], Hendra Edi GUNAWAN[1], Yuni KARUNIAWATI[2]
[1]*Universitas Gadjah Mada, Indonesia*
[2]*Province of D.I. Yogyakarta, Indonesia*

Collaborative distribution is an alternative which is expected to be able manage the increased demands due to for example increasing population in urban cities. One form of collaboration is by sharing vehicles to deliver goods. Therefore the selection of vehicle types in the delivery process needs to be considered in support of successful implementation of collaborative strategy. This paper presents an empirical study of the use of different types of vehicle, i.e. heterogeneous vehicles, in Yogyakarta city, Indonesia for investigating the effectiveness of collaborative distribution. Three scenarios were evaluated, i.e. scenario without collaborative strategy, and scenarios with collaborative strategy based on distribution center's capacity. The results showed that selecting proper vehicles in collaborative distribution can have reduction in total traveled distance as well as total transportation costs.

IEEM17-P-0841

The Joint Decisions of Modularity Level Design and Refund Price in a Two-Tier Supply Chain

Qingying LI, Weijian ZHOU
Donghua University, China

This paper investigate a two-tier supply chain for producing and selling modular products. The manufacturer may invest to increase the modularity level of the products, the retailer sources from the manufacturer at a modularity-level related wholesale price and then sells to the market. Customers may return the products to the retailer if unsatisfied. The retailer offers a refund price and returns the products to the manufacturer, where the products get salvaged. We investigate the joint decisions of the manufacturer's modularity investment and the retailer's refund pricing under both centralized and decentralized models. We derive the conditions under which the optimal decisions can be uniquely determined, and express the optimal decisions in closed forms. Sensitivity analysis of the optimal solutions regarding part of the cost parameters is also conducted.

IEEM17-P-0275

Capacity Investments in Logistics Outsourcing

Tarun JAIN[1], Jishnu HAZRA[2]
[1]*Indian Institute of Management Udaipur, India*
[2]*Indian Institute of Management Bangalore, India*

Recently, various e-commerce businesses are investing in their in-house logistics fleet to implement a partial outsourcing strategy. Under this strategy, the business source their excess requirements through a delivery-as-a service model using third party logistics (3PL) providers. Further, these 3PL also invest in the fleet capacity to cater to various sources of demand. Our aim in this paper is to study capacity investment decision of the 3PL providers as well as of the buyers who implements the partial outsourcing strategy. We investigate the impact of demand parameters and pricing parameters on the above decisions.

IEEM17-P-0635

Towards an Approach to Assess Supply Chain Quality Management Maturity

Ana FERNANDES[1], Rui OLIVEIRA[1], Catarina CUBO[1], Paulo SAMPAIO[1], Maria do Sameiro CARVALHO[1], Paulo AFONSO[1], J. ROQUE[2], Marcio REBELO[2], Joao BRANDÃO[2]
[1]*University of Minho, Portugal*
[2]*Bosch Car Multimedia, Portugal*

Maturity models have been developed in order to help companies to improve organizational performance. Furthermore, due to the globalization and the growing competition, companies need to increase the competitiveness through operational efficiency, internally and in the entire supply chain. In this paper, an approach for the design and implementation of a Supply Chain Quality Management maturity model is presented. The concept of Supply Chain Quality Management has been developed in order to achieve a good integration between the two approaches: Quality Management and Supply Chain Management, and how such integration can help and support the companies to become more effective and efficient. The proposed approach to assess Supply Chain Quality Management maturity incorporates both quantitative and qualitative information to define several levels corresponding to different integration maturity levels. A case study in a world class company of the automotive industry is being used to validate the approach.

IEEM17-P-0209

Evaluation of Market Entry Strategies of Late Entrant in the Sustainable SCM

Tasuya INABA
Kanagawa Institute of Technology, Japan

This study evaluates market entry strategies of companies that execute sustainable supply chain management (SSCM). Those companies deal with environmentally and socially friendly goods and deliver the value to consumers. In this study, we assume a situation in which a pioneer company develops a market and another company enters the market as a late entrant, and evaluate strategies of the late entrant company. Four possible strategies are evaluated using agent-based simulation with a hypothetical scenario. From the simulation, findings such as each strategy works differently to market share increase and efficiency of the strategy is different are observed. These findings are useful for late entrants in deciding their market entry strategies.

Session	Decision Analysis and Methods 4
Date	12/12/2017
Time	13:45 - 15:30
Room	MR333
Chairs	Ainul Akmar MOKHTAR, *Universiti Teknologi Petronas*, Xue-Ming YUAN, *Singapore Institute of Manufacturing Technology*

IEEM17-P-0622

Weighted Point Matrix Based Supplier Evaluation Method for the Oil and Gas Industry

Qamarul FADHLI BIN KHAIRIZAN[1], Wee Li LEE[2], Xue-Ming YUAN[1]
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This paper proposes a weighted point matrix based supplier evaluation method for the oil and gas industry. The survey and interview are conducted to determine the weighted point matrix. The case study of an oil and gas company evidences the proposed method is feasible and efficient while it is applied to evaluating the suppliers in the company.

IEEM17-P-0602

Challenges in Implementing Cleaner Production: Barriers and Strategies in the Indonesian Seafood Processing Industry

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[2]*Institut Teknologi Sepuluh Nopember, Indonesia*

This paper investigates challenges in implementing cleaner production concept in Indonesian seafood processing industry. A number of obstacles and strategies related to cleaner production implementation is determined. A concept of Delphi method that involves some expert's opinion is adopted. A deep discussion and questionnaire is used to identify these barriers and strategies. These barriers and strategies will be structured into a hierarchy, and then an analytical hierarchy process will be used to investigate and prioritize underlying barriers and strategies to cleaner production implementation via Indonesian seafood processing industry. This research concludes on how rearranging public regulation or environmental rule and policy in order to help to alleviate the widespread and adoption of cleaner production in Indonesian seafood processing industry.

IEEM17-P-0817

Project Change Request: A Proposal for Managing Change in Industrialization Projects

Deborah PERROTTA[1], João FARIA[2], Madalena ARAÚJO[1], Anabela TERESO[1], Gabriela FERNANDES[1]
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Most often, industrialization projects, such as New Product Development (NPD) projects, do not have the full scope of work well known beforehand; the degree of uncertainty is high. In this context, the development of the Project Management Plan (PMP) is postponed to later stages of the project, when the scope becomes better understood, having great consequences on the planning of activities and on the way work is performed. In order to overcome this problem, the common concept of Change Request is separated in the existent Engineering Change Request (technical) and the Project Change Request (management). The Project Change Request (PCR) is presented as a solution not only to allow the PMP to be defined earlier, according to Project Management (PM) good practices, but also to manage changes on project documents as the project evolves. The implementation of PCRs is expected to bring value to NPD practitioners when integrating NPD to PM practice.

IEEM17-P-0426

A New Method for Aggregating Experts' Probability Judgments

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This paper proposes a new method to aggregate experts' probability judgments based on judgment evidence. The method uses a single causal Bayesian Network to express the judgment evidence of a single expert, and the final judgments are demonstrated through the integration of multiple causal Bayesian Networks into a single one, with the technology of reversal of arcs and the introduction of latent variables. This paper demonstrates the application of this method and raises some problems that occurs during its performance, by using a case of risk analysis for a large scale ground test of Air-to-Surface Missile.

IEEM17-P-0626

An Integrated Decision Making Model for Sustainable Supplier Selection Under Uncertain Environment

Xiongyong ZHOU, Zhiduan XU
Xiamen University, China

Sustainable supply chain management has gained extensive attention of both scholars and practitioners in recent years. Due to a rather limited number of literatures considering social responsibility in the evaluation of sustainable supplier, we construct a novel criteria framework based on the Triple Bottom Line theory and then propose an integrated decision making model for supplier selection. We use the DEMATEL method together with ANP to find the criteria weights. Further on, an extended fuzzy VIKOR method is adopted to optimize the ranking of alternatives under the uncertain environment. A case study in the manufacturing industry is presented to demonstrate and verify the effectiveness of the proposed approach. The results shows that the integrated method we proposed is more reasonable to deal with the hybrid data in the uncertain environment than the traditional TOPSIS method.

IEEM17-P-0170

The Prison Construction Decision Analysis for Reducing Capacity Overloads with the Social Cost of Crime Concept

Hsiao-Ling CHANG, Tyrone T. LIN
National Dong Hwa University, Taiwan

This conference paper is mainly to explore the decision-making of the prison construction for reducing capacity overloads. The ratio of prison construction for reducing capacity overloads and the prison population size for capacity overloads are measured by the cost of new construction and the social cost of crime. If the construction cost for reducing capacity overloads is less than or equal to the social cost of crime, it is worth to determine the suitable reducing ratio of construction and the prison population size of construction in capacity overloads. The proposed mathematical model provides a decision analysis with a simple method and project management viewpoint; the results can provide decision- makers with some suggestions to make the optimal decision on whether to construct at different reducing capacity overloads.

IEEM17-P-0248

Assessing the Possible Potential in the Global Energy Consumption: Integrated Artificial Neural Network and Data Envelopment Analysis

Oludolapo OLANREWAJU, Charles MBOHWA
University of Johannesburg, South Africa

Energy is fundamental to attaining various objectives globally. Its conservation and optimal use will help achieve the numerous objectives. Energy use has been well analyzed and assessed for different purposes using Artificial Neural Network (ANN) and Data Envelopment Analysis (DEA). This study has looked at the various benefits that can be acquired using these methods leading to the significance of developing an integrated model. To determine how much energy could be conserved globally, the integrated model was developed. The model applied to the global energy consumption from 1995 to 2009 discovered a possible saving of 1.62% that could have been conserved.

Session	Engineering Economy and Cost Analysis
Date	12/12/2017
Time	13:45 - 15:30
Room	MR334
Chairs	Jasmine Siu Lee LAM, *Nanyang Technological University*, Diego MANOTAS-DUQUE , *Universidad del Valle*

IEEM17-P-0837

Feasibility of Implementing Energy Management System in Ports

Jasmine Siu Lee LAM, Ming Jun KO, Jing Rong SIM, Yang TEE
Nanyang Technological University, Singapore

As a key element of the maritime industry that consumes considerable amounts of energy, ports have the potential to tap on higher energy efficiency and renewable energy production to reduce their environmental impact. Ports can also achieve financial benefits when they have better energy management. This study investigates the feasibility of implementing an energy management system (EnMS) in terms of cost and benefit for a port. Results from a discrete event simulation done on Singapore's container terminal show that the implementation of EnMS is financially beneficial for terminal operators. There is also lower greenhouse gas emission.

IEEM17-P-0492

Financial Risk Measurement in Colombian System of Mining Royalties

Angelica BUSTOS-GONZÁLEZ, Luis Felipe RAMÍREZ- DOMÍNGUEZ, Stephania MOSQUERA-LOPEZ, Diego MANOTAS-DUQUE
Universidad del Valle, Colombia

The objective of risk management is to mitigate the probability of financial losses due to different types of risk that could affect supply chain. This paper presents a methodological approach to estimate the financial risk of steam coal royalties received by Colombian government considering risk factors such as the commodity price, freight price and Exchange rate. These risk factors are considered in the model for estimating the Colombian steam coal royalties. We used robust risk indicators such as VaR (Value at Risk) and ES (Expected Shortfall). These measures were obtained through three approaches: parametric, semi-parametric and non- parametric. The coal royalties are a very important income for Colombia. The royalties obtained of steam coal exports represented USD 894 million in 2014. In this framework, it is very important to estimate the volatility of tax incomes related to steam coal exports.

IEEM17-P-0329

Sustainable Building Policy Management in Kolkata, India

Rohan Singh WILKHO[1], Himadri GUHA[2]
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[2]*Jadavpur University, India*

In order to promote sustainability additional construction rights are provided to green buildings in Kolkata, India. The paper derived the green building costs from two cases presently under construction and determined that the existing policy is profitable to the builders only for high value properties in the city center. A life cycle analysis showed that there would be substantial financial and environmental benefits if properties in the outskirts are also converted to green. Concessions like tax reductions that are directed to the flat owners should be offered in addition to the present policy for promoting green buildings for all.

IEEM17-P-0503

Decisive Economies and Opportunity Cost of Modular Product Structure Alternatives: An Empirical Case Study

Marc WINDHEIM[1], Erik GREVE[2], Dieter KRAUSE[2]
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[2]*Hamburg University of Technology, Germany*

Versatile, global markets as well as the increasing demand for more individualized products has increased the pressure on companies to offer a broad variety of products. Developing modular product families is an established approach to provide a suitable variety under economic conditions. However, balancing the demands for more external variety and less internal variety is a complex task for product development, affecting multiple domains in companies. In this paper, we conduct an empirical case study and investigate the correlating effects of external and internal variety on respective performance indicators (PI). Within two companies, we identify recurring chain reactions across ten decision scenarios and derive a subset of PIs affected by modular product structure alternatives (MPSA). In addition, the results highlight the major trade-offs between different target dimensions that occur while choosing dissimilar product structure alternatives.

IEEM17-P-0566

Some Thoughts on the Kelly Criterion Associated with a Real Investment Perspective

Gyutai KIM
Chosun University, South Korea

Since the inception of the Kelly criterion in 1956, most relevant theoretical and practical research has been done in the gambling and financial industries. However, the criterion is regarded to possess so high a potential that it may be applicable to real investment project analysis. From this perspective, this paper addresses some issues: i) a violation of a conventional stochastic dominance theorem, ii) a discounted Kelly criterion, iii) its optionality in terms of a binomial lattice option pricing model.

IEEM17-P-0883

Performance Evaluation of Logistics listed Companies Based on Grey Ideal Correlation Entropy

Fumin DENG, Canmian LIU, Xuedong LIANG, Jing XU
Sichuan University, China

Aiming at the logistics operation performance problems of logistics listed companies, the performance evaluation system is constructed by four aspects of the profitability, solvency, asset operation and growth ability. On the advantages of the inheritance of grey correlation method and TOPSIS (Technique for order preference by similarity to ideal solution) evaluation method, the performance evaluation model of weighted grey relational entropy is constructed. The model is applied to the performance study of Chinese logistics listed companies, and provides decision support to improve the management of the company, and to increase the reference basis for the logistics investors.

IEEM17-P-0470

Product Portfolio Optimization Based on Substitution

Anna MYRODIA, Alexandria Lee MOSELEY, Lars HVAM
Technical University of Denmark, Denmark

The development of production capabilities has led to proliferation of the product variety offered to the customer. Yet this fact does not directly imply increase of manufacturers' profitability, nor customers' satisfaction. Consequently, recent research focuses on portfolio optimization through substitution and standardization techniques. However when re-defining the strategic market decisions are characterized by uncertainty due to several parameters. In this study, by using a GAMS optimization model we present a method for supporting strategic decisions on substitution, by quantifying the impact of those parameters. Empirical evidence supplements the research, where a case study from an industry company producing construction material demonstrates the results.

Session	Project Management 3
Date	12/12/2017
Time	13:45 - 15:30
Room	MR335
Chairs	Ralph RIEDEL, *Chemnitz University of Technology*

IEEM17-P-0181

Post Formation Dynamics and Their Determinants

Xiao-li CHEN, Ralph RIEDEL, Egon MUELLER
Technische Universität Chemnitz, Germany

In a collaboration, on-time management of post-formation dynamics is very important for the surviving of this special arrangement. In the paper, with a view to the possible changes regarding partners, monitoring mechanisms and profit distribution, impact factors are identified for the composition of a determinant set. These are factors related to on-going trust, relative power and external issues. Moreover, based on social psychology and behavioral theory of inter-organizational activities, an impact-dynamic model is established, which tries to reveal detail influences of these factors and to shed some light on the management of collaboration. Continuing with further analysis, an online survey based on the experience of participants was conducted. As a result, the determinant set was confirmed with high reliability, and the influence of these factors have also been revealed. All these could be used as the theoretical foundations, which helps to provide with on-time management of post-formation dynamics.

IEEM17-P-0369

Outcome Prediction of Software Projects for Information Technology Vendors

Tomoyuki KAWAMURA, Tetsuya TOMA, Kenichi TAKANO
Keio University, Japan

Several studies indicate that roughly 70% of the projects based on the software development have resulted in failure, thereby researchers and practitioners have been tried to develop solutions that will improve project success rates. It is insisted that to raise success rates, support should be provided by the organization to which the projects belong. With the aid of predictions that incorporate project outcomes for various information technology (IT) vendors, this study aims at identifying projects that should be preferentially supported by an organization. The data of 332 projects of various Japanese IT vendors were collected using an Internet survey, and a success/failure prediction algorithm is created by employing the Bayes classifier technique on the collected data. A resultant algorithm with 77.3% prediction capability was obtained. It is expected that the success/failure prediction procedure, including the prediction algorithm, help significantly to specify projects that an organization needs to participate in as priority.

IEEM17-P-0541

An Empirical Study on Value Creation of Multi-Product Small-Volume Production Through Industry-Academia Collaboration

Sadayo HIRATA
Shibaura Institute of Technology, Japan

The aim of this study is to build an ecosystem through industry-academia collaboration for company problem solving and the educational reform of universities. Focus is placed on the solution of problems in small-lot production of various small and medium-sized enterprises (SMEs) in the manufacturing industry in Japan. The manufacturing industry in Japan is supported by SMEs with multi-product small-volume production and subcontracted production. The manufacturing industry must be reformed; however, the reform methods for mass production such as the Internet of Things (IoT) are not suitable for SMEs. This study reports on the result of co-designing the information and communication technology (ICT) system to replicate the excellent craftsmanship of SMEs through industry-academia collaboration. This study will contribute to the dissemination of mutual learning between companies and universities through industry-academia collaboration.

IEEM17-P-0502

Risk Evaluation in Project Management Implementation: The Case of Infrastructural Development Projects

Jan-Harm PRETORIUS, Nokuthula DLUDHLU, Jurie VAN WYNGAARD
University of Johannesburg, South Africa

Risk plays an important role in the success of infrastructure projects. In managing risk, the identification of risk factors is critical. This paper evaluates the impact of human, organizational and technological risk factors on infrastructure projects. A survey on how well risk factors and risk management/mitigation predict project performance was carried out. The results of the survey were analyzed through statistical analysis techniques namely, exploratory factor analysis, correlation and multiple regression. The correlation result showed a high positive correlation between risk management and risk mitigation. This correlation is likely to occur because if risk is better managed, positive results of risk mitigation will be higher. Hierarchical multiple regression explored the ability of the human, organizational and technology factors, risk management and risk mitigation to predict the project performance time factor. Risk mitigation appeared to be a strong predictor of performance. This result proves that risk mitigation does influence project performance.

IEEM17-P-0034

Why CPM is Not Good Enough for Scheduling Projects

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Even with the widespread embrace of CPM and Gantt charts, projects miss deadlines, pay overtime and penalties, tackle low morale and fatigue and perhaps most critically, struggle with limited resources. This paper tutors gritty individuals on adopting Critical Chain Project Management (CCPM)-a 10-year old innovation now regularly used by NASA, ITT, BOSCH, Honeywell, Lucent Technologies, TATA Steel and many others. CCPM is vastly effective in resolving resource contentions and in meeting deadlines-without affecting the quality of deliverables. The lingo is different, yet CCPM easily deserves to fully displace CPM as the primary project instrument. Many fear that CCPM will add more confusion, uncertainty, and anxiety-"do we have a software for it?" To answer this MSProject® is used throughout this tutorial to reveal that even this common tool can enable one to add in the essentials of CCPM and reap material benefits.

IEEM17-P-0185

Transmission of Software-Related Agile Mechanisms of Action Towards Product Development Processes for Technical Products

Günther SCHUH, Michael RIESENER, Jan KANTELBERG, Niklas STEIREIF
RWTH Aachen University, Germany

Producing companies are forced to a continuous development of new product innovations in shorter development cycles. The integration of mechatronic components with simultaneous high demands on quality and costs results in a significant increase of complexity. Therefore, the necessity to handle this rising product complexity requires a sustainable conceptual realignment of the current product development process. An approach to face this challenge is provided by the application of methods used for agile software development. These methods have helped the software industry for years to a measureable optimization of the success factors time, quality and costs. Referring to these successes, a method is developed which allows a systematic transmission of agile mechanisms of action towards development processes of technical products. In a first step, applied agile practices are identified and clustered to common so-called agile mechanisms of action. The second step considers their influence on the adjustment of deterministic process elements.

IEEM17-P-0559

Using Fuzzy Front End Theory on the New Product Development and Innovation

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The Fuzzy Front End (FFE) theory, which focuses on the market decision making process and utilizes the online simulation methods to test the design ideas, it is easy to understand, convenient to control, and fit to meet the rapidly changing market demands. The FFE theory is preferred for a timely and effective conceptual design of the new product development. Combination the Fuzzy Front End theory, a Flexible Four-Terminal (F4T) principle is deduced corresponding to its metaphorical analogy to the four bar linkage mechanism. Using the F4T principle and the Fuzzy Front End theory, a new FFE frame model is established for the product innovation and design process.

Session	E-Business and E-Commerce
Date	12/12/2017
Time	13:45 - 15:30
Room	MR309
Chairs	Daniel MO, *Hang Seng Management College*, Michel ALDANONDO, *Toulouse University*

IEEM17-P-0435

How Do Flexible Options Affect Customer Decision Making in an Online Configurator System?

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Product configurators are the prevailing toolkit used to enable online product customisation. Studies of consumer behaviour have acknowledged that consumers are usually indifferent to certain products or product attributes. Thus, they may have multiple satisfactory attribute choices when configuring products. However, existing configurators allow customers to choose only one attribute, which may make customers hard to make decisions. This paper proposes a new, flexible option-based configurator mechanism that allows customers to select multiple attribute choices. We investigate which factors significantly affect customers' decisions to choose multiple options, and whether the flexible configurator increases customers' satisfaction levels. The results of a series of empirical experiments show that the significant factors for utilitarian products and hedonic products are different. Customers gain no extra satisfaction from products customised by a flexible configurator, but enjoy a better configuration process.

IEEM17-P-0653

ETO Bid Solutions Definition and Selection Using Configuration Models and a Multi-Criteria Approach

Abdourahim SYLLA[1], Elise VAREILLES[1], Thierry COUDERT[2], Michel ALDANONDO[1], Laurent GENESTE[2], Yvan BEAUREGARD[3]
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In a bidding process, bidders have to define and estimate potential bid solutions relevant to the customer's requirements. Afterward, based on several criteria (e.g. cost, due date), they have to select the most interesting solution to be sent as an offer to the customer. However, the lack of complete and accurate information makes the estimation imprecise and uncertain. In this paper, an approach is proposed to support the definition and the estimation of the potential Engineering To Order (ETO) technical bid solutions and the selection of the most interesting ones. The definition and the estimation of the potential bid solutions is supported by a new knowledge-based configuration model whereas the selection of the most interesting solutions is supported by a new multi-criteria decision making approach that takes into account uncertainties and imprecisions.

IEEM17-P-0293

Assessing the Profitable Conditions of Online Grocery Using Simulation

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In the era of information revolution, the retailing industry has a significant opportunity to reach every single individual through Internet. Online Grocery Shopping is the new promising business. One of the major challenges facing this industry is the high cost and uncertainty associated with operations. This paper attempts to assess the profitable conditions for an E-grocery to a major retailer in Jeddah, Saudi Arabia. We will develop simulation models for E-Grocery order picking and home delivery operations in order to generate several strategies and evaluate them. This study has shown that simulation is a powerful decision support tool that can assist in predicting and mimicking Online Grocery Shopping operations before implementation. A brief operational strategy is proposed based on the case study for an entrepreneurship project that is based on the principles of courage and caution to exploit the opportunities and overcome the challenges.

IEEM17-P-0527

Application of Revenue Management in Supply Chain of Postal Services

Ahmad TEYMOURI, Amir KHATAIE, Pavel ANDREEV, Craig KUZIEMSKY
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E-commerce has been changing the rules of marketplace by empowered customers seeking immediate and flexible delivery. Advantages of online shopping opportunities lead to the constantly increasing parcel volumes that need to be shipped and delivered through postal services network. This evolution caused capacity management to become a serious challenge for postal organizations. Postal services have been upgrading their static value chain inherent to letter-mail to more dynamic for e-commerce parcel. The current solutions mainly focus on improving the productivity of collection and delivery (i.e. higher truck utilization) and increasing the efficiency of the equipment (i.e. fewer missorts). However, these solutions are temporary and expensive. This paper addresses the shortcoming of the existing solutions by conceptualizing application of revenue management and developing capacity management model for postal services.

IEEM17-P-0683

The Study of Critical Success Factors of Cross-Border E-Commerce Freight Forwarder from China to Thailand

Ting SUN, Woramol Chaowarat WATANABE
Naresuan University, Thailand

In recent years, online shopping on China's e-commerce platform is extremely increasing in Thailand. Therefore the cross-border e-commerce freight forwarder plays as an intermediary to provide ordering services, exchange services, and cross-border shipping services for Thailand's consumers. The continual growth of cross-border e-commerce raises the needs to understand more about cross-border e-commerce freight forwarder, especially identifying critical factors that affect their success. This paper intends to identify the critical factors effect on cross-border e-commerce freight forwarder by using Critical Success Factors (CSFs) which are particularly formed for e-commerce business. The Analytic Hierarchy Process (AHP) is used to identify the influence level of all critical success factors. By using this method, the organization will noticed the importance of critical success factors and its effects.

IEEM17-P-0349

A User Experience Evaluation for Wendy's Online Delivery Website Geared Towards Improving Customer Experience

Wendy SIA, Rendell TIU, Jazmin TANGSOC
De La Salle University, Philippines

In the present generation, many individuals turn to online websites to purchase their necessities due to the sake of convenience. Wendy's Philippines launched their new and improved online website in 2012, which allow their customers to access their menu and order from their homes. However, despite the improvements made, the online website sales were significantly low. Wendy's sought the need further improve the website usability as the company found this to have a direct relationship with the website sales. This paper aims to identify the usability issues of Wendy's current website and evaluate these issues based on efficiency, effectiveness and satisfaction.

Session	Reliability and Maintenance Engineering 4
Date	12/12/2017
Time	13:45 - 15:30
Room	MR308
Chairs	Yaping LI, *Nanjing Forestry University, Shanghai Jiao Tong University*, Yihai HE, *Beihang University*

IEEM17-P-0075

Jointly Optimal Design of Perfect Maintenance Policy and CUSUM Control Chart

Yaping LI, Long CHEN, Ershun PAN, Zhen CHEN
Shanghai Jiao Tong University, China

For quality control and maintenance management of small process shift, jointly optimal design of perfect maintenance policy and CUSUM control chart is put forward, in which four scenarios of production process are considered, quality loss cost is introduced into total cost and quality loss functions are defined based on the parameters of CUSUM chart. The cost caused by the downtime for detection and/or maintenance is also proposed. By minimizing the expected total cost per unit time, a model is established to search the optimal combination of decision variables to realize the joint economic design of CUSUM control chart and maintenance policy. Pattern-search algorithm is used to find the solution. Finally, a numerical case is shown to illustrate the proposed methodology and sensitivity analysis is conducted.

IEEM17-P-0728

Development of a Low-Cost Tool for Semi-Automatic Classification and Counting of Particles in Industrial Oils

Bruno Cesar CAIXETA LEME, Luis Fernando DE ALMEIDA, Jose Walter PARQUET BIZARRIA, Francisco Carlos PARQUET BIZARRIA, Alvaro Manoel SOUZA SOARES, Marcos Alessandro CRUZ RAMOS
University of Taubate, Brazil

Particle counting is a well-established method for detecting contaminations in industrial oil aiming at extending machinery shelf life. Although being standardized procedures for oil analysis vast, they are also very time-consuming and complex to be performed by most companies. This results in an often used standard-less analysis called photo-comparison. Besides not being standardized, this method does not present the real condition of the oil and is highly subjective. In this paper, we present an approach for semi-automatic classification and counting of particles in industrial oils strictly in accordance with the ISO 4406 standard. The aim is to turn feasible for companies in general, standardized methods for particle counting. The results demonstrate the potential of the tool to quickly and effectively count particles, providing the specialist with relevant information concerning the characteristics of the particles, availing one a more accurate decision making.

IEEM17-P-0243

Intelligent Fault Diagnosis of Rotating Machinery Using Locally Connected Restricted Boltzmann Machine in Big Data Era

Saibo XING, Yaguo LEI, Feng JIA, Jing LIN
Xi'an Jiaotong University, China

In intelligent fault diagnosis, unsupervised feature learning is a potential tool to replace the manual feature extraction in big data era. Therefore, we first develop a locally connected restricted Boltzmann machine (LCRBM) from the traditional RBM in order to handle the periodic appearance of fault characteristics in the raw signals of rotating machinery. Then, using LCRBM, we propose a method for intelligent fault diagnosis of rotating machinery. In the method, LCRBM is used to obtain features directly from raw signals. Based on the features learned by LCRBM, the method uses softmax regression to recognize faults. The proposed method is verified by the dataset of locomotive bearings and its superiority is demonstrated by the comparison with methods using the traditional RBM and eighteen widely used manual features. Results indicate that the proposed method is able to automatically learn fine features from raw signals of rotating machinery and achieves higher diagnosis accuracies.

IEEM17-P-0540

Memetic Algorithm to Optimize Level of Repair and Spare Part Decisions for Fleet System

Ayush JAIN[1], Ganesh K. RAO[1], Manish RAWAT[1], Bhupesh Kumar LAD[2]
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[2]*Indian Institute of Technology Indore, India*

The Level of Repair Analysis (LORA) and Spare Parts Provisioning (SPP) are the major maintenance planning decisions which have a direct impact on the Life Cycle Cost (LCC) of a capital intensive system. Such capital intensive systems are comprised of a considerable number of assemblies/sub-assemblies, which need to undergo optimized maintenance actions, proving to be beneficial for them. Employing heuristic methods can yield faster results which can converge to the global optimum. This research consists of an integrated approach which simultaneously optimizes the level of repair and spare parts decisions for fleet systems. This study uses the memetic algorithm to yield appropriate results for this complex combinatorial problem. It also draws a comparison of the results obtained by the memetic algorithm with those obtained by genetic algorithm.

IEEM17-P-0217

Optimal Scheduling of Imperfect and Perfect Inspections for Systems Subject to Continuous Degradation

Jingyuan SHEN, Lirong CUI
Beijing Institute of Technology, China

Inspection and Maintenance policies are important in detecting system failures and restoring the system. Most existing researches assume that inspections are perfect. A more realistic situation is that inspections influenced by the environment or technical conditions are imperfect. In this paper, we consider a system subject to continuous degradation with both imperfect and perfect inspections. The system is modeled by a renewal process and expected cost and length of a renewal cycle is derived. A numerical example is presented in the end, which derives the optimal number of imperfect inspection within a cycle by minimizing the long-run cost rate.

IEEM17-P-0259

Reliability Assessment of NAND SSD Based on Acceleration Degradation Test

Peng LI, Kai LIU, Wei DANG, Tianji ZOU
Chinese Academy of Sciences, China

Characterizing life of cheap, highly reliable products is a challenge due to cost and time restriction. Accelerated degradation testing (ADT) provides a way to predict life or reliability cost- and time-effectively. To evaluate the lifetime of solid state disk (SSD) rapidly, this paper carried out research on modeling and statistical analysis method of constant stress accelerated degradation testing (CSADT). Take a certain type of commercial off-the-shelf NAND SSD as the object, the write current is chosen as the degradation index, and CSADT is conducted under 80oC, 90oC and 104oC. A time-to-degradation model is constructed based on the physics of failure and test observations. Besides, a preliminary test is conducted to determine the relationship between current drift and temperature, aiming at modifying the degradation data. Then reliability and lifetime information of SSD can be predicted through the obtained degradation model. The application shows the proposed method not only can save time and money, but also provides reference for other space electronic products.

IEEM17-P-0386

Reliability Analysis for Single-Unit System of Warship Equipment with One Repairman Having Vacations Based on Phase-Type Distribution

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[2]*Huazhong University of Science and Technology, China*

As maintenance resources must be dispatched and assigned between warship equipment system, the policy is introduced to a common single-unit system, which is a repairman taking single vacation and multiple vacations, respectively. This paper assumes that single unit lifetime, the time spent on vacation by the repairman, idle time and repairing time all follow different Phase-type distribution, the more applicable interpretive models for system reliability with a repairman taking vacations are built respectively. The reliability features, such as steady-state failure frequency and system mean time between failures, are introduced by these models. Finally, these models are applied by a numerical application and how difference policy affects the system reliability laws will be introduced.

Session	Poster
Date	12/12/2017
Time	16:00 - 18:00
Room	Nicoll 1-2

IEEM17-P-0047

On Economizing Local Foods Networks in Developing Countries

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[3]*Parahyangan Catholic University, Indonesia*

Economizing is associated with efficient resource use in networks. Based on preceding studies that have revealed particularities of local food production, that they resemble more services than modernistic food production, this entails a need to enhance networking supported by cheap and easy to use information technology. Conceptual understandings from preceding studies on local food networks in developed countries are applied to discuss adaptation regarding networking in local food production in developing economies. The discussion suggests that in these economies local foods needs to focus on enhancing interaction and gradually on automating the supply chain. In addition, developing economies should consider hybrid supply chain solutions, where only the upstream food production is considered "local".

IEEM17-P-0197

Tax Policy and Sourcing Strategy – A Social Welfare Perspective

Huafan MA[1], Ziping WANG[2]
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[2]*Morgan State University, United States*

For recent decades, China has been the clear choice for global companies to build manufacturing plants to supply the world due to its seemingly unlimited supply of low-cost labor, lower currency, and attractive government incentives. However, recent trends have showed that the U.S., with a resilient corporate sector, flexible skilled workforce, and potential stricter tax policies, is becoming more attractive as a place to manufacture many goods to consume on its own soil. This research studies the incentives, possibilities and benefits of reshoring from the perspective of the social welfare. First, our analysis indicates that firms may remain offshoring even if the government provides tax incentives. Secondly, reshoring may increase the employment in the home country, but it also has a negative effect on the domestic consumer surplus, and then impair the overall social welfare given the tax policy implemented by the government.

IEEM17-P-0461

On the Circular Supply Chain's Impact on Revenue Growth for Manufacturers of Assembled Industrial Products – A Conceptual Development Approach

Samuel B. LARSEN, Torben KNUDBY, Jacques VAN WONTERGHEM, Peter JACOBSEN
Technical University of Denmark, Denmark

Materials scarcity, legislative compliance, and cost savings opportunities drive firms to take back used products from their customers for reuse, recovery, and recycling. For this purpose, firms implement circular supply chains. Although academia has given circular supply chain related topics considerable attention since the 1990s, the relationship between the circular supply chain and the firm's revenue growth remains under-researched. Using revenue growth theory, this study examines how the use of circular supply chains can grow the revenue of manufacturers of assembled industrial products (e.g. process equipment and engines). Findings show that the circular supply chain can increase revenue streams from the firm's existing markets, create market opportunities in new geographies, and provide access to market segments un-addressable with the firm's new products. The paper adds to understanding of the circular supply chain and provides research suggestions into the revenue potential inherent in circular supply chains.

IEEM17-P-0630

Pricing Decisions of Seller and Speculative Strategic Customers

M. LI, J. J. LU, Yongquan LAN, Z. W. MIAO
Xiamen University, China

We study the seller's optimal two-period pricing policies when speculative behaviors exists: strategic customers with heterogenous valuation make the tradeoff among price, consumption valuation, speculative benefit and availability to decide whether to be a consumer or transfer into speculators. We get the speculators' resale behavior and the seller's pricing decision. Our research suggests that the strategic customers with valuation being in a middle range will choose to speculate. Besides, we propose the speculators and seller's optimal pricing strategies.

IEEM17-P-0686

Strategic Organizing of Piping Supplies for Ship Construction

Per ENGELSETH, Bich LE
Molde University College, Norway

Shipbuilding implies an engineering challenge dependent on well-coordinated supplies of goods and services. A case study of supplies of piping materials to shipbuilding reveals how piping supplies are carried out through business relationships involving variation, both in product design as well as logistics. The case concerns three customer relationships in varying stages of development. This offers comparative descriptions on strategic organizing the logistics of ship construction supplies. Engineering represents a key factor in this supply variation. Over time simpler make-to-stock supply types may become developed into vender managed inventory solutions. The case reveals that engineering-to-order products are dependent on well-developed relationships. The studied supply involves accordingly features of engineering both product design and logistics. The importance of geographical proximity is vital in relation to logistics. Proximity is, however, of lesser importance to engineering.

IEEM17-P-0712

A Multi-Channel Sale System Under Financially Constraint

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Macau University of Science and Technology, China

We study a perfect information game among three parties: the bank, the telecom operator and the mobile phone brand company. In the first stage, the bank decides a interest rate and shows to the telecom operator and the mobile phone brand company. In the second stage, the telecom operator and the mobile phone brand company are engaged in Cournot subgames: a simultaneous game, and two sequential game with the telecom operator as the leader and the mobile phone brand company as the leader. We investigate the telecom operator's and the mobile phone brand company's decisions, the optimal sales, the bank's decision in this game.

IEEM17-P-0786

Optimal Multi-Period Multi-Product Supplier Selection and Order Allocation: Balancing Supplier Development and Supplier Switching

Lixin CUI[1], Lu BAI[1], Zhipeng CUI[2]
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[2]*Tianjin University, China*

Manufacturing firms are constantly searching for more competitive suppliers to lower purchasing cost. The sourcing decision often involves whether to invest in incumbent suppliers or to switch to new suppliers. While a broad branch of literature have investigated the supplier development and the supplier switching decisions individually, limited research focuses on how manufacturers should balance these two strategies and optimize the associated supplier selection and order allocation decisions. This paper investigates a multi-period multi-product supplier selection and order allocation problem of a manufacturer. The manufacturer can either invest in incumbent suppliers or switch to new suppliers. A new mixed integer programming mathematical model is developed considering various criteria for multiple suppliers. Because the proposed problem is NP-hard, we apply IBM ILOG CPLEX to obtain optimal solutions. The effectiveness of the proposed model is demonstrated through a numerical example. Extensive analysis is conducted to study the impacts of different parameters.

IEEM17-P-0862

Multi-Objective Optimization of Costs and Pollutants in Order to Manage the sustainable Supply Chain of Bio-Fuels

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Considering the importance of supply chain performance, the investigation of the relationship between supply chain performance and supply chain sustainability is substantial too. On the other hand, energy is considered in the center of environmental, social and economic analysis, and effects on the elements of sustainability. In this paper a sustainable model is represented to optimize the supply chain of biofuels through a two-objective mathematical model by taking into account both economic and environmental objectives. The presented model is consists of three levels that are biomass fields, bio-refineries and distribution centers. The model also consider uncertainty, limited availability of transportation facilities, nitrogen dioxide and carbon monoxide emissions. In order to solve the model, the weighted sum method in GAMS software has been applied based on different weights according to the importance of each objective. Finally, the analytical results demonstrate the validity of the presented model.

IEEM17-P-0289

Excess Inventories Redeployment Strategy for Spare Parts Service Logistics Management

Daniel MO, Danny HO, Nicole CHAN
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Many leading companies are now offering global customers better spare parts services for system maintenance through a more complex service logistics network, extending beyond the traditional on-site stocking management, to boost profit margin. One challenge these spare parts service providers face is how to achieve desired service levels at a low cost through minimization of excess inventories in the global spare parts supply chain. To address this issue, we demonstrate an inventory redeployment strategy to transform a conventional spare parts supply chain (with forward stocking facilities only) into a closed-loop, multi-echelon service network with the capability of redeploying inventories from overstocking to understocking facilities, reducing purchase of high-value spare parts. To assess the quality of our novel solution approach, we used a network flow optimization model to analyze the proposed excess inventories redeployment strategy of an international company's service parts operations, and found significant inventory cost savings.

IEEM17-P-0508

Status and Future of Manufacturing Execution Systems

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This paper proposes a taxonomy for characterizing manufacturing execution systems and discusses how they can benefit from the recent developments of Industry 4.0. The study is based on a literature review. The taxonomy contributes to theory and practice by providing a framework for benchmarking of manufacturing execution systems. The taxonomy can be utilized in the selection or design process of the manufacturing execution systems. Outlining the further opportunities provided by Industry 4.0 technologies, the paper also provides directions for future improvements of manufacturing execution systems.

IEEM17-P-0632

A GA-Based Method for Sales Order Allocation in a MTS/ MTO Supply Chain

Chin Sheng TAN, Zhong Jin NG, Chi XU
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Today's manufacturing environment has shifted from mass production to mass customization where products are specially catered to customers' varying preferences. To avoid having high inventory levels in this high mix low volume environment, supply chains are adopting the Make-To-Order (MTO) production strategy. This allows companies to have intermediate inventory for generic parts and the remaining production processes only resume when demand is known. However, with this strategy, the new challenge is to ensure fulfilment of orders before their respective due dates. To address such challenge, this paper proposes a Genetic Algorithm (GA)-based method for the allocation of customized orders to different MTO production sites. The proposed method generates an allocation plan that minimizes the transportation and backorder cost. Efforts have been made to improve solution accuracy by incorporating in the GA's fitness function estimates of each allocated order's completion date based on actual conditions in a job shop manufacturing environment.

IEEM17-P-0016

Using DEA Model Without Input and with Negative Input to Develop Composite Indicators

William CHUNG
City University of Hong Kong, Hong Kong SAR

We propose a kind of DEA model to develop composite indicators. In particular, this DEA model has no input and has negative outputs, which can be considered as a generalization of the Farrell proportional distance function. This DEA model were used to develop a composite indicator for rating the economic conditions of the countries along China's Belt and Road initiative.

IEEM17-P-0077

Feasibility Analysis of Grid Tied PV System Based on Net-Metering Incentive for a Developing Country: A Case Study of Pakistan

Ayesha ZAHIR, Shoab Ahmed KHAN, Afshan NASEEM
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This paper investigates the techno-economic viability of grid tied PV system that can be massively deployed in the residential areas of a developing country. Pakistan has been chosen as the area of study for this research. Furthermore, it takes net - metering incentive into account to propose a technologically viable and cost effective grid tied photovoltaic (PV) setup to mitigate the energy crisis prevalent over Pakistan. A detailed market research has been carried out for appropriate technology selection and optimal design of the PV system. Cost and payback analysis for the proposed system has been carried out to find the economic feasibility of the system. The results of the analysis showed that the proposed system can recover its cost with the net-metering incentive within 12 years and the consumer can benefit from the free electricity produced by the system for the remaining of its life time i.e. 13 years.

IEEM17-P-0249

Assessing the Possible Potential in the Global Energy Consumption: Integrated Artificial Neural Network and Data Envelopment Analysis

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Energy is fundamental to attaining various objectives globally. Its conservation and optimal use will help achieve the numerous objectives. Energy use has been well analyzed and assessed for different purposes using Artificial Neural Network (ANN) and Data Envelopment Analysis (DEA). This study has looked at the various benefits that can be acquired using these methods leading to the significance of developing an integrated model. To determine how much energy could be conserved globally, the integrated model was developed. The model applied to the global energy consumption from 1995 to 2009 discovered a possible saving of 1.62% that could have been conserved.

IEEM17-P-0250

The Selection of Enterprise Technology Innovation Mode (TIM) Based on Grey-AHP Method

Hongjie ZHANG, Yuming ZHU, Xiaoyu SONG
Northwestern Polytechnical University, China

The choice of enterprise technology innovation mode (TIM) is a critical part of the enterprise strategy, which has important influence on the development of enterprises. This paper proposes a four quadrant model of TIMs, drawing upon relevant literature on technology innovation. Then, the evaluation index system was structured by Delphi method and literature analysis, and AHP method was used to determine the weights of indexes. Grey comprehensive evaluation method is a scientific and reasonable method, it comprehensively analyzes qualitative data and quantitative data. According to the evaluation results of two dimensions, determine the choice of TIM, and the selection model of TIM was established. Finally, the effectiveness and applicability of the TIM selection model is verified by a case study of ZX Company.

IEEM17-P-0353

Nested Bilevel Genetic Algorithms for Game-Theoretic Optimization of Product Line Design Considering Competition

Xiaojie LIU[1], Gang DU[1], Roger J. JIAO[2], Yi XIA[1]
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[2]*Georgia Institute of Technology, United States*

Product line design considering competition (CPLD) can be formulated as a discrete bilevel optimization model based on the Stackelberg-Nash game, which is proved to be NP-hard in nature. This paper develops a nested bilevel genetic algorithm (NBGA) for solving the CPLD problem, in which the lower-level optimization problems are solved in a nested and sequential way for given upper-level decision variables. To compute the Nash equilibrium, the sequential tatonnement procedure is adopted in the lower-level optimization. A generic integer encoding scheme is introduced to represent the upper- and lower-level product line generation and selection, respectively. The design and implementation of the NBGA is discussed in detail. Finally, an application to CPLD of mobile phones is reported to illustrate the feasibility and potential of the proposed NBGA.

IEEM17-P-0462

A Two-Staged Task Assignment Algorithm for Worker Recommendation in a Crowdsourcing Environment

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Crowdsourcing markets have provided a means to complete tasks cheaply by global netizens. However, having less control of their workers may adversely affect the quality of work, even worse when assigning tasks without considering workers' skills, abilities and commitments. We extend the Dual Task Assigner (DTA) algorithm with the Artificial Bee Colony (ABC) algorithm, which figures out the optimal task baseline level for each task to guide the task assignment to workers with appropriate skills. We empirically evaluate the proposed algorithm using data collected from several crowdsourcing practices by freshmen in computer classes. The results show that our algorithm guarantees task results, and statistically performs better than the existing DTA and random assignment algorithms.

IEEM17-P-0521

Simulation-Driven Manufacturing Planning for Product-Production Variety Coordination

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Ambitious manufacturers are challenged to satisfy a broad range of customers while ensuring that the emerging product variety can be produced. Current practice suggests that products and production systems are modeled separately until the late stages of development when the designs are fixed and modifications are costly. In this paper, both product and production varieties are modeled, assessed, and evaluated using discrete-event simulation during preliminary stages. An illustrative example from the aerospace industry is used to demonstrate the approach. The simulation software Simio is used to model a sequence of operations and a set of input data related to a variety of aerospace sub-systems and a variety of welding resources. Through the simulations, the average utilization rate, the average throughput time, and the average work in process are generated. These outputs are used to evaluate the sets of product-production alternatives during the early stages of platform development when the cost to adjust the design of the products, production resources and operations are trifling.

IEEM17-P-0872

Statistical Analysis of Oil Insulation Breakdown Voltage

Himanshu GUPTA, Supriyo DAS
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Liquid or oil insulation are widely used in electrical power apparatus. The breakdown characteristic of oil insulation is statistically analysed. In order to obtain adequate information, suitable statistical distribution function needs to be identified to map with breakdown voltage data set. In this work, breakdown test of oil insulation is carried out with certain ramp rate i.e. rate of rise of voltage. The experimentally obtained breakdown voltage data was mapped with normal and weibull distribution. The statistical distribution of data is adopted to obtain information about the breakdown characteristics of oil insulation. The normal distribution is used to estimate mean value, standard deviation, whereas scale parameter, shape parameter are estimated using weibull distribution. Skewness factor is estimated for normal distribution and is seen to be of non-zero value. This non-zero skewness represents asymmetric distribution of experimental data. Weibull distribution being asymmetric in nature fits well with the experimental data. The weibull distribution provides significant information about the breakdown mechanism as well as characteristic breakdown voltage magnitude.

IEEM17-P-0910

Robust Model Predictive Control for Energy Management of Isolated Microgrids

Mengyan ZHAI, Yajie LIU, Tao ZHANG, Yan ZHANG
National University of Defense Technology, China

This paper proposed a robust model predictive control (RMPC) framework for the energy management of isolated microgrids to cope with the uncertainties and the dynamic of various loads and the renewable energy output. A mixed deterministic integer programming model of the energy management of isolated microgrids was firstly proposed with the goal of minimizing the cost of integrated economic operation, then the robust counterpart of the deterministic energy management optimization model was derived. After that, based on the model predictive control (MPC) framework, we proposed an online energy scheduling strategy, in which through adjusting the related settings in the robust optimization, the isolated microgrid can adapt to the various uncertain risks in energy management. At last we used a numeric test to verify the effectiveness of the proposed model and the proposed RMPC framework.

IEEM17-P-0088

Resource Recovery from Municipal Waste and Bio Solids (Digestate) Through Vermicomposting: A Waste Management Initiative

Mercy MANYUCHI, Charles MBOHWA, Edison MUZENDA
University of Johannesburg, South Africa

In this study, municipal waste and anaerobic digestate (bio solids) were co-vermicomposted in a bid to properly manage waste at disposal sites. Municipal waste and bio solids in the ratio 2:1 were vermicomposted in a vermireactor for 45 days. Process parameters such as moisture, temperature and pH as well as the nutrient composition in terms of nitrogen, phosphorous and potassium (NPK) content of the vermicompost were closely monitored. Approximately 250 Eisenia Foetida, a species of the red worms was used as the vermicomposting inoculants. After the 45 days, a rich vermicompost with an NPK composition of 6.18%, 3.27% and 8.26% respectively. The optimum conditions for producing this vermicompost were moisture content>27%, temperature >18.6% and neutral pH. An addition of the bio solids to municipal waste during vermicomposting adds value to the nutritional composition of the vermicompost.

IEEM17-P-0431

Industry 4.0 Interface for Dynamic Reconfiguration of an Open Lab Size Automated Production System to Allow Remote Community Experiments

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Nowadays, there are various use cases and proprietary demonstrators for Industry 4.0 or Cyber Physical Production Systems (CPPS) developed, operated and maintained by one or multiple research institutions. Within the development of new technologies for Industry 4.0, such demonstrators are used to support the interaction with the physical world, i.e. the machinery containing sensors and actuators. In this paper, we propose a concept that allows remote access using an Industry 4.0 interface on an open lab size automated production system (aPS), which has been available and used as a research community demonstrator for more than 5 years. Besides availability of evolution scenarios in various models and code, offering the possibility to conduct experiments from remote enables easier access and opportunities to interact with an aPS and provides a basis for concepts like production as a service and other research areas. The proposed concept is based on a model-driven approach that allows a dynamic reconfiguration of automation control code and generates a middleware interface. The middleware dynamically offers the possibility to retrieve information about the aPS and to control it via web services.

IEEM17-P-0489

Integrated Value Stream Mapping and Simulation for Cash-to-Cash Cycle Time Improvement of a Machining Facility

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This paper aims to improve the cash to cash (C2C) cycle time in a machining facility using integrated values stream mapping (VSM) and discrete event simulation (DES) techniques. C2C has been used as a metric to measure the effectiveness of working capital especially the cash management. This paper illustrated that the integrated VSM and discrete event simulation methodology can be an effective tool for C2C cycle time improvement. The methodology is described through a case study of a machining facility. The results show that through the integrated VSM and discrete event simulation methodology the C2C cycle time could be improved significantly.

IEEM17-P-0667

Manufacturing Industry in Cloud Computing Era: Case Study

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Cloud computing is a popular term to companies because of its characteristics of cost efficiency and flexibility. Cloud computing impacts the industries from both technical perspective and business perspective. Many companies adopt cloud to support their business activities. They can provide their internal resources/capabilities as services to other stakeholders in their collaborative relationship. It's critical to realize the importance and usefulness of cloud solutions for companies. Therefore, the current status of cloud-based solutions development and the innovation are discussed in this research paper, particularly in the manufacturing industry. A multiple cases analysis will be performed to understand how companies are using cloud as an enabler of their business. Various cloud-based solutions were implemented in the case companies to help researchers to understand the implementation and application. In the end, some advice and suggestions on their cloud implementation strategies will be provided for companies from different aspects.

IEEM17-P-0300

A Fuzzy Approach for Fatigue and Creep Analysis in a Fire and Tube Boiler

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A fuzzy approach for fatigue and creep analysis is proposed for a fire and tube boiler. Pressure and temperature induce cyclic stresses in boiler components, thus rendering them very susceptible to fatigue failure. Elevated temperatures in the creep regime in boiler tubes increase the probability of failure. Thus, the need has risen for an integrated Programmable Logic Controllers and fuzzy approach to come up with an adaptive controller capable of monitoring fatigue and creep. Finite Element Analysis (FEA) is performed on the boiler model using SolidWorks and the results obtained help to determine the overall integrity of the boiler. Temperature, pressure and the boiler materials are then taken as inputs to the Fuzzy Inference System (FIS) which then determines the extent of fatigue and creep damage aggregation through the rules generated in the fuzzy logic toolbox simulations in Matlab.

IEEM17-P-0304

The Advantage of the Arduino Sensing System on Parking Guidance Information Systems

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Parking is a big problem in metropolis. When people go to mall, department stores or hospitals, they often waste much time to find an unoccupied parking space. The study aims to provide people with real-time information about the parking spaces using an app which is transmitted through Arduino systems, WIFI communication modules, and the parking route planning mechanism. In this way, people can have a good command of parking information when they get into the parking lot.

IEEM17-P-0681

An Intelligent Optimization Approach for Waste Collection with Dynamic Disposal Trips

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This paper investigates a waste collection problem with the consideration of dynamic disposal trips. A hybrid artificial bee colony (ABC)-based approach is developed to handle this problem. We hybrid the ABC algorithm with the variable neighborhood descent algorithm to generate the better optimum-seeking performance, and propose heuristic procedures to choose disposal trip dynamically and calculate the carbon emission in waste collection process. The effectiveness of the proposed algorithm is validated by numerical experiments. The experimental results show that (1) the proposed hybrid ABC algorithm can solve the investigated problem effectively; (2) the algorithm exhibits better optimum-seeking performance than several traditional metaheuristics; (3) dynamic disposal trips should be considered in practice because it reduces the carbon emission at most 7.29% for investigated instances.

IEEM17-P-0191

A Sequential Multi-Objective Robust Optimization Approach Under Interval Uncertainty Based on Support Vector Machines

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Interval uncertainty can cause uncontrollable variations in the objective and constraint values, which could seriously deteriorate the performance or even change the feasibility of the optimal solutions. Robust optimization is to obtain solutions that are optimal and minimally sensitive to uncertainty. In this paper, a sequential multi-objective robust optimization (MORO) approach based on support vector machines (SVM) is proposed. Firstly, a sequential optimization structure is adopted to ease the computational burden. Secondly, SVM is used to construct a classification model to classify design alternatives into feasible or infeasible. The proposed approach is tested on a numerical example and an engineering case. Results illustrate that the proposed approach can reasonably approximate solutions obtained from the existing sequential MORO approach (SMORO), while the computational costs are significantly reduced compared with those of SMORO.

IEEM17-P-0240

Reliability-Oriented Quality Risk Modeling and Monitoring Approach in Manufacturing Process

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As a critical stage to form the final product reliability, the manufacturing process is always a focus of quality control activities. However, the reliability oriented quality control in manufacturing stage has not obtained enough attention. In this paper, based on the risk-based thinking advocated by the ISO 9001:2015 standard, a reliability-oriented manufacturing quality risk monitoring approach is presented to promote the fitness of the process quality control. First, the formation mechanism of quality risk in manufacturing process is expounded considering the product reliability degradation. Then, the quality negative event is defined to metric the quality risk, and its risk computation model is established based on the potential quality failure cost. Further, the Poisson moving average chart is adopted to achieve workstation-level and product-level quality risk monitoring. Finally, a case study is carried out to verify the proposed method.

IEEM17-P-0340

Test Stand for the Investigation of Driven Rollers

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Energy requirements of belt conveyor systems are essentially determined by the necessary drive power, which is composed of the main drive and intermediate drives. The use of driven support rollers reduces the load on the conventional drive at the head of conveyor systems. Thus, the drive can be build smaller, which can lead to energy and cost savings. In contrast to conventional head drives, driven rollers enable the implementation of modular conveyor systems. The theoretical possibilities and consequences of driven rollers are promising. Due to a lack of knowledge regarding the economic efficiency and behavior under certain conditions, driven rollers have not yet been integrated into real operation. In order to investigate the behavior of driven rollers and to ensure the introduction into practice, test stands are indispensable. This paper presents the concept of driven rollers and, on this basis, the development of a test stand for investigating these rollers.

IEEM17-P-0358

Multi-Criteria Classification for Prioritization of Preventive Maintenance Tasks to Support Maintenance Scheduling

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Preventive maintenance scheduling is a complex maintenance management activity that involves the consideration of several factors: maintenance technicians' availability, available machine periods, maintenance skills required and, task duration and its set date of achievement. When resources are scarce and time to perform maintenance is limited due to high utilization of equipment, tasks are delayed in relation to the date set for achievement. In this context, maintenance tasks must be prioritized to minimize the delays of critical tasks and, consequently, the overall negative impact. Thus, tasks classification is considered the first step of maintenance scheduling. This paper presents a multi-criteria classification using a risk-based approach to prioritize preventive maintenance tasks. The developed method can be easily integrated in a computerized maintenance management system to support maintenance scheduling.

IEEM17-P-0374

A Method for Function Modules Clustering Based on the Function Analysis and the Law of System Completeness

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In the modern TRIZ,the function analysis is often used to analyze complex system whose principles are difficult to understand or confuse problems are needed to identify . In this paper,the function analysis is used to build the Numeric Design Structure Matrix (NDSM) of the system,and then we cluster the system components into four modules according the Genetic algorithm. Finally, the law of system completeness is introduced to identify the type of the module and judge the degree of idealization of each module. As a result,the problem scope of system is ascertained.

IEEM17-P-0382

Analysis of Multi-State Warm Standby System Reliability Model with Repair Priority

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A single repair facility can provide the services of corrective maintenance and protective maintenance. For a multi-state warm standby system with repair priority, a model is built to describe the system reliability satisfactorily based on the PH distribution, which can fit any distribution approximately. A series of reliability features including system stability availability, system failure rate and mean time between failures (MTBF) are obtained. The applicability of PH distribution is verified in the numerical application to demonstrate the fluctuation of system reliability function as time goes by.

IEEM17-P-0408

Reliability Model Analysis on Parallel System Having Multiple Vacations of One Repairman

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As large complex equipment cannot be repaired in a timely manner in practice, the policy that a repairman takes multiple vacations is introduced to the parallel system containing identical components. Considering too stringent constraints of model due to exponential distribution and other special types of distributions in past studies, this paper assumes that service life of system components, repair time and the time of vacation of a repairman are in accord with continuous Phase-type distribution, builds a more valid interpretive model for system reliability, gives the reliability indicators including system reliability, system steady-state availability, steady-state failure frequency and system mean time between failure (MTBF), etc., and an application will be taken to verify the applicability of the model.

IEEM17-P-0413

The Reliability Analysis of Multi-State Cold Standby System Based on Phase-Type Distribution

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The multi-state cold standby system with two identical units has a single repair facility that provides two kinds of service: preventive maintenance and corrective maintenance according to the state of units, and the corrective maintenance has a higher priority. The continuous Phase-type distribution, instead of exponential distribution or other typical distributions, are used to described the residence time in the different performance of the operational unit, the preventive maintenance time and the corrective maintenance time. The proposed analytic model is more suitable to characterize the real situation. The stationary distribution is built by using matrix analytic methods; and several performance measures of interest, such as the system stationary availability, operational time, mean time between failures (MTBF), failure arrival rate of repair facility and system failure rate, are obtained. Finally, the validity and applicability of the model are implemented by numerical applications.

IEEM17-P-0537

A Maintenance Evaluation Method for Complex Systems with Standby Structure Based on Goal Oriented Method

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This paper proposes a maintenance evaluation method for complex systems with standby structure based on Goal Oriented (GO) method to evaluate their Mean Time To Restoration (MTTR). First, the proposed method is expounded in detail from aspects of conducting system analysis, developing maintenance evaluation model, and obtaining system MTTR. Then, the AC power system for single unit with 100% capacity divisions in nuclear power plant is taken as an example; its MTTR is evaluated by this paper's method. All in all, this study not only widens the application of GO method; but also provides a new MTTR evaluation approach for complex systems with standby structure.

IEEM17-P-0774

A Mean Life Evaluation Method for Complex Multi-Function Systems Based on GO Method: Case Study of Vehicle Transmission System

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This paper proposes a mean life evaluation method for complex multi-function systems based on GO method. Taken the vehicle transmission system as case study, first, the GO method for evaluating mean life of complex multi-function systems is expounded in detail from aspects of presenting the reliability analysis for complex multi-function systems by GO method and formulating the evaluation process of the proposed method. Then, the Power Shift Steering Transmission (PSST) of a heavy vehicle is taken as an example, its mean life is evaluated by this paper's method. Finally, in order to illustrate the advantages and rationality of the proposed method, the evaluation results and operation efficiency are compared with those by Monte Carlo method. All in all, this study not only widens the application of GO method; but also provides a new mean life evaluation approach for complex multi-function systems.

IEEM17-P-0815

Criticality Analysis from Maintainability Point of View

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Maintainability performance of a system depends on component's performance. Some components have more influence on the system maintainability, which can identify by use of importance measures. The aim of this paper is to develop the concept of maintainability importance measure, which is useful for maintainability improvement. Therefore, this paper will present the concept of maintainability importance measures for the criticality analysis of each component. The result of analysis will be useful for allocation of resources in order to improve maintainability of the system.

IEEM17-P-0838

Research on Basic Maintenance Unit Model Under Two-Level Maintenance

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In two-level maintenance, the intermediate-level sites are replaced by other sites. How to allocated tasks of testing and replacing shop-replaced units is the key to balance material reliability and expenses. This paper raises basic maintenance unit model to divide support tasks and resource among organizational-level sites of a basic maintenance unit with lateral support. The process of level of repair analysis is also improved. Finally, the feasibility of the model is verified with a numerical example by Monte Carlo simulation on comparing with other models.

IEEM17-P-0861

Tool Condition Monitoring in Deep Hole Gun Drilling: A Data-Driven Approach

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Data-driven tool condition monitoring techniques have received attention in manufacturing industry due to their ability to improve effective and efficient decision-making. In this paper, we present a novel data-driven tool condition monitoring method for tool wear estimation in deep hole gun drilling. The proposed method uses the Gaussian process regression (GPR) based on a combination of force, torque, and vibration signal features, which are extracted within a pre-defined segment. The segmentation method is based on the sliding time window approach, to improve the estimation accuracy of the GPR. We also leverage a smoothing method to refine the estimation outputs to reduce noise and outliers.We show the performance of the proposed method using gun drilling experimental data. The results showed that the tool wear estimation accuracy can be enhanced by the proposed method, which considerably outperforms the other methods such as linear regression, ensemble, and support vector regression.

IEEM17-P-0119

Modelling Electricity Spot Prices with a Three-Regime Markov Model

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Price formations in the spot market have received significant attention due to its great impact on delivered profits for the retailer and in turn, the pricing signal received by the consumer. The increased availability of supply and demand data since the shift towards deregulated industries has enabled the relationships between prices and their underpinning drivers to be better understood and analysed. In order to appropriately capture these stylised features, particularly mean-reversion, seasonality, volatility and short-lived spikes, a three-regime Markov switching model to predict hourly spot prices for the NSW region in Australia is proposed. The model's superior performance in comparison to similar works found in literature can be attributed to the lack of limitations placed on electricity spike behaviour and the consideration of reported intra-day, inter-day and annual seasonality.

IEEM17-P-0563

Self-Organizing Network Control with a TD Learning Algorithm

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We study a network control problem characterized with self-organizing network structure and self-organizing job routing. We decompose the self-organizing network control problem into a series of Semi Markov Decision Processes and construct a control decision model for them based on the coupled Reinforcement Learning framework. To minimize the mean weighted flow time of the jobs through the network, we propose a Reinforcement Learning algorithm to deal with the control decision model and obtain a control policy integrating the jobs routing selection strategy and the jobs sequencing strategy. Computational experiments verify the learning ability and the effectiveness of the proposed Reinforcement Learning algorithm applied in the investigated self-organizing network control problem.

IEEM17-P-0187

A Fitness Approximation and On-Line Variable-Fidelity Metamodel Based Multi-Objective Genetic Algorithm

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Population-based algorithms can become computationally intractable when applying in practical engineering design optimization involving computational expensive simulation. To address this challenge, this paper proposes an on-line variable-fidelity metamodel (VFM) assisted Multi-Objective Genetic Algorithms (OLVFM-MOGA) approach. In OLVFM-MOGA, the VFM integrates information from low-fidelity (LF) and high-fidelity (HF) models is constructed to replace the simulation model during the optimization process to ease the computational burden. Besides, a novel model updating strategy is developed to address the issues of 1) which individuals will be sent for running simulations. 2) whether the LF model or the HF model should be selected to run for a selected individual. The effectiveness and merits of the proposed OLVFM-MOGA approach are demonstrated on the design optimization problem of a torque arm.

IEEM17-P-0307

A Global Support Vector Regression Based on Sorted K-Fold Method

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Support vector regression (SVR), as one of the most popular metamodels, has been widely used to replace expensive and time-consuming simulation models in complex engineering design process. In this essay, a global support vector regression metamodeling approach based on the sorted K-fold method (SKM-SVR) is proposed, which combines the K-fold cross-validation technique with SVR. Firstly, all sample points are sorted and divided into K groups according to their absolute prediction errors from traditional SVR metamodel. Secondly, K number of SVR metamodels are constructed based on cross-validation technique. The weighting factor of each SVR metamodel depends on their prediction accuracy. Finally, K number of SVR metamodels are integrated to form the SKM-SVR metamodel. The effectiveness of SKM-SVR method is demonstrated by a mathematical example and a pressure vessel design problem. Results indicate that SKM-SVR approach has better prediction ability than that of SVR.

IEEM17-P-0443

Normal Forms of Homoclinic Bifurcation for a Rotor-Active Magnetic Bearings System

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The normal forms of homoclinic bifurcation for a rotor-active magnetic bearings (AMB) system with the time-varying stiffness are computed through considering the zeros of Melnikov equation by using the method of singularity theory. The results indicate that the bifurcation of limit point, simple bifurcation, isola center, hysteresis and quartic fold occurs.

IEEM17-P-0561

Analysis on Factors Affecting the Configuration of Maintenance Support System

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This paper introduces the ship equipment maintenance support as well as its system. By introducing the evaluation indicators for the configuration of ship equipment maintenance support system, an evaluation structure chart for ship equipment maintenance support system is created, while the factors affecting evaluation indicators are illustrated. Based on the actual activities of maintenance, the factors affecting the configuration of ship equipment maintenance support system are analyzed, while the principles of system dynamics are followed to analyze the causal loop diagram of each factor. Subsequently, an evaluation indicator model for the configuration of ship equipment maintenance support system is built, while sensitivity analysis is carried out for these factors, so as to realize the effect of optimizing the configuration of maintenance support system and fulfill the purpose of evaluating the configuration of maintenance support system.

IEEM17-P-0642

Research of Silicone Oil Uniformity for Butyl Rubber Stopper and Simulation Verification

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Silicone oil has been recognized as an effective factor for dealing with the butyl rubber stopper demolding. For the problem how to decide reliable injection for butyl rubber stopper, we take on some research on the uniformity of silicone oil, and verify the test according to the finite element simulation. At first, a 3D model of mold is constructed, while the economic cost and reconfigurability are used as the indexes. Then computational fluid dynamics (CFD) simulation is used to establish the function model, which is a powerful and often indispensible tool for modeling airflow and aerosol transport in realistic and complicated airway geometry. After we mesh the model and set the appropriate boundary conditions, better entrance speed of injection is achieved. From this result, it could be suggested that silicone oil could be quantified, and we can evaluate the quality of butyl rubber stopper silicide optimization.

IEEM17-P-0055

The Effect of Tightness-Looseness on Well-Being : Residential Mobility as a Moderator

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This study examines how tightness-looseness influence well-being at individual level and residential mobility as moderator. The sample comprised of 344 Chinese participants(aged 13 to 66), and the data were collected from the internet. Two important results were found. First, tightness-looseness was positively associated with the life satisfaction, job satisfaction and efficacy, but it was negatively associated with exhaustion. Tightness-looseness can predict job satisfaction, life satisfaction, exhaustion and efficacy. Second, Residential mobility partly moderated the relationship between tightness-looseness and well-being. Residential mobility had a moderating effect on the relationship between tightness-looseness and job satisfaction, tightness-looseness and exhaustion.

IEEM17-P-0069

The Effect of Calling Orientations on Work Engagement of Employees in Securities Company: An Intermediary Model of Mediation

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This study focuses on the impact of calling orientation on employees' work engagement in securities industry, through the investigation of 291 securities employees, and also discusses the mediating role of professional identity and the moderating role of organizational identity in this mechanism. The results show: (1) Securities employees' calling orientation can significantly predict work engagement; (2) Professional identity serves as a partial mediator in the relationship between calling orientation and work engagement; (3) Organizational identity has a significant positive effect on the intermediary role of professional identity, referring that the impact of calling orientation on professional identity increase along with the increasing of organizational identity.

IEEM17-P-0141

The Impact of Performance Feedback on Work Engagement ---- The Mediating Effect of Psychological Empowerment

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In order to investigate the impact of performance feedback on work engagement and the impact mechanism between the two constructs, a questionnaire survey was conducted among 155 employees from 5 enterprises in Shandong Province by three scales, psychological empowerment, work engagement and performance feedback. The results showed that: First, performance feedback had a positive impact on work engagement and psychological empowerment. Second, the impact of performance feedback on work engagement was mediated by two dimensions of psychological empowerment, meaning of work and autonomy. Performance feedback helped employees get a sense of meaning, enhanced their sense of autonomy and thus increased work engagement.

IEEM17-P-0710

Research on the Influence of Employees' Career Adaptability on Occupational Success

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With the development of science and technology and the intensification of organizational change, employees are moving frequently between organizations. Currently, to strengthen employees' career adaptability consciously will be helpful to their occupational success; therefore, it becomes a new trend for organizational human resources development and management. Based on the theory of career construction and resource conservation, this study establishes the theoretical model of the influence of career adaptability on occupational success, and uses questionnaire survey method to analyze 315 employees from enterprises and institutions. The results show that career adaptability has significant positive impact on job involvement and occupational success; job involvement plays a mediating role between career adaptability and occupational success; organizational career management plays a regulatory role in job involvement and occupational success. The research findings enrich and expand the theory of occupational success, which also provide valuable theoretical support for the employees' career management practice.

IEEM17-P-0717

The Effect of Servant Leadership on Work-Related Well-Being: The Mediating Role of Work Flow and Work Engagement

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The study aimed to explore the effect of servant leadership (SL) on work-related well-being of employee (WWB), and also investigated the mediating role of work flow (WF) and work engagement (WE) between servant leadership and work-related well-being in China. Participants in the study consisted of 338 employees of organizations who took part in an online questionnaire. The results showed that servant leadership had positive effect on work-related well-being of employee, and both work flow and work engagement mediated the influence of servant leadership on work-related well-being. Our results show that leaders' servant leadership style is important to their followers' work-related well-being, and through work flow and work engagement can enhance the level of their work-related well-being.

IEEM17-P-0800

Relationships Among Personality, Calling, Career Engagement, and Self-Defeating Job Search Behavior in Chinese Undergraduate Students: The Mediating Effects of Career Adaptability

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Based on the career construction therapy, this paper explores the relationship between personality, calling, career engagement(CE) and self-defeating job search behavior(procrastination and impulsiveness) among university students, as well as the intermediary role of career adaptability(CA) in this relationship. 337 students were randomly selected from 2 universities to complete the big five personality scale, the brief calling scale, career engagement scale and the job search procrastination and impulsive behavior scale for statistical analysis including correlation analysis and regression analysis. The study results confirmed the significant positive impact of calling on career engagement, and career adaptability partial mediated the relationship between calling and career engagement. Among the personality dimensions, conscientiousness and openness to experience had significant influence on career engagement, and the study confirmed career adaptability mediated the relationship in this relationship. Conscientiousness, openness to experience and neuroticism had significant influence on job search procrastination (JSP); and career adaptability mediated the relationship between conscientiousness, openness and job search procrastination

IEEM17-P-0202

Predictive Modeling of Potential Customers Based on the Customers Clickstream Data: A Field Study

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With the development of e-commerce business and techniques, customer behaviors have been digitalized. In this research, we target on solving the challenge for most of the companies: finding the next group of paying customers. We conduct field studies at the telemarketing team of an online advertising classifieds website company. Dynamic models are developed to predict the probability of making purchases after each telemarketing contact. The real life data is collected from more than 1.2 million of the historical telemarketing campaign contacts. The model utilizing clickstream data successfully integrates the early indicators of purchase behaviors, and deliver comparable results (best AUC 0.867) with models on paid customers. We have also designed a practical decision support system which could generate and distribute candidate customers for the sales representatives of the telemarketing team. The decision support system has been launched and the effectiveness of the system has been tested in real life practices.

IEEM17-P-0645

Service Strategy Under Online B2C Dual-Channel Competition

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This paper studies the online B2C dual-channel's service strategy under two service-delivery models: e-tail channel and direct channel separately provide the service. We combine service, channel preference and pricing into the model and get the supply chain members' optimal profits. It is found the manufacturer and the whole supply chain prefer e-tail channel to be the service provider. However, the e-tailer is not always willing to provide service. Therefore, the manufacturer may have to compensate for e-tailer or provide service itself.

IEEM17-P-0709

The Effects of Relationship Norms on On-Line New Product Development Value Co-Creation Engagement

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In today's market, new product innovation is very important to the company, especially to the Fast Moving Consumer Goods (FMCG) company. This paper focuses on the motivations of individual's participation in the new product development(NPD) co-creation which is hold by FMCG company. At the same time, the concept of relationship norms (communal relationship, exchange relationship) is quoted in this paper to study what are the different motivations of the two relationship groups to participate in the co-creation activity. Data analysis show that, in exchange relationships, the high lever financial rewards can positively influence the willingness of participation significantly. But it's not significant to the communal relationship respondents. The moderating effect of relationship norms is significant. And the motivations of helping the enterprise and gaining hedonic benefits can enhance the willingness of participation significantly. It's very meaningful to the FMCG companies when they want to hold a NPD value co-creation activity on internet. They can have a test first to estimate the relationship norm between the brand and the consumers. Then make decision to give what kind of rewards to the consumers to encourage them.

IEEM17-P-0730

Effect of Service Recovery on Recovery Satisfaction and Behavior Intention: An Empirical Study on Clothing Product Online Shopping

Yun LI, Tong LIU, Yi-Wen CHEN
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In the background of clothing products online shopping, data of 276 service failure experienced consumers had been collected through online survey. The aim of this study was to investigate the influence mechanism of service recovery strategies (compensation, recovery speed, apology and recovery initiation) on recovery satisfaction (RS) and behavior intentions (BI) (Word-of-Mouth (WOM) and Repurchase Intention (RI)). Hierarchical regression and bootstrapping had been used to examine the mediation effect of WOM and RS. The findings indicated that all of the four strategies had positive effects on RS; Positive WOM had the mediation effect between RS and RI; RS had the mediation effects between recovery strategies and BI. Also, theoretical and practical contributions had been discussed to give some new perspectives or advices. Limitations and suggestions for future research had been mentioned in the end.

IEEM17-P-0765

Keyword Extraction from Online Product Reviews Based on Bi-Directional LSTM Recurrent Neural Network

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Online reviews are acknowledged as an important source of product information when customers make purchasing decisions. However, in the era of information overload, product review data on the Internet are too abundant and contain much irrelevant information. This makes it difficult for customers to find useful reviews. To solve this issue, some e-commerce websites provide keywords for product reviews, but these are generated beforehand and have the potential to distort customers' opinions of products. This paper presents an automatic keyword extraction method based on a bi-directional long short-memory (LSTM) recurrent neural network (RNN). The results of experiments conducted on product reviews obtain by data-crawling jd.com show that the proposed approach has a very high accuracy of keyword extraction. This can help reduce human annotation efforts in e-commerce.

IEEM17-P-0793

Empirical Study of the Relationship Between Flow Experience, Perceived Transaction Value and Impulse Buying Behavior

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As a pleasant experience of being immersed in the current activity, flow experience is an important factor that facilitates impulse buying behavior. In addition, consumers' perceived value in the virtual environment has a significant impact on the purchase decision making. This research employ questionnaires to investigate the consumers' psychological experience of online shopping, thereby study the relationship between flow experience, perceived transaction value, positive affect, shopping motivation, and impulse buying behavior. The results indicate that (1) flow experience and perceived transaction value, which mediated by positive affect, have positive impact on impulse buying behavior; (2) the positive relationship between positive affect and impulse buying behavior is moderated by hedonic shopping motivation.

IEEM17-P-0368

Solution to Excess Capacity in View of Stakeholders

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Excess capacity is one major problem in the process of China's economic development. The reason is that capacity goes far beyond the market demand. It's different from excess capacity in the West, which is caused by insufficient demand of consumers. In addition, various stakeholders who have different needs are involved in the processes of formation and governance of excess capacity. Excess capacity is formed and further upgraded by game among central governments, regional governments, manufacturing companies and other institutions. Therefore, solution to resolve excess capacity issues are raised by analyzing market failure and game among central governments, regional governments, manufacturing companies.

IEEM17-P-0005

Understanding the Service Desk: Applied Forecasting and Analytics Approach

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In this paper, the study aimed to identify the best forecasting model to represent I-Helpdesk, service desk of an Information Technology (IT) project under the Singapore's Ministry of Defence (MINDEF), in the aspect of Service Requests management. Defence Science and Technology Agency (DSTA) support MINDEF users in the area of technical consultancy and project management areas such as resource allocation management for IT service delivery and excellence. To achieve an overall aim of better service delivery for their system users, we intend to answer questions such as: How should we plan the helpdesk staffing for the next week/month?

IEEM17-P-0392

Multimode Resource-Constrained Multi-Project Scheduling with Ad Hoc Activity Splitting

Byung Jun JOO, Ping Chong CHUA
Singapore Institute of Manufacturing Technology, Singapore

This paper focuses on a multimode resource-constrained multi-project scheduling problem in an engineer-to-order company. During the execution of multiple projects, some activities should be split into sub-activities in an ad hoc manner according to the readiness of customers. Moreover, there is no prior information on when and how the activities need to be split. To deal with the problem which has not been addressed in previous research, an ad hoc activity splitting method and a simulated annealing algorithm is developed. A prototype scheduling system is developed and a case study for scheduling with ad hoc activity splitting is reported.

IEEM17-P-0451

Resource-Constrained Project Scheduling in Hazardous Environment

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Dongguan University of Technology, China

This paper studies a resource-constrained project scheduling problem(RCPSP) in hazardous environment. Due to the special working environment, this problem is not only constrained by the resources quantity, but also influenced by the cumulative damage suffered by workers. As this extremely increases complexity of the problem. We use particle swarm optimization(PSO) algorithm to solve the investigated problem and design a specific discrete mechanism. Computation results shows the adaptability of our algorithm.

IEEM17-P-0083

Wiki as a Research Support System – A Trial in Information Systems Research

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This paper shows the preliminary results of a study on exploring how to use Wiki as a research support system, with a focus on literature reviews management and research project management. A wiki was established by an Information Systems research student, who focused on e-Commerce. The Wiki included literature reviews and other related information, such as conferences and journal information.The technical issues and user experience are covered in this paper, and analysis on some wiki pages are made. The paper also addresses the issues and difficulties of writing literature reviews as suggested by some previous scholars. Based on the preliminary outcome, further research directions are suggested, and recommendations are made to researchers and wiki software developers. In the long term, the study would contribute to a clearer image of Research Support System development

IEEM17-P-0226

Outsourcing in Business and Management Studies: A Co-Citation Analysis

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Outsourcing is a critical issue for an enterprise in the past two decades. It extended from the local operation service to the global service and influenced enterprise decision making process. Companies need to create competitive advantage from cost reduction, especially via outsourcing their operational activities. The purpose of this article is to bring up a visual mapping of two-dimensional intellectual structure and to recognize the subfields of the outsourcing through co-citation analysis. In this study, we collected some papers from ISI Web of Knowledge (WoS) database in the outsourcing area. We rank the outsourcing documents by times cited and collect the top 60 articles. Also, we use multidimensional scaling (MDS) and clustering techniques (CT) to create the two-dimensional maps to show the intellectual structure of outsourcing dynamically. The conclusion would provide for the researchers' reference.

IEEM17-P-0916

Applicability of Lean Product Development to a Company in the Marine Sector

Elisabeth SYNNES, Torgeir WELO
Norwegian University of Science and Technology, Norway

How can a marine company best combine people, process and technology to optimize its Product Innovation system for advanced, complex products produced at low volumes? This paper discusses the possibility of using the Lean concept to improve the company's product development system. The operational context of the case company is analyzed up against the framework of Morgan and Liker's 13 Lean Product Development (LPD) principles. Our hypothesis is that although the business context of the case company is radically different from Toyota, several principles and practices will still be applicable once 'contextualized'. A workshop was held with a multidisciplinary product team to assess the practices of the company relative to LPD. The team evaluated current company practices and desired future practices. The results are summarized and discussed herein. It is concluded that the original LPD principles have a varying degree of applicability to the context of the case company.

IEEM17-P-0021

The Effect of Service Quality Among Customer Satisfaction, Brand Loyalty and Brand Image

Kai-Fu YANG, Hao-Wei YANG, Wen-Yu CHANG, Hsuan-Kuang CHIEN
Chaoyang University of Technology, Taiwan

The objective of this study was to assess the psychological and physiological dimensions of service quality, customer satisfaction, and brand loyalty of Taiwan's Superdry, and to find out whether brand image has a positive moderating effect between service quality and brand loyalty. The findings from the study confirmed that service quality has a positive direct effect on customer satisfaction, as well as customer satisfaction to brand loyalty and service quality to brand loyalty no matter in both psychological and physiological dimension. Moreover, brand image has a positively moderating effect between service quality and brand loyalty.

IEEM17-P-0167

Exploring the Role of Professional Development Motivation Between Work Values and Job Satisfaction

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National Taipei University of Technology, Taiwan

This research probes the role of professional development motivation between work values and job satisfaction. Convenient sampling is employed to conduct questionnaire survey to the administrative staff of four private technological universities in northern Taiwan. The valid 242 data are analyzed using SEM (structural equation modeling) and the results reveal that work values significantly affect professional development motivation and job satisfaction respectively. The mediating effect of job development motivation between work values and job satisfaction shows a statistical trend toward significance. In addition, the strongest motivator of administrative staff' professional development is "cognitive interest" orientation and "social relations" orientation takes second place. Implications for educational institutions, the university staff and future researches are discussed.

IEEM17-P-0400

A Game-Based Learning System to Disseminate Kanban Concept in Engineering Context: A Case Study from Risk-Based Inspection Project

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Engineering activities (e.g. design, analysis, and assessment) are characterized as knowledge works, which have intangible output/input and processes, as well as invisible work-in-process (WIP). Due to its invisibility, WIP in engineering projects has not received adequate attention, which hinders engineering companies from capturing the challenges associated with WIP management and optimization. The kanban concept has been proven to enable the management and optimization of WIP in the manufacturing industry. This concept has not been prominent in engineering type of activities and projects, due to the belief that it is applicable only to repetitive and physical production. This manuscript proposes the utilization of game-based learning to disseminate the importance of managing and optimizing WIP by applying the kanban concept in engineering projects. A game is developed to serve this purpose. A project related to risk-based inspection (RBI) is selected as the case study for developing the game.

IEEM17-P-0644

Analysis of the A3 Report Template and Suggestions for Improvement

Susiwati TA, Laura Xiao Xia XU
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This paper studies the current difficulties lean team members face when creating and using the A3 report as a lean implementation tool. A study was conducted in a Singaporean manufacturing firm to observe problems faced when participants create, review and edit the A3 report. Problems observed include participants not creating action tasks, not recording identified problems, lack of collaborative root cause analysis, excess time spent on consolidating the Kaizen Newspaper, and excess time required to inform persons-in-charge of action tasks. Probable causes of difficulties observed are highlighted and case studies are referenced to propose possible features to mitigate these difficulties, such as sending tasks for review automatically, recording problems when identified, encourage sharing of A3 reports, automatic updating of the Kaizen Newspaper, and automatic notifications for persons-in-charge of action tasks. A mobile application was suggested as the medium of the improved A3 report and developed. Preliminary testing of two features indicate that it can reduce time required to manage the A3 report by approximately 90%. Additional trials were suggested to support the proposed features in the improved A3 report.

IEEM17-P-0724

Influence of Parental Rearing Patterns on Academic Burnout: The Mediating Role of Psychological Capital and Self-Control

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On the basis of resource conservation theory and self control resource model theory, the influence of parental rearing patterns on academic burnout of junior high school students is investigated to explore the mediating role of psychological capital and self-control, providing theoretical and practical basis for reducing academic burnout of junior high school students. Questionnaire method is adopted to test 197 students in certain junior high school of Beijing City. The data were analyzed by descriptive statistics, hierarchical regression analysis,AMOS data analysis , bootstrap and so on. The results show that:Parental refusal has positive correlation with academic burnout and negative correlation with psychological capital and self-control; parental emotional warmth has negative correlation with academic burnout and positive correlation with psychological capital and self-control; different dimensions of parental rearing patterns can influence students' academic burnout through the mediating role of psychological capital and self-control.

IEEM17-P-0082

Safety, Sustainability, and Consumers' Perceived Value in Affecting Purchase Intentions Toward Organic Food

Shu-Yen HSU, Chiao-Chen CHANG, Tyrone T. LIN
National Dong Hwa University, Taiwan

This study aims to investigate the influence of the corporate social responsibility for environmental protection on consumers' attitudes and purchase intentions toward organic food under the circumstances of global warming and frequent food safety problems. Samples are collected by questionnaires with a total of 177 valid questionnaires. The data are analyzed by Structural Equation Modeling (SEM) and the result shows that corporate social responsibility has a significant influence on consumers' perceived value. Moreover, consumers' perceived value and corporate social responsibility are the important factors of affecting consumers' attitudes and purchase intentions. And consumers' attitudes also has an indirect effect on food safety concern and purchase intentions. The results of the study would serve as a reference for corporations to pursue economic benefit as well as to fulfill corporate social responsibility for the goal of sustainable management.

IEEM17-P-0089

Appraisal of Mask Manufacture Information Security Based on ISO27001 and Common Criteria

Cynthia WANG, Eric GUO, Sammy CHEN, Sherry ZHU, Jason WU
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Information security management has become one of the key areas of organization management and customer audit, also has been concerned by more and more clients and third-part audit organizations. How to establish, implement, maintain and continually improve information security management system has become a big concern for enterprises to improve strategic management level.ISO27001 standards is an evaluation scheme of information security operational system. But ISO27001 is neither necessary nor sufficient to pass Common Criteria evaluation. This paper presents the difference and the relationship between ISO27001 Information Security Management System (IAMS) and Common Criteria which are popular in many semiconductor companies, and will find more benefits in information system management with these two types of certifications for semiconductor production process.

IEEM17-P-0143

Study on Hazard Identification Method for Life Cycle of Patch Board

Xia LIU, Bisong LIU, Wanjin TANG, Wu QIAN, Pei FEI
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For patch boards are widely-used, the consumer's demands on safety of them become more and more strict. Therefore identifying hazards during the life cycle of patch boards with formal methods has played an important role on improving the products' safety level. In the paper, hazard identification during the design stage can adopt the comprehensive list of hazard. During the logistics stage, the hazard and operability study method were adopted. Hazard identification during the usage stage, adopted the method of failure mode and effect analysis based on analytic hierarchy process and the fault tree analysis method to find the primary causes and triggering conditions of the accidents. Hazard identification during the recovery stage adopted the fault hypothesis analysis method to analyze environmental harm caused by improper handling.

IEEM17-P-0215

An Improved Aircraft Landing Distance Prediction Model Based on Particle Swarm Optimization - Extreme Learning Machine Method

Silin QIAN, Shenghan ZHOU, Wenbing CHANG, Fajie WEI
Beihang University, China

Aiming at the problem that aircraft landing runway overrun, this paper proposed a landing distance prediction model based on improved extreme learning machine (ELM) with flight data. Particle swarm optimization (PSO) was used to optimize the input layer weights and the hidden element bias of a single hidden layer feedforward network. And then the optimal input weights and the implicit bias were applied to the ELM prediction model. Firstly, flight data is preprocessed with data slicing method based on flight height, and determine model input variables. Secondly, select the appropriate activation function. Subsequently, establish the PSO-ELM model of landing distance prediction. In the end, compare with traditional BP neural network and ELM under different evaluation indexes. The results show that the prediction of landing distance conforms to the actual measured data. The maximum absolute error is 45 meters, and the maximum relative error is 6%.

IEEM17-P-0239

Light SIEM for Semiconductor Industry

Wu QINGRONG, Sherry ZHU, Eric GUO, Max LU
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Information security is the foundation of enterprise information framework, and a strong enterprise information framework benefits business growth. Information security management system combined with business data can provide more effective service for enterprise. When IC production enters into the nanometer generation, more and more semiconductor manufacture companies have taken a lot of effort in information security area to prevent company information security. Lots of traditional security approaches are deployed, such as firewall, IDS, HIPS, anti-virus, DLP. But these products and applications like information islands, to protect sensitive data independently. This paper tempts to analysis semiconductor industry security requirements and to describe our practice on building up a high-performance Light SIEM. The Light SIEM system links with different security products and applications, correlates business data with information security management, and an effective approach to support enterprise information security management, including threat detection and security incident response and reports for compliance purposes.

IEEM17-P-0389

An Efficient Intranet Architecture Scheme Based on Regional Function and Security Requirement in Semiconductor Manufacturing Enterprises

Fan SHUAIJIE, Sherry ZHU, Eric GUO, Max LU, Wu QINGRONG
Semiconductor Manufactory International Corporation, China

The use of information and communication technologies is growing rapidly [1], and information security requirements have risen to a new stage. When IC production enters into the nanometer generation, more and more semiconductor manufacture companies have taken a lot of effort in information security area to prevent company information security, especially at the network level. The network structure of the semiconductor manufacturing enterprise is complicated due to huge organizational structure, and there are easily potential risks come from threat or attack to network. In this paper, and a good practice of internal area network solution is presented. In order to guarantee the security of customer IC design data and foundry process knowledge, an effective functional security zones scheme is designed to enhance the security level of intranet and at the same time not to affect operation convenience and efficiency.

IEEM17-P-0387

Big Data Analytics to Improve Photomask Manufacturing Productivity

Xiaoming FAN, Xuan ZHU, Kuei Chi KUO, Cong LU, Jason WU
Semiconductor Manufacturing International Corporation, China

Driven by Moore's law, the number of transistors fabricated on a wafer will be doubled every 12 or 24 months with a lower average selling price [1]. When IC production enters into the nanometer generation, many factors including recipe, process, tool, and chamber with the multi-collinearity affect the yield that are hard to detect and interpret. This paper describes both our practice on big data analytics to a real-time remote monitor mask production line, and how to monitor critical production machines' parameters, and then setup an alert mechanism, all of which are helpful in improving production machine usage and production line productivity, and decreasing mask scrap.

IEEM17-P-0464

Failure Mode Classification for Control Valves for Supporting Data-Driven Fault Detection

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Significant losses of production due to unplanned downtimes are a major problem caused by technical failures of equipment. Existing approaches like failure mode and effect analysis try to identify possible equipment breakdowns, their causes and effects in order to quantify the reliability of the system. Yet, they are not used for the detection of faults. On the other hand, Industrie 4.0 and data mining aim to improve the total operating time of automated production systems. However, due to the complexity of automated production systems and the underlying physical phenomena, it is essential to formalize expert knowledge for usage during data analysis. In this contribution a classification table is proposed, in which the expert knowledge on failure modes, underlying parameters and detection features are summarized and presented. This knowledge is used to formulate appropriate detection models. The evaluation for detection of failure modes for control valves showed the usefulness of combination of expert knowledge and data-driven data analysis.

IEEM17-P-0848

Development of an Entropy-Based Feature Selection Method and Analysis of Online Reviews on Real Estate

Hiroki HORINO[1], Hirofumi NONAKA[1], Elisa Claire ALEMÁN CARREÓN[1], Toru HIRAOKA[2]
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In recent years, data posted about real estate on the Internet is currently increasing. In this study, in order to analyze user needs for real estate, we focus on "Mansion Community" which is a Japanese bulletin board system about Japanese real estate. In our study, extraction of keywords is performed based on calculation of the entropy value of each word, and we used them as features in a machine learning classifier to analyze 6 million posts at "Mansion Community". As a result, we achieved a 0.69 F-measure and found that the customers are particularly concerned about the facility of apartment, access, and price of an apartment.

IEEM17-P-0388

Abnormal Data Analysis in Process Industries Using Deep-Learning Method

Wen SONG, Wei WENG, Shigeru FUJIMURA
Waseda University, Japan

This research is mainly about the abnormal data analysis in factories of process industries. In the processing factory, there are many sensors which transmit the values to each other. Workers in process factory need to be alerted when the values of some sensors are abnormal values. In our research, the main target is to detect the potential abnormal value from different sensors of process industries. Since the value is filled with noise and delays, we first use the cross-correlation and wavelet transformation to remove them. Then, use deep-learning method to train the model with processed data and use the model to detect potential abnormal value. Finally, we evaluate the model we trained by the data extracted from a real process factory. The result shows that our model performs well.

IEEM17-P-0327

Implementing the Balanced Scorecard in Excel for Small and Medium Enterprises

Antonio VIEIRA, Nuno SOARES, Sergio D. SOUSA
University of Minho, Portugal

Performance measurement is a way for organizations to be able to assess processes' performance. The Balanced Scorecard (BSC) is one of the best-known performance measurement systems. However, many small and medium enterprises (SME) face problems when trying to implement these frameworks, due to software associated costs. In this context, this paper documents the work conducted to develop a low cost solution for SME. The solution consisted on implementing the BSC in an excel workbook. The created tool allows users to have a chromatic view over data and assess its quality, by introducing risk analysis, through the utilization of trails with different intensities, depending on the associated risk. Moreover, data is automatically recorded to allow traceability and dynamic charts were introduced to allow the analysis of different performance attributes.

IEEM17-P-0569

Determining Golden Process Routes in Semiconductor Manufacturing Process for Yield Management

Chang-Ho LEE[1], Dong-Hee LEE[2], Young-Mok BAE[1], Kwang-Jae KIM[1]
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Managing the yield of wafer is one of the most important tasks to the semiconductor manufacturers. A lot of efforts for enhancing the yield of wafer have been conducted in both industries and academia. Thanks to the advance of IoT and data analytics techniques, huge amount of process operational data, such as indices of process parameters, equipment condition data, or historical data of manufacturing process, is collected and analyzed in real-time. Though the amount and availability of process operational data have been increased, existing yield management approaches on semiconductor manufacturing process have only considered a single process or few processes among the overall processes. This study proposes a way to find process routes which maximize the yield of wafer (i.e., golden process routes) in view of multiple process steps. This work is expected to complement the existing efforts for managing the yield of wafer by adding results of process-oriented analysis.

IEEM17-P-0829

Nonparametric Variance Control Charts Based on Siegel-Tukey Test

Suyi LI
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To monitor the process variance in a distribution-free way is important, but relative research is still lack in the literature. We propose some new nonparametric control charts based on Siegel-Tukey test. The proposed charts can detect shifts in process variance, and the in-control performance will not be affected by the underlying process distribution. We compare the out-of-control performance to the parametric control charts and the results are convincing. We also give a numerical example to show how the charts work.

IEEM17-P-0928

Optimization of Machining Parameters for Ultrasonic Assisted Vibration-Grinding (UAVG) of Ultra-Low Expansion (ULE) Optical Glass Using Taguchi Method

Kabwe MULENGA[1], Bing GUO[2], Xingyu FU[2], Qingliang ZHAO[2]
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[2]*Harbin Institute of Technology, China*

Glass materials possess properties that are highly needed in various areas of today's and future innovation applications. In this study, we concentrated on optimization of Ultrasonic Assisted Vibration Grinding parameters for Ultra-Low Expansion (ULE) optical glass using the Taguchi method. This material is of interest as it finds its applications in the space industry such as Hubble telescope. A hybrid process of grinding; Ultrasonic Assisted Vibration Grinding (UAVG) has been used in this work, an alternative to solving the current problems with machining glass materials. We investigated the effects of control parameters; Feedrate, Depth of cut, Spindle speed, and Diamond grit size, on response variables; surface roughness and cutting force. Using Signal to Noise ratios (S/N) and Analysis of Variance (ANOVA), the machining parameters were optimized revealing that for Surface roughness had was more influenced by the spindle speed while diamond grit size influenced the cutting force.

IEEM17-P-0149

The Panel Data Predictive Model for Recurrence of Cerebral Infarction with Health Care Data Analysis

Xiaohan LI, Wenbing CHANG, Shenghan ZHOU, Fajie WEI
Beihang University, China

The paper has developed a predictive model for recurrence of cerebral infarction by analyzing the diagnostic data of cerebral infarction inpatient from health care system with the panel data regression method. The cerebral infarction has high morbidity, high disability and high mortality rate. It also has high relapse rates. The mortality rate of recurrent patients is much higher than its first onset. Which means the implementation of targeted prevention measures based on the prediction result may effectively reduce the mortality and invalidity. Firstly, the paper analyzes the possible factors of the cerebral infarction recurrence. Then the study builds the initial predictive model with the panel-regression method. Finally, the proposed model is validated by empirical research to show the prediction effect. The accuracy of prediction result suggests the proposed model is feasible.

IEEM17-P-0159

Design and Implementation of a Dynamic Healthcare System for Weight Management and Health Promotion

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Overweight and obesity have become the major public health challenges globally, since late 20th century and they are apparently on the rise in some upper middle- and high-income countries. Over past few years, the obesity-related research has been turning to use mobile wireless device to deliver the weight management intervention, with the tremendously increased use of mobile phones. Mobile health (mHealth)-related smartphone application (app) is brought to facilitate user to self-monitor the diet, physical activity and body weight for improving accuracy and reducing burdens. A dynamic healthcare solution called "Intelligent Weight Management System" (iWMS) has been developed to support user to collect and transmit the objective data in real time. User can follow the advice from healthcare professionals to not only make the changes in lifestyle and behavior, but also communicate easily with healthcare professionals. This paper discusses the development of iWMS and contours the future plan for clinical trial.

IEEM17-P-0474

Combined Forecasting of Patient Arrivals and Doctor Rostering Simulation Modelling for Hospital Emergency Department

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This paper studied the complexities of reducing patient waiting time in an Emergency Department by using a combined ARIMA forecasting approach with discrete event simulation modelling. The forecasted patient arrivals using ARIMA technique were used as inputs to the doctor rostering model built with discrete event simulation methodology. The intention of this study was to conduct comparisons between current waiting times and potential reduction of waiting times by optimizing the doctor rosters. The optimal doctor roster was selected by experimenting with patient categories bearing different severity of medical conditions (who are to be attended to within different time durations) through simulation models combined with forecasted results. Simulation results are analysed, and the results based on daily and hourly forecasted patient arrivals show potential significant waiting time reductions with optimal doctor rostering.

IEEM17-P-0486

Modeling Ambulatory Care to Obtain a Balance Between Quantity and Quality Provided

Ana Cecilia LYRA FIALHO BREDA, Lays Marina FERREIRA MARQUES, Laryssa HOLANDA
University Center CESMAC, Brazil

It is common for organizations to achieve high productivity in order to increase their profit, but for the health sector, in addition to quantity of care, quality of care is important to customers. However, it is common to see poor quality in medical care centers caused by a number of variables. After analyzing a Brazilian outpatient clinic, the short duration of medical care observed referred to low quality of care. In this way, the article performed a mathematical modeling that seeks a satisfactory solution for decision-making when the quality and quantity of care are balanced. In order to perform this modeling, the theory of endogenous growth was applied using the production function, Markovian decision process and the Cobb-Douglas function. The satisfactory solution found can be adopted for other centers.

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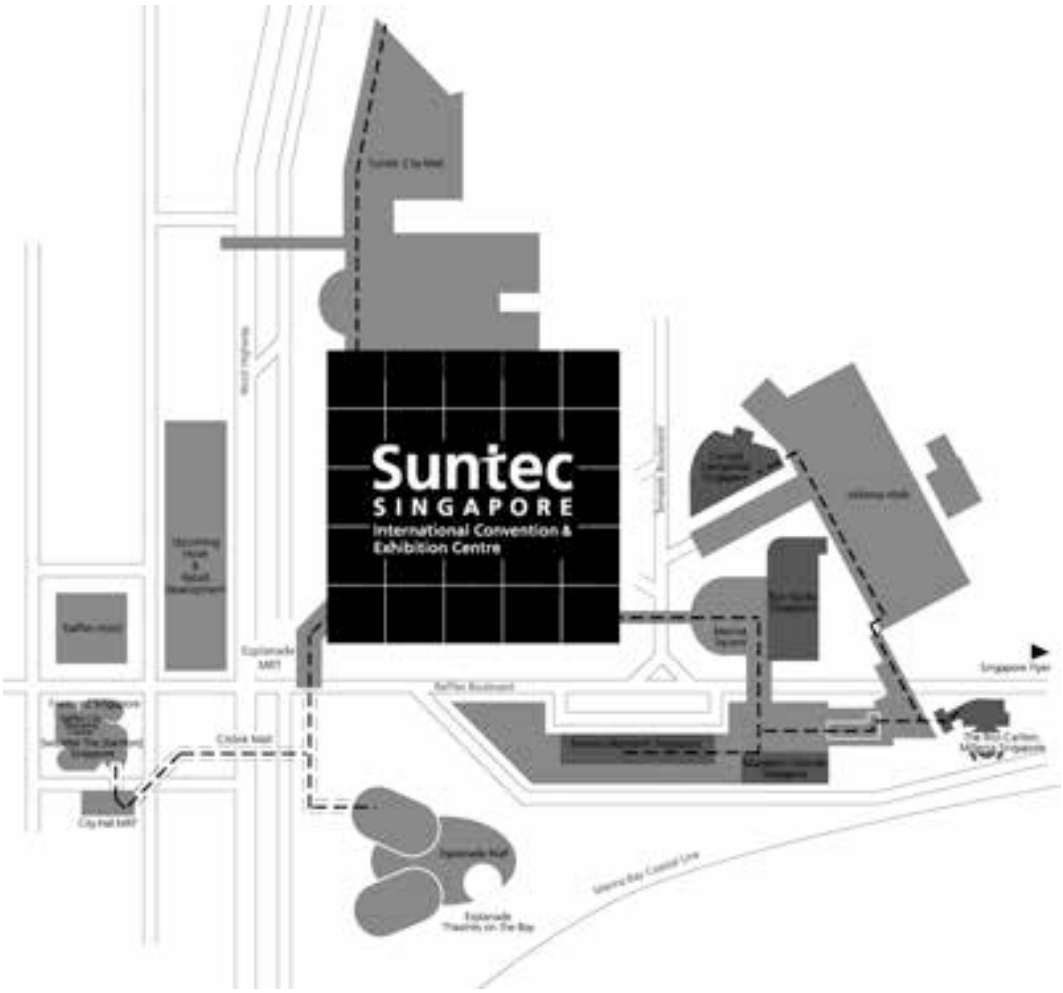
Transport Services

Comfort and City Cab	+65 6552 1111
Premier Taxi	+65 6363 6888
Prime Taxi	+65 6778 0808
SMRT Taxi	+65 6555 8888
TransCab	+65 6555 3333
MRT Information Centre	1800 336 8900

Emergency Services

Police	999
Police Hotline	1800 225 0000
Fire & Ambulance Services	995
Ambulance Service (Non-emergency)	1777
Emergency Road Service (24h)	6748 9911

GETTING TO SUNTEC



SUNTEC Singapore
Address: 1 Raffles Boulevard, Suntec City, Singapore 039593
Tel: +65 6337 2888

By Buses:
Bus Services: 36, 97, 106, 111, 133, 501, 502, 518, 857, 700

By MRT:
MRT stands for "Mass Rapid Transit", and is Singapore's train and subway system. Suntec Singapore is connected to the MRT network through several MRT stations.

The nearest MRT Stations are Esplanade Station (CC3) and Promenade Station (CC4/DT15) via the Circle Line which will bring you directly to Suntec Singapore.

Alternatively, take the MRT to City Hall Station (NS25/EW13), followed by a five to ten minutes walk via an underpass to Suntec Singapore.

Walking from MRT station
- 1 min from Promenade and Esplanade MRT
- 5 - 10 mins from City Hall MRT

TRANSPORTATION IN SINGAPORE

Singapore has one of the most extensive & efficient public transportation systems in the world. With the Mass Rapid Transit (MRT) trains, buses & taxis, travelling in the city and suburbs can be a quick and affordable affair. For a comprehensive guide that includes offline maps, estimated prices & time, download free smart phone app Singapore Map by Street Directory Pte Ltd from Google Play or Apple App Store. If you are using a Blackberry, you can still visit www.streetdirectory.com for the same services.

Train (MRT)
The MRT is a fast and cost-effective way of getting around Singapore. You can take the MRT from Changi Airport Terminal 3 to the city for a just couple of dollars. (If you are arriving at Terminal 1, 2 or 4, you can take the Skytrain to Terminal 3.) If your hotel is not walking distance from any MRT station & you wish to save some dollars on transport, you can consider taking the MRT to the nearest MRT station before taking a taxi. Services operate from about 5:30am and usually end before 1 a.m. daily.

Bus
There are currently more than 300 bus services which run daily from 5.30 to midnight. The suggested app above will direct you to the exact bus-stop and the number to take.

Taxi
Taxis ply the island round the clock, bringing you wherever you want, anytime you want. However, do note that airport, peak-hour, city area & Electronic Road Pricing (ERP) gantry surcharges apply.

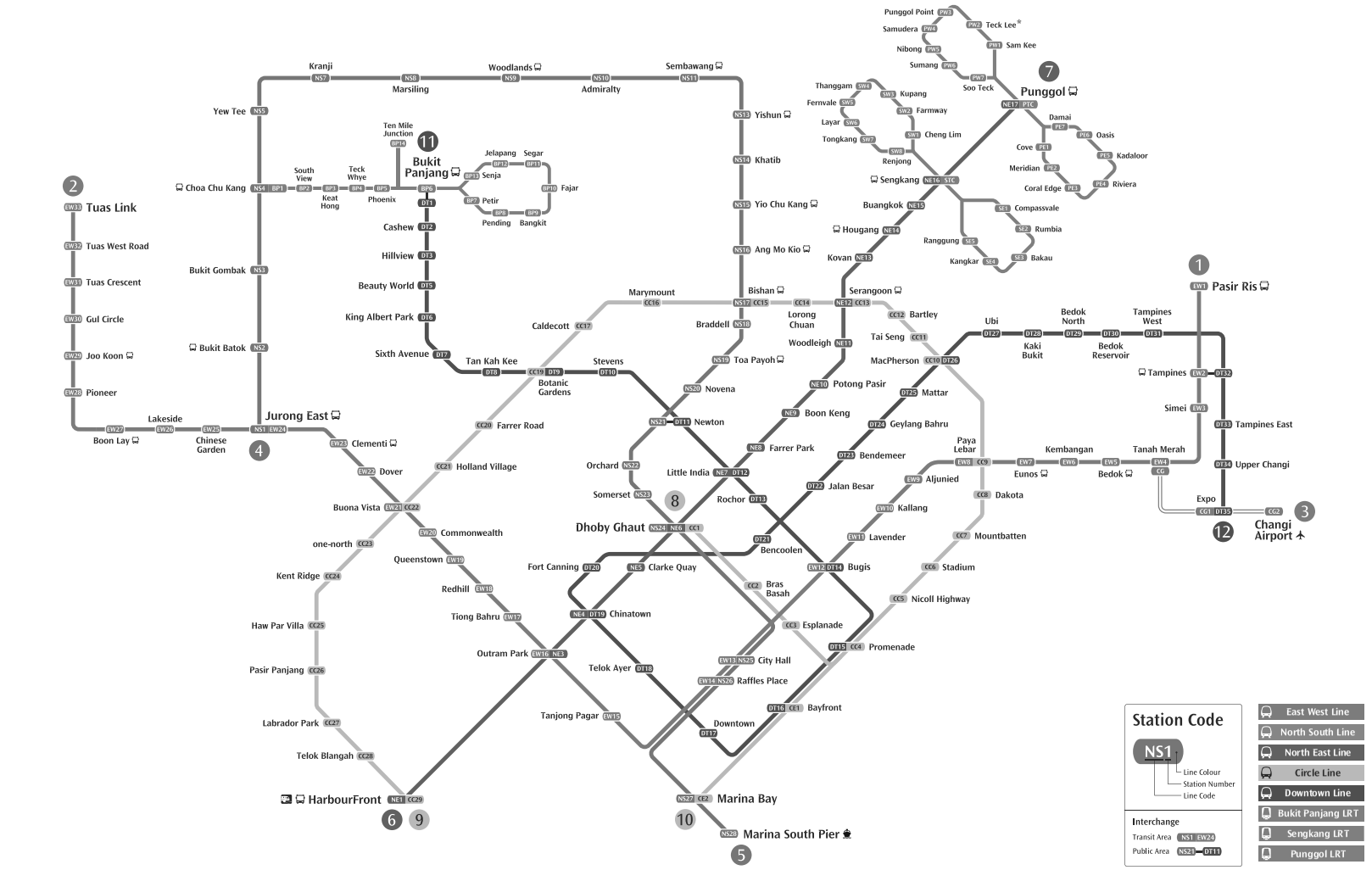
The hotlines for various taxi services in Singapore, are also listed below.

Comfort and City Cab	+65 6552 1111
Premier Taxis	+65 6363 6888
Prime Taxi	+65 6778 0808
SMRT Taxis	+65 6555 8888
TransCab	+65 6555 3333
MRT Information Centre	1800 336 8900

Uber and Grab services are also available in Singapore.

MRT | LRT System Map

* station not in operation



EXPERIENCE SINGAPORE

Singapore, the tiny sunny island, named after a legendary lion that could have been a Malayan tiger instead, is an exciting little cultural potpourri of mainly Chinese, Malays & Indians, not to mention the influx of new immigrants from the rest of the world in the recent years. Smaller than a full-stop on the world map, only 761.1km2 in size, Singapore has a bewitching concoction of activities & attractions to fill up your time after your conference.

Merlion Park

A picture with Singapore's most iconic national mascot, the Merlion (a half-lion, half-fish), is the best proof of "You've Been Here" & best of all, it is free to visit! Pose with the Merlion before taking a walk into the restored colonial architecture Fullerton Hotel which used to be Singapore's General Post Office, built in 1928. Another interesting restoration nearby is the Fullerton Bay Hotel which incorporated buildings that used to be part of the bustling Collyer Quay. Do make sure you also take a shot of the Esplanade, the durian shaped architecture unique to Singapore.

Marina Bay Sands

Another icon of Singapore's skyline would be the most expensive to build integrated resort in the world – the Marina Bay Sands. Other than taking a photo of the iconic resort, there are various attractions worth visiting in Marina Bay Sands including the Shoppes at Marina Bay Sands mall, a museum, two large theatres, seven "celebrity chef" restaurants, two floating Crystal Pavilions, an ice skating rink, and the world's largest atrium casino with 500 tables and 1,600 slot machines.

Gardens by the Bay

Spanning 101 hectares, Gardens by the Bay comprises three waterfront gardens – Bay South, Bay East and Bay Central. An exemplary showcase of horticulture and garden artistry, the Gardens will bring the world of plants to Singapore and present Singapore to the world. Get up close with a wide variety of plant species from around the world in the iconic cooled conservatories, marvel at the Supertrees vertical garden, or discover the intricacies of plant life at the themed gardens. In this horticultural oasis nestled in the heart of the city, there's so much to explore!

Geylang

If you want to taste some good food while experiencing the seedy side of the clean & safe Singapore, just head down to the red-light district – Geylang. With neon lights marketing China Chinese cuisine, sleazy nightclubs & adult shops lighting up the main street, Geylang is the place where you can find cheap & exotic foods like frog legs in congee or a very expensive crab beehoon (rice vermicelli) in a grimy restaurant listed by celebrity chef Anthony Bourdain as one of the 13 places to eat before you die.

Clarke Quay

Clarke Quay exudes a charming mix of modern and traditional. From a humble fishing village, it developed into a busy seaport and is now a popular spot for dining and nightlife. Five blocks of restored warehouses house various restaurants and nightclubs. Notable restaurants and nightclubs include Hooters and Indochine. To get a dose of adrenaline rush, hope onto the G-Max Reverse Bungy. For a calming cruise along Singapore River, hop onto the River Taxi.

Chinatown

Chinatown is Singapore's oldest ethnic district rich in culture and history. Chinatown Street Market is a one-stop shopping dining and entertainment hub in Chinatown where visitors will come across numerous Chinese Medical halls, teahouses, eateries and also handicrafts. To learn more about the history of Chinatown, be sure to visit the Chinatown Heritage Centre.

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Department of Systems Engineering and Engineering Management
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Enquiries
Tel: 3442 9321 Email: seemgo@cityu.edu.hk
Website: www.cityu.edu.hk/seem

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IT'S NOT JUST HOW YOU THINK. IT'S WHAT YOU CAN IMAGINE.

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